








Vartiainen:

Helsinki University of Technology  
Laboratory of Work Psychology and Leadership  
Report 2006/3  
Espoo 2006

WORKSPACE METHODOLOGIES - STUDYING COMMUNICATION, COLLABORATION AND WORKSCAPES

## WORKSPACE METHODOLOGIES - STUDYING COMMUNICATION, COLLABORATION AND WORKSCAPES

Matti Vartiainen (Ed.)

<p><b>Physical space</b></p> <ul style="list-style-type: none"> <li>- Settings</li> <li>- Arenas</li> <li>- Environments</li> <li>- Tasks</li> </ul>	<p><b>Home</b></p> 	<p><b>Main workplace(s), 'Office'</b></p> 	<p><b>Moving places, i.e. trains, airplanes, ships</b></p> 	<p><b>'Other workplaces', e.g. clients' and suppliers' places</b></p> 	<p><b>'Third workplaces', e.g. hotel, cafe, congress venue</b></p> 
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Julkaisun nimi Workspace methodologies – studying communication, collaboration and workspaces				
Tiivistelmä Tämä raportti koostuu työtilojen tutkimisesta, arvioinnista ja kehittämisessä käytettyjen tiedonkeruu- ja analysointimenetelmien kuvauksista. Työn toimintaympäristöä eritellään eri tasoina tai kerrostumina: fyysisinä, virtuaalisina ja henkisinä/sosiaalisina tiloina. Tasoerittelyssä hyödynnetään Kurt Lewinin klassista, yksilöpsykologista 'elämäntila' käsitettä sekä Nonakan, Toyaman ja Konnon käsitettä 'ba'. Ba tarkoittaa sosiaalisesti jaettua tilaa, jossa olevat ihmiset luovat, jakavat ja käyttävät tietoa. 'Ba' yhdistää fyysisen tilan, kuten toimisto, virtuaalisen tilan, kuten sähköposti, ja henkisen tai sosiaalisen tilan, kuten yhteisesti jaetut kokemukset, ideat ja ihanteet. Oletuksena on, että näiden tilojen tarjoama tuki ja esteet vaikuttavat keskeisellä tavalla yksittäisten työntekijöiden, ryhmien ja organisaatioiden toimintaan. Työpaikkojen suunnittelun ja kehittämisen kannalta on olennaista tunnistaa toimintaa helpottavia ja estäviä tekijöitä. Tähän tarvitaan erilaisia menetelmiä kerätä työtiloja koskevaa tietoa, analysoida sitä, kuvata näitä ympäristöjä ja arvioida niiden laatua. Raportin kirjoituksissa kuvataan joitakin menetelmiä. Kuvatut menetelmät ovat: sosiaalisten verkostojen analyysimenetelmät, piirros- ja valokuvamenetelmä, kommunikaatioanalyysi, kuormitustekijä- ja hyvinvointianalyysi, simulaatiopelimenetelmä ja monitieteinen työpaikkojen tutkimusmetodologia. Esitellyt menetelmät ovat esimerkkejä tavoista paneutua työpaikkojen tutkimuksen haasteisiin.				
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Title Workspace methodologies – studying communication, collaboration and workspaces				
Abstract <p>This report consists of descriptions of methods, which are used for studying, evaluating and developing workplaces. Work environments are analyzed as layers or imbedded levels: as physical, virtual and mental/social spaces. In this analysis, Kurt Lewin's classical psychological concept 'Life Space' is used as well as the concept 'ba' provided by Nonaka, Toyama and Konno. 'Ba' refers to socially shared space, where people create, share and use knowledge. The concept of <i>Ba</i> unifies the <i>physical space</i>, such as an office space, the <i>virtual space</i>, such as e-mail, and the <i>mental or social space</i>, such as common experiences, ideas, values, and ideals shared by people with common goals as a working context. A hypothesis is that the support and/or hindrances of these spaces have a crucial influence on the activities of employees, groups and organizations. To design and develop workplaces it is fundamental to identify these facilitating and hindering work context characteristics. For this purpose, various methods are needed to collect data, to analyze it, to describe and model the environments, and to analyze their quality. In this report, some only methods are described. They are: social network analysis, sketching and photographing methods, communication analysis, work requirement and well-being analysis, simulation game method and multidisciplinary workplace study methodology. The described methods are examples of approaches and methods meant to cling to the challenges of workplace design.</p>				
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## **FOREWORDS**

”Work is always carried out in some space” sounds to be a matter of course. However, if we open the concept of the ‘space’ a bit, everything turns out to be more complicated and not so clear anymore. This was one of the starting points of the ‘Distributed Workplace – dWork’ – project, which started two years ago and has now reached its end. The project was funded by Tekes and partner companies Nokia, Nordea and Senate Properties. The project’s aim was to analyse and describe the challenges of distributed and mobile work on workplace design and development. It is evident that we are today on the edge of something new in working life; work is becoming multi-locational, mobile technologies as its enabler. When employees are not anymore sitting by their desks at the main office, they still are somewhere, but where and doing what?

To understand the challenges of distributed and mobile work and its outcomes, a set of research methodologies and methods are needed. Some of them are described in this report, which consists of the papers presented in the researcher workshop on the 1<sup>st</sup> February 2006 at TKK, Department of Industrial Engineering and Management. A handful of researchers met and presented their papers, which are now here to read. Thanks to you for your participation and for your patience of waiting these papers to be published. It seems that we are still just in the beginning of a long road to understand all the challenges that new work creates. The first steps have been taken, but the road is long to go.

Otaniemi 15<sup>th</sup> June 2006

Matti Vartiainen



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## **STUDYING MOBILE MULTI-LOCATIONAL WORK**

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### **INTRODUCTION**

Work is always carried out in some space. Workspaces are imbedded and layered entities consisting of physical, virtual and mental/social workspaces. This report aims at answering the question, how these spaces could be studied, analysed and described? This question raises from both practical and research reasons. The number of multi-locational workers is increasing, and we do not know much about their everyday life and needs, for example, to what degree the workplaces they work in support them in their activities. Therefore, it is interesting to know, for what purposes (tasks), how (mode of communication and collaboration) and where (place) and with whom (network) mobile multi-locational employees act and communicate. How physical, virtual and mental/social spaces support or should support employees in their work. Answers to these questions could increase our knowledge to understand, how best to support mobile and distributed employees and teams in their work. From research point of view, the new types of work challenge the existing models of communication and collaboration. Are they still valid? How can we study these new forms of work? Are our methodologies and methods valid and reliable?

### **CHALLENGE OF MOBILE, MULTI-LOCATIONAL WORK**

Some studies show that the prevalence of new types of work is high today. For example, Gareis, Lilischkis and Mentrup (2006, see also Gareis, Kordey and Müller, 2004) show that telework including home-based telework (at least one day/week), supplementary home-based work, mobile eWork, and freelance telework in SOHOs (small office home office) increased from six per cent in 1999 to 13 per cent in 2002 in Europe. They suggest that to categorise teleworkers as either “home-based” or “mobile” distracts from the fact that many teleworkers spend their working time at a number of different locations, among which the home might be only one option (Table 1). This trend has obviously been enabled by mobile technologies, which has liberated work from being bound to a particular space and time. For this phenomenon, Gareis et al. (2004) propose the term “multi-locational telework” (see also

CEC, 2003). It implies that persons work wherever it suits their work tasks, business schedule, and/or lifestyle.

Table 1. Multi-locational telework – working locations (Gareis, Kordey and Müller 2004, 25).

<b>Base →</b>	<b>(a) at home or the same grounds</b>	<b>(b) on another site of employer</b>	<b>© at customers/ clients</b>	<b>(d) at a hotel/ meeting venue</b>	<b>(e) on the move</b>
<b>at home or the same grounds</b>	100.0	40.4	42.2	39.1	42.5
<b>on another site of employer</b>	11.5	100.0	52.5	57.4	55.6
<b>at customers/ clients</b>	17.4	76.0	100.0	64.6	71.9
<b>at a hotel/ meeting venue</b>	9.2	47.4	36.9	100.0	50.1
<b>on the move</b>	14.2	65.2	58.3	71.0	100.0

Base: all multi-locational workers. Data source: BISER RPS 2003, weighted.

Table 1 shows the share of those teleworking from one of locations (columns) who also do telework at each of the other locations (rows). For example, of persons teleworking from the home (a) 11.5% also work at a second location of their employer and use online connections to stay in contact when doing so. Another example: 42.5% of those who telework from mobile locations (e) also spend time teleworking from home.

ITAC, the Telework Advisory Group for WorldatWork (2005), reports that millions of Americans are working in a variety of different locations outside of their employer’s office. This result is based on research conducted for ITAC by The Dieringer Research Group as part of Dieringer’s 2005 American Interactive Consumer Survey. The survey was conducted from August 15 – September 1, 2005. The survey asked respondents to check up to 13 different locations where they may have conducted work in the past month. The survey found that out of 135.4 million American workers: 45.1 million worked from home, 24.3 million people worked at client’s or customer’s place of business, 20.6 million in their car, 16.3 million while on vacation, 15.1 million at a park or outdoor location, and 7.8 million while on a train or airplane. Among the 45.1 million Americans working from home, the average number of locations they work from is 3.4. The ability for people to work from anywhere is attributed in part to increasing availability of portable computer and high-speed communication technologies. The use of broadband in the home by teleworkers increased by over 60 per cent

during the former year resulting in 25.6 million home-based teleworkers with high-speed access. The survey also showed a 30 per cent increase during the past year in employee telecommuters, while self-employed telecommuters decreased by two per cent. Overall, there are 26.1 million people who work from home at least one day a month, and 22.2 million at least once a week.

Among Finnish workforce, the number of those who had agreed with employer to work at least some hours from home utilising information technology has remained at the steady 10 per cent level (Lehto and Sutela, 2005). In the 2003 survey, seven per cent of men and four per cent of women, or six per cent of all employees reported that they factually teleworked. Many employees work at home without any agreement with an employer. Antila (2005) shows that one third of employees work at home occasionally two hours per week on an average, but only one per cent work solely at home. His data was based on two surveys collected in 2003 (n=1538, response rate 49,5%) and in 2004 (n=2856, response rate 53%). Another study (Uhmavaara et al., 2005) explored the variety of places where employees work. Respondents in the survey (n=1177 from 106 offices in 2004) were asked to select where they had done their main job during last week. It was shown that at one time or another 40 per cent of employees work either from home, on business trips, at the customer's place or at different locations of the same business. In detail, the working places were: only at the main office 55 per cent, other places plus meeting and training rooms 29 per cent, home 25 per cent, at customers' site 15 per cent, domestic trips 12 per cent, train, bus, and airplane 8 per cent, parties and lunch 5 per cent, trips abroad 3 per cent, at relatives' site 2 per cent and summer house one per cent.

The figures show that people are increasingly working in many places during their work day and week. Little is, however, known to what extent the spaces support employees in their work.

## **WHAT TO STUDY?**

Three intertwined and partly embedded factors influence the type and outcomes of multi-locational collaboration. First, the complexity of individual and collective assignments and tasks, referring to the question whether a collaborating group of employees has to execute mainly routine tasks or creative tasks? Second, the complexity of context or space, i.e. in what kind of physical, virtual, and mental/social spaces work is done? Third, these two factors influence the internal regulative processes of individuals in groups and of groups themselves,

i.e. what internal mechanisms and tools are needed to regulate actions, relations and boundaries between subjects, objects, tasks, and the environment? As Ashby's law of requisite variety tells (Ashby, 1958), the greater the variety in an environment of a system, the greater the variety should be within the system to adapt properly to its environment. The various forms of complexity interact. Simple tasks in a simply settings require only relatively simple regulatory activities, the more complex the task and the context are, i.e. the higher the contextual complexity is, the more regulation or at least the more energy and support are required.

Distributed virtual work units always have some purpose for their activity, which expresses itself as the motives for and objectives of actions. These factors not only result in positive and negative performance outcomes, but also provide descriptions of user needs and specifications for work system design and development.

### **What is done?**

Complexity of tasks consists of two main features: (1) the mental requirements for task execution, and (2) interdependence of tasks. Task complexity has critical implications for the structure and processes of collaboration as well as many leadership implications.

There are different purposes for distributed collaboration, and the content of assignments and tasks vary from routine task execution to problem-solving and creative tasks (Andriessen, 2003). The *mental requirements for tasks* vary therefore also. At one end, tasks are complex, requiring creativity and abilities to diagnose and solve problems. At the other end, tasks are simple requiring routine-like thinking and actions. Many virtual teams are management teams co-ordinating distributed activities and expert teams designing new products on a temporary basis. Other teams are doing more routine collaboration, for example, arranging together goods transportation from one place to another.

Bell and Kozlowski (2002, 18-20) use a combined set of characteristics to describe differences in the complexity of team tasks including the task environment, external coupling and internal coupling. Couplings refer to the *interdependence of tasks*. Tasks at the less complex end of the continuum are static and loosely coupled to the external context, with minimal temporal pacing or entrainment requirements. These tasks require only weak and asynchronous intra-member linkages in teams. They require also minimal collaboration and information sharing among team members. Simple tasks require less co-ordination and their competence requirements are lower than in the case of complex tasks. Complex tasks are

more dynamic and involve tightly coupled external linkages. They are highly coupled temporally, with demanding pacing requirements for intra-team processes and for the team's interface with the external context. Tasks are challenging, requiring synchronous collaboration and intensive information sharing.

### **Context: where and how - defining workspaces**

What do we mean when we speak about workspaces? Work is always carried out in a combination of spaces. Kurt Lewin in his time described how each individual exists in a psychological field of forces that determines and limits his or her behaviour. Lewin (1972) called this psychological field the 'life space'. It is a highly subjective 'space' dealing with the world as the individual sees it. 'Life space' is, however, embedded in the objective elements of physical and social fields. As 'Life space' describes individual contexts, the concept of 'ba' (Nonaka, Toyama & Konno, 2000) concerns shared contexts. It is useful for differentiating various spaces in collaborative work. *Ba* refers to a shared context in which knowledge is shared, created, and utilised by those who interact and communicate there. *Ba* does not just mean a physical space, but a specific time and space that integrates layers of spaces. The concept of *Ba* unifies the *physical space*, such as an office space, the *virtual space*, such as e-mail, and the *mental or social space*, such as common experiences, ideas, values, and ideals shared by people with common goals as a working context (Figure 1).

*Physical places.* The physical environments that employees use for working are divided into five categories: (1) home, (2) the main workplace ('Office'), (3) moving places, such as cars, trains, planes, and ships, (4) a customer's or a partner's' or a company's other premises ('other workplaces'), and (5) hotels and cafés etc. ('third workplaces').

The use of physical places can be described by different indicators, such as their distance from each other (near – far), their number (one – many), and the frequency with which they change (seldom – often). The indicators are then used in modelling various types of distributed and mobile work units. A physical place itself can move, for example, a car, a train, or an aeroplane. This type of working in many places is sometimes called multi-location work (Lilischkis, 2003).

A *virtual place* refers to an electronic working environment or virtual working space. The internet and intranet provide a platform for working places for both simple communication tools, such as e-mail and chat, and complex ones, such as collaborative working environments, which integrate different tools.

The combinations of physical and virtual workplaces can be described as a ‘workscape’ (Harrison, Wheeler & Whitehead, 2004). The term ‘workscape’ refers to the “layers of where we work”, i.e. the constellation of 1) real and virtual work settings, i.e. furniture + IT, within 2) particular spaces, i.e. meeting rooms, project areas, cafés etc, that are, again, 3) located in a specific environment, i.e. office building, city district, street, home, airport, bus etc.

<b>Physical Spaces</b> - Settings - Arenas - Environments - Tasks	 Home	 Main workplace(s) 'Office'	 Moving plane, i.e. trains, airplanes, ships	 'Other workplaces', e.g. clients' and suppliers' places	 'Third workplaces', e.g. hotel, café, congress venue
<b>Virtual Spaces</b> - Connections - Devices - Services - Purposes - Functionality	PC, phone, Internet, broadband, wlan	Intranet, communicat- ion and collaboration systems	Mobile devices 	Intra- and extranet, Internet	Laptop, intranet
<b>Mental and Social Spaces</b> - G&O and HRM issues	Tranquility, well-being <b>family</b>	Shared goals and values, 'stress', <b>peers</b>	Change and solitude, <b>strangers</b>	Trust, <b>partners</b>	Interruptions, <b>mostly            strangers</b>

Figure 1. Work activities are carried out in physical, virtual, and mental/social spaces.

*Mental/social place* refers to cognitive constructs, thoughts, beliefs, ideas, and mental states that employees share. Creating and forming joint mental spaces requires communication and collaboration, for example, exchanging ideas in face-to-face or virtual dialogues.

### **Regulative processes and outcomes**

The task and contextual complexities set requirements for collaboration, and have influence on the structures and processes of action regulation. Structures and intra-group processes for their part modify the influences of the complexities on performance and well-being outcomes. By internal processes a group regulates and overcomes the external influences. This also calls for individual flexibility of employees.



When considering *performance*, it has been found consistently that virtual and multi-locational interaction increases the amount of time required to accomplish tasks. Some reasons offered for the increased time are firstly the fact that typing and using ICT technology takes longer time than face-to-face discussions, and secondly that asynchronous communication is slower than synchronous communication. The findings for the effects on performance quality are mixed. Several researchers have found no differences in performance quality between virtual and face-to-face teams, while others have found that face-to-face teams outperform virtual teams. On the other hand, there are findings, which show that virtual teams produce better work, make more effective decisions, generate more unique and high quality ideas, and report their solutions as being more original. Martins et al. (2004) show that these inconsistent results can be explained with factors such as *task type*, e.g. in negotiation and intellectually requiring tasks face-to-face teams perform better, *time spent working in a group*, e.g. groups evolve, learn and become experienced, and *social context*, e.g. cooperation and communication openness improves team performance. Powell et al. (2004, 13) for their part summarize factors contributing to the successful performance of a virtual team: training, strategy/goal setting, developing shared language, team building, team cohesiveness, communication, coordination and commitment of the team, the appropriate task-technology fit, and competitive and collaborative conflict behaviours.

Mixed results on *satisfaction outcomes* have emerged from the comparison of traditional and virtual teams, with some studies detecting no differences while others found traditional team members more satisfied than virtual team members (Powell et al. 2004). According to Martins et al. (2004) satisfaction appears to be dependent on the nature of the task and on team composition. One study found that traditional team members started out more satisfied, but virtual team members' satisfaction levels rose throughout the year (Powell et al. 2004). Teams using electronic chat have reported higher levels of frustration. However, for decision-making tasks, members of virtual groups reported to be more satisfied with the group process. Similarly, members of electronic brainstorming teams have been found to be more satisfied than their face-to-face counterparts. Finally, all-female virtual teams tend to report higher levels of satisfaction than all-male virtual teams.

## **METHODS IN USE**

The articles in this report describe different manners to explore workspaces and their use for collaboration. The article of *Tuire Palonen* provides methodological tools, which combine

social network analysis to communication studies and learning research. *Antti Tuomela* and *Heidi Rasila* focus on service network as an integral for efficient service production in workplace environment. The aim of this article is to present a framework for studying network service organization in workplace environments. *Marja Kauttu's* paper introduces sketching and photographic self-documentation as methods for visualising and explicating subjective realities and perceptions of employees. The visualisation methods are used as additional elements of individual thematic interviews. Sketching and photographic self-documentation as complementary tools provided the chance to quickly establish a common frame of reference for discussing a complex topic. *Ursula Hyrkkänen* explores the work requirements and well-being outcomes of mobile work in her article. The data was gathered by interviewing each member of the groups by a semi-structured interview. In addition to the interviews, three different surveys were used: virtual team questionnaire (VTQ1), well-being in dispersed work (WDW) and Job Engagement Questionnaire. *Virpi Ruohomäki's* paper focuses on the simulation game called the Teamwork Game for studying and promoting collaboration and teambuilding in organizations. With the help of a case study, the paper describes how the game is applied within the context of distributed and mobile teamwork in a building project at its launching phase. The paper also shows empirical results with follow-up study and discusses the outcomes and effectiveness of the game. The final paper is written by *Suvi Nenonen* and *Nils Gersberg* and deals with multidisciplinary workplace research. This paper's objective is to describe the challenges of multidisciplinary workplace research. It provides an overview of different workplace research approaches as well as it presents one research example 'The nature of the workplace for knowledge creation' more closely.

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# **STUDYING EXPERTS' COMMUNICATION FLOWS BY USING SNA TECHNIQUES**

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In this chapter, the aim is to provide some methodological tools, which combine social network analysis to communication studies and learning research. The framework focuses on social networks including cohesion approach, structural equivalence techniques, and personal (egocentric) networks. Some empirical examples are presented related to different kinds of analyzing units on organizational, community and individual level.

## **INTRODUCTION**

The network study approach connects the social context to individual capacity by describing, how people create, maintain, cultivate and activate their personal social networks (e.g. Brown & Duguid, 1999, 2001; Hakkarainen et al., 2004). Instead of relying on the shelter of the workplaces and institutes, the expertise is cultivated and covered in experts' own personal social networks. Experts nurture and profile their own expertise by re-activating and strengthening some relevant links depending on what kind of work they are doing (Nardi, Whittaker & Schwarz, 2000, 2002; McCarty, 2002). The research of social networks stresses the importance of cross-boundary analyses of workplaces' networks and even experts' past relations in their former networks.

Previous studies have indicated some relevance to study the significance of the worker's network positions. Various approaches have been presented at least as regarding: the importance of cohesive network positions, mediator and boundary crossing roles, the relationship between informal and formal power positions, personal characteristics and how they are related to persons' network position, and the different role of strong and weak network ties in knowledge mediation.

First, the central position in knowledge exchange network has been indicated as a patterned set of cohesive advice and information flows. In organizational settings, the structure of knowledge exchange is often a nested one. Information circulates within a work group more than between groups, within a division more than between divisions and so on. At the individual level, knowledge diffusion occurs among tightly linked workers (Burt, 1999,

2000; Friedman & Podolny, 1992, Palonen et al., 2004). Consequently, informal communities of practice have an essential role in knowledge exchange. Secondly, not only dense network flows but also the importance of non-redundant sources of information has been highlighted. Burt's (1992) argument about "structural holes" reveals, how gaps between non-redundant contacts can generate control and information benefits. The information benefits are various, when there are people bridging diverse groups that have little or no interaction. Boundary crossing workers have access to more and varying information and they are likely to hear about more valuable information sooner than other workers. They are also more likely to be exposed to a range of interpretations and thus be more accurate in their judgements about the trustworthiness and validity of the information available (Burt, 1999).

In the report of Friedman and Podolny (1992), for the organisation investigated, a moderately high correlation between a central position within the team and boundary spanning has been found. Those who are most influential within the teams seem to be the most likely to occupy boundary-spanning roles. In the same way, the structural position has shown to be an important resource of power (Burkhardt & Brass, 1990). There is evidence that individual characteristics like high self-monitoring (Mehra, Kilduff, & Brass, 2001) or entrepreneurial personality (Burt, 1998) correlate with network agency. There has been shown that correlation exists between individual cognitive and social structures (Janicik, 1997; Krackhardt, 1990). There is also empirical evidence according to which personal network characteristics are closely related with individual experiences and with differences in learning (Janicik, 1997). Finally, the nature of the knowledge exchanged and the strength of ties among members of the network are shown to be very important considerations (Hansen, 1999; Uzzi, 1997). Strong ties represent the reciprocal, redundant and specialized information flow, whereas weak ties guarantee an adequate number of ties with the result that new information can also be captured in the network. The strong ties provide the best net effect in the case of complex knowledge whereas weak ties may be more effective in transmitting well-coded knowledge.

### **Social network (SNA) approach to communication studies**

In SNA, one of the most consequential properties of repeated exchange relations is the strength of dyadic ties, that is, the intensity of exchange that reflects the degree to which a link is significant, stable and mutual. (Scott, 1991; Wasserman & Faust, 1994; Johanson et al., 1995; Mattila & Uusikylä, 1999). Standard statistical methods, in contrast, provide

information about attributes of individual actors rather than relationships among actors. Social relations can be thought as dyadic attributes, whereas mainstream social science is concerned with monadic attributes. The relations, i.e. dyadic attributes, can be, e.g. kinship, social roles, affective or cognitive properties, actions, flows, distance or co-occurrence. Relational structure models can be used to describe social and other phenomena where interactions between units are observed. These models allow researchers to represent pair wise relational structures of social actors (individuals, teams, organizations etc.), where the relationships are defined by social interactions, e.g. collaborating, seeking advice, mediating information, and providing friendship.

A social network is defined as a set of actors and the relations that hold them together. In the whole network approach the actors are tied together via resource, e.g. information, exchange. The essential aim is to reveal the importance of repeated exchange relations that form the basis of both dyadic (between individuals) and structural (in the network) embeddedness. The continuous flow of communication creates a structure, which is then studied. In the egocentric approach, the network is examined from the perspective of one person (ego) and the focus is on his or her links to other people (alter). According to the latter approach, the network is “owned” by an ego. The network members (alter) consist of the persons who have reported that ego is part of their network, or who are nominated by the ego himself or herself. Although the analysis of relational structures focussed on the pattern of relationships between the actors involved, the relations often are strongly affected by the monadic attributes possessed by the actors, e.g. age, gender or educational status and field. The complexity of the situation is increased by the fact that it is often, a priori, unclear which attributes influence the relationship patterns, and whether these attributes have been measured.

In this chapter, there are three approaches to social network analyses: (1) the whole network level based on cohesion, (2) the whole network level based on structural equivalence, and (3) the egocentric network level approach.

*In cohesion approach*, density is a basic concept, and it is a simple way to measure a network: the more actors have relationship with one another, the denser will be the network. When studying centralization, it is possible to focus either on centrality of an individual actor or centralization of a network structure (e.g. team, workplace or school class). The centrality of an individual shows the most popular actors, those who stand at the centre of attention and are highly chosen individuals in contrast to the isolates, who are rarely or not at all chosen. For example, Freeman’s betweenness (Borgatti et. al., 1996) has been used as indicator of the

information gatekeepers' positions. The measure is based on the concept of path distance, which can be understood better if we think communication as an information flow consisting of the individual connections. In SNA interactions between two nonadjacent actors, i.e. actors who are not directly interacting, depend on the other actors, who lie on the paths between these two. An actor has a high betweenness value if he or she often lies between other actors, who are not directly connected to each other, given that the shortest distance between two actors in the network (the geodesic) is used to calculate the betweenness (Wasserman & Faust, 1994, 188-192). The term centralization refers to the extent to which a whole graph has a centralized structure. Centralization measures are always related to individual centrality measures. The concepts of density and centralisation focus on differing aspects of overall compactness of a graph. Density describes the general level of cohesion in a graph, while centralization describes the extent to which this cohesion is organised around particular focal points. Centralization and density, therefore, are important complementary measures (Wasserman and Faust, 1994, 169-219; Scott, 1991).

*Structurally equivalent* people, in turn, occupy the same position in the social structure and are so proximate to the extent that they have the same pattern of relations with occupants of other positions. So, two people are structurally equivalent if they have identical relations with all other individuals in the study population. Actors who are structurally equivalent do not need to be in direct contact with each other. Many methods that are concerned with this kind of notion of *social position* or *social role*, translate into procedures for analysing actors' structural similarities and patterns of relations in multi-relational networks. Although the methods are mathematically and formally diverse, they share a common goal of representing patterns in complex social network data in simplified form to reveal a subset of actors who are similarly embedded in networks of relations and to describe the associations among relations in multi-relational networks (Wasserman & Faust, 1994, 345-393). In real life, it is rare that two actors would have exactly equivalent position, so blocks identified using a stochastic criterion might be more accurately referred to as blocks of structurally similar actors (Frank, 1996).

The SNA data can be gathered in many ways, e.g. through a questionnaire in which interpersonal collaboration and informal discussion can be addressed. The questionnaire consists of a list of names in which rows represented names, and columns, different types of networking relations, e.g. concerning advice seeking, information exchange, collaboration, or social support. By questionnaire, the information can be collected, e.g. about the networking

practices, with a focus on tracing how the knowledge sharing takes places in some communities or organizations. Each of the network dimensions can be studied separately but the features can also be combined if correlation between them is observed.

Despite of using questionnaires, it is possible to use, e.g. citation count, interviews, and electronic log files (Nurmela et al., 1999, 2003). It would also be possible to have a sample of informants, who report the information needed. If not carefully planned, the gathering and working with data can be very time-consuming as network techniques are usually analysed in the form of case-by-case matrices. The samplings, used mainly in the form of snowball sampling are sensitive to research design and, as well, become large without showing the saturation expected.

In egocentric network analysis, data can be gathered, e.g. via interviews, in which network members are free-listed. For interviewees, this seems to be a natural way to report their personal network members. People tend to classify their collaborators into groups and often members of one group do not know members of another. In attribute-based analyses the data are often summaries of attributes of network members that are then compared to the same or other attributes of respondents. One typical question asked concerns the type or content of the relation with each network member. Structural analyses can be gathered e.g. as lists of the names in which respondents mark with whom they are having a relationship (such as advice seeking, collaboration, social support). It is to be noticed that gathering whole network data is a time-consuming task if the network is large.

For next, some empirical examples are presented in order to explain what kinds of phenomena can be studied via SNA. The analyses are detailed reported elsewhere (Palonen, 2003; Palonen, 2005; Palonen, Rehl, Gruber & Lehtinen, submitted).

## **EMPIRICAL EXAMPLES OF SNA USE**

The analyses focus on: (1) cohesion in the whole network (organizational level), (2) structural equivalence of the network (organisational level), and (3) egocentric networks of some workers (actor level).



## **Participants**

The case organization is a part of the public administration in Finland. All of the organization's 89 workers (43 females) took part in the study (about the data set more detailed, see Palonen, 2003).

## **Data gathering**

The data were gathered with Networking Questionnaire, in which interpersonal collaboration and informal discussion were addressed. The questionnaires were distributed by organization's internal mail. The reminder was sent twice via email by researchers. The questionnaire consisted of a list of names, in which rows represented names of each of the 89 workers of the organization; and columns, four types of networking relations. In the case of each worker, the participant was guided to think about whether he or she (1) goes for advice to this worker, (2) receives new information from him or her, (3) collaborates with this worker, or (4) gets support or has informal discussions with the worker. In addition, there was an empty line row for explaining the content of each relationship reported. These explanations were later used to facilitate the interpretation of the results.

Each of the variables was first studied separately but the features were later combined for further analyses. With the exception of few workers, who retired during the study process, all sent back the questionnaires. As data are symmetrized according to the rest of the (86) answers in the cases of the (3) missing papers, all participants are present and, thus, the dataset can be looked upon as complete with no missing values in it.

## **Cohesion approach to the data**

*Searching the most visible and central actors in multi-relational network.* Density is a simple way to measure a network: the more actors that have relationships with one another, the denser the network will be. The density of a (binary) network is the total number of ties divided by the number of possible ties. This measure can vary from 0 to 1 (Scott, 1991, 74).

In searching for the most active and visible key workers, we calculated the centrality values to look at the amount of addressed and received information and knowledge. The concept of centrality in social networks traces the persons who are the most popular and highly chosen individuals in contrast to the "isolates". Freeman's degree, i.e. degree of connection, is simply the number of other points to which a point (an actor) is adjacent (Scott, 1991, 70-87); the

measure is also known as one of network size since it shows the total number of each individual's direct links with other actors in the network. Especially, we have set up an Advice size variable, measured by flows of advice (to whom workers go for work-related advice) as a performance measure for the study. It can be treated as a rough estimate of workers' relative importance or cognitive centrality in the organization (Burt, 2000; Krackhard, 1990). Advice size indicator will be used as a part of the following analyses.

In order to examine the general structure of exchange relationships, we investigated networking practices within the whole organisation. Table 1 provides information about densities and centralisation of relations that were related to (1) giving or asking for advice, (2) giving or receiving new information, (3) collaborating, and (4) social support i.e. interacting informally.

Table 1. Density and centralisation of the knowledge exchange network.

	Density		Centralisation* (%)
	Directed (asymmetric)	Direction ignored (symmetric)	
Advice	0.20	0.32	38
Information	0.11	0.18	34
Collaboration	0.08	0.13	16
Social support	0.13	0.20	25

\* The relations in asking for advice and new information are symmetrised so that the tie is present if either of the two has reported about connection. In contrary, the relations as regarding informal interaction or collaboration are to be present only if both have confirmed the relationship.

From Table 1 we can infer that giving advice, providing guidance and helping other workers was the most common form of communication. In 32% of all relations between pairs of workers, help was flowing at least to one direction. The participants were also having relatively intensive informal interaction (20% of all possible ties). New information is transmitted almost as often (18%) between the participants. There were not as much collaborative relations (13%) compared to other forms of interaction. Presumably, this is because collaboration requires more resources than providing and receiving help once and a while. From the left column, one can conclude that about 60% of all relations (advice, new information, social support, and collaboration) between two workers are reported only to one direction. This may be partly because the relations actually are asymmetrical in nature, i.e. one worker may help another without the help needing to be reciprocal in nature. Even if collaboration represents mainly relations that are reciprocal in nature, we may assume that a clear asymmetry is caused by the fact that people are using different kinds of criteria in assessing their mutual relationships. Some participants may use tighter criteria for assessing relations with their fellow workers.

Giving advice and being asked for new information seems to be concentrated in certain workers whereas social support, and especially collaboration, is more equally distributed among all workers. This can be seen by looking at the centralisation values in the right-hand column in Table 1. The asymmetry of the answers is not as harmful with in-degree values that are not based on the worker's own report (a row sum of the matrix) but gathered from all of the answers (a column sum of the matrix). In the case of the collaboration, networks and informal ties, the connections are confirmed by both of the actors and therefore the values are symmetric.

Further, we used QAP correlation analysis in order to test or confirm whether the different dimensions (asking for advice, asking for new information, collaborating, and social support) could be treated as features of the same construction and, thus, be combined for further data analyses. The relationship regarding these dimensions and their mutual relationship is, however, interesting as such. Ties are expected to be stronger to the extent that they demonstrate greater numbers and types of resource exchange. One way to look at this is through relationship multiplexity (Wasserman and Faust, 1994). This offers a simple measure to quantify the redundancy across networks, where a high correlation indicates an overlap of memberships across networks. The QAP correlation algorithm permutes the rows and columns of the original matrices and counts the correlation between these randomly permuted matrices. The procedure is repeated many times (here 5000 times) and the obtained correlation coefficients are used to assess the probability that original correlations occurred by chance.

Correlation analysis results show that all knowledge exchange dimensions are positively correlated with each other. The values are highest between advice asking and collaboration ( $r=.43$ ), and lowest between expressive ties (friendship) and instrumental dimensions, like advice and information seeking and collaboration ( $.26 < r < .29$ ). For further analyses, the matrices can, therefore be combined so that egocentric network analyses are based on an added matrix of all work related ties (Advice, information, collaboration). The social support dimension has been left out the added matrix.

To conclude, the relationships of various network dimensions were different even among the same actors when looking at how cohesion is distributed. Networks demanding few resources, e.g. advice seeking, were rather dense and asymmetric, whereas the time-consuming relationships, such as collaboration, were sparse and often supported by both actors. The advice network was most centralized, while social support and collaboration relationships were more equally distributed among all network members. Further, all

knowledge exchange dimensions were positively correlated with each other. The values were highest between various instrumental, i.e. work related network dimensions, and lowest between expressive ties (friendship) and instrumental dimensions. These results are consistent with previous studies (Ibarra, 1992, Ibarra and Andrews, 1993; Ibarra, Kilduff & Tsai, 2005). Therefore, the notion of important and central network actors is obvious. The social networks are not random but they are concentrated on some important and influential persons, “stars” (Scott, 1991), or “hubs” (Barabasi, 2002). These central actors have key roles in their communities.

### **Structural equivalence approach to the data**

Since it often is a priori unclear, which attributes influence the relationship patterns, stochastic modeling is used to find latent classes, that is to say some kinds of clusters or “colors” in which the workers belonging to same class have the same probability distribution as that of their relations to other workers. The analysis is based on a model, which assumes that the probability distribution of the relation between two vertices (workers) depends only on the latent classes to which the vertices belong and that the relations are independent conditionally on these classes. The stochastic block model has two parts: the division of the set of actors into latent classes (the coloration), and the probability distribution of the relations within and between these classes. BLOCKS program, which is a Bayesian statistical method and a part of larger StOCNET program collection (Boer, Huisman, Snijders and Zeggelink, 2001, available from <http://stat.gamma.rug.nl/stocnet/>) is used. In the Bayesian approach, all uncertainty about the conclusions of the statistical inference is expressed in probability statements about the model parameters. The aim is to obtain knowledge of this a priori unknown coloration of the actors. However, it will be known only as probability distributions (Nowicki and Snijders, 2001; Snijders and Nowicki, 2001).

On the basis of the analysis (reported in Palonen, 2003), the workers can be classified in six colors (classes). Next, we study how formal and informal expertise is distributed in these classes, i.e. whether there are differences on the qualitative properties between the classes. The informal expertise is measured by high value of Advice size, i.e. the most often advice asked workers, that is to say, the one with high in-degree value in advice matrix. The formal expertise is measured by the team leaderships and the proportion of workers with multiple team memberships in the organization, inside each class. The results can be seen in Table 2.

The results indicate that the classes may have different rankings. The informal expertise measured with Advice size is very clearly concentrated on Class2. The formal expertise measured with the position of team leaderships, and the number of leaders in each class, and the number of workers that are members of several teams is focussed on Class2 and Class4. Class6 has high frequency value in multiple team memberships, although other indicators for key workers position are missing.

Table 2. The distribution of expertise in stochastic block structure (Classes).

<b>Class</b>	<b>Team leaders (f)</b>	<b>Workers with multiple team membership (f)</b>	<b>Workers with high advice size (&gt;30) (f)</b>
Class1	1	2	1
Class2	5	9	6
Class3	2	3	-
Class4	7	6	2
Class5	2	2	2
Class6	-	5	-
	N=17*	N=27	N=9

\* Some of the teams have two leaders and two team leaders have two leadership

Looking at the name list of the workers in Class2 (not reported here), we notice that there were both experienced male workers with long working carrier and other workers that were closely co-operating with them, mostly females. By contrast, the female workers in Class1 were working with routines and office work, not so tied with the general administration and funding as the female members in Class2. Team leaders seem to form the core of Class3, and the number of workers with multiple team membership was also high in there. However, the informally acting expert persons with high Advice size do not characterize this group. Class5 and Class6 seem to form unified blocks, indicating groups of workers that were focusing on their specialties.

### **Egocentric analysis**

In this chapter, the egocentric approach is used to indicate how different personal networks can be found even among workers in the same working environment. The cases have been selected to analysis according to the workers' Advice size (one high value, two mean values, and one low value). Further, we take a closer look at one ego's attributive properties combining the individual characteristics (work task, gender and formal position in the organization) with the structural properties (the size, density and diameter of the egocentric network).

*Egocentric networks, ego's structural network properties.* The egocentric network analysis is computed on the combined matrix of the case organisation data set, in which all work-related ties (advice, information, and collaboration) are added. The matrix is dichotomised. So the tie is present if workers have reported it in one of the matrices and the matrix cell can only get values 1 (the tie is observed) or 0 (there is no tie).

The following measures have been used: Size, density, and diameter. Size shows the number of actors (alters) that ego is directly connected to. Density is the number of ties (total number of ties in the ego network) divided by the number of pairs (total number of pairs of alters in the ego network, i.e. the number of potential ties among alters), times 100. This measure can be understood as a percent of the full network. Diameter is the longest geodesic distance between two alters within the ego network. In analyses ego is removed from the matrix. Other ways of structural measures such as centrality or density, will demonstrate very high cohesiveness because ego, by definition, connects everybody.

The variation of the amount of both outgoing and incoming ties is big among workers. The workers with highest position in the hierarchy and a specialized expertise profile seem typically have a network, which has a very short diameter although their egocentric network is large (see the worker code 34 in Table 4). This indicates that they are collaborating with other central and important workers from all over the organization, not only inside their own unit. In order to become a central network member, it is, further, reliable that they have to search for information and knowledge outside the organisation. The gatekeeper role of frequently asked experts has been reported by previous studies (e.g. Burt, 1998, 1999; Palonen et al., 2004; Palonen & Lehtinen, 2001; Sverrisson, 2001). Another indicator for boundary crossing is Freeman's betweenness measure.

Table 3. Examples of small, middle sized and large egocentric networks.

<b>Worker (code number)</b>	<b>Advice in/out** degree</b>	<b>Between-ness***</b>	<b>Social support in/out**</b>	<b>Network size*</b>	<b>Density</b>	<b>Diameter</b>
<b>34 (high advice size)</b>	47/29	239	23/5	53	37%	4
<b>5 (mean advice size)</b>	18/29	133	17/44	37	38%	3
<b>20 (mean advice size)</b>	18/8	71	9/9	31	36%	4
<b>38 (low advice size)</b>	0/1	0	5/5	2	100%	1

<b>Min-max values in the whole organization</b>	0-47/ 1-58	-397	2-23/ 0-44	2-62	29-100%	1-62
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\* Social support network not included.

\*\* Notice that the question has been asked “to whom do you go...”, which means that advice is flowing to opposite direction, e.g. in degree means that the person provides lot of advice to other workers.

\*\*\* Freeman’s betweenness measure in all work related ties (advice, new information, collaboration).

In Table 3, we also can see that the diameter in middle-sized network (Code 5 and Code 20 workers) is as long as in the case of large network (Code 34 worker). The longest diameter in the organization is 62 steps. On the basis of the results, we can conclude that in the large network, which is organized in effective way and including central network members, the distances to all network members can be as short as in the small network. The richness of the network consisting of 53 colleagues compared to the networks of only couple of persons can easily be imagined.

*Egocentric networks, ego’s attributive properties.* Next, we focus the analysis on the individual level in order to show an example, how individual characteristics can be combined to the social context and structural variables. For the example, we select the Expert 34 with highest Advice size in our case data set.

Looking at the attributive properties of the most central persons, we can draw some conclusions concerning, what kinds of people are informally central in the organisation. Being an expert on some special field is one explanation of becoming central actor in the information network. This is the case also with Expert 34. His age is under 40 years old and his experience in the workplace is no more than five years. So, he is younger than most of his colleagues and he has worked a moderately short time in the organisation. The expert area, in which he is specialised is a strategically and technically important, and despite it is needed all over the organisation. However, the expertise area is not any of the traditional expert fields of the organisation. Expert 34 is a team leader and despite a member in four other teams.

His egocentric network is large in the combined matrix of all work related variables (advice, information and collaboration). He has himself reported 29 ties to his colleagues and 51 colleagues have reported a tie to him. About every second (54%) of these ties are reciprocal. So, he is an active and popular in communication and knowledge exchanger. His own ties are directed to central male workers all over the organisation but especially inside his own department. He himself has been mentioned as a network partner by more than every second

worker in the organisation. Almost all males, except some of the routine workers belong to his network. He is as well socially popular. He himself has reported only four ties in social network question but he has been mentioned 22 times by other workers, which is the highest value in the whole network data set as regarding social relationships, too. So, he also has a large social network. Even though his network covers the whole organisation, it is very effective (the diameter of it is 4), as there are so many other central members and reciprocal ties in it.

As we look at the information gathered by the empty line of the questionnaire and study what kinds of pieces of advice he is asked for, we can see that the nominations focus on his expertise area and the issues closely related to it, as expected. He has clearly been able to integrate his special field it in the different work context all through the organisation.

He is also told to have meta-knowledge concerning the organisation: other team members recognise that he is well informed what is happening in different parts of the organisation, and what will be the strategy and future visions in the organisation.

To conclude, he has a large and effective egocentric network and social skills; he is recognised as a good expert of his own special field, and he has meta-knowledge and general understanding concerning the operative actions in the whole organisation. Unfortunately our data set does not provide information about collaborative ties outside the organisation. Inside the organisation, he seems to be a mediator and a representative of his special expert knowledge, crossing the barriers and department boundaries. Compared to small or intermediate network his network is large, well structured, moderately sparse and effective.

## **VISIONS AND LIMITATIONS TO SNA APPROACH**

In organizational sciences, networks are considered a potential source of learning, facilitating learning by promoting skill transfer or by producing novel synthesis of existing information. It appears that heterogeneous networks and multiplex relationships facilitate such learning but very close, long-term relationships are likely to result in network homogeneity, reducing the diversity of experiences and turnover in networks (Beckman & Haunschild, 2002). Similar results have been found in small group research (Jehn et al., 1999). This would provide a clear contribution to the methods and tools such as SNA. However, though the SNA studies have provided interesting cases of fieldwork, they have not become part of the larger interpretations of communication studies or learning research. One reason for this is the level at which the data have been gathered. To be able to follow complex communication processes, more detailed and richer datasets combined with qualitative methods should be



collected. In spite of these limitations, the contribution that SNA methods have provided for fieldwork in organizations is promising. The concrete tools to describe patterns of interaction have been helpful. In particular, the visualizations have shown their strength in laying out abstract networks in a readable way (for visualizations, see Freeman, 2000).

Further, after testing Advice size indicator, one can notice that there are some biases related to its use, e.g. as concerning the routine coordinators (it shows too high values), experts with special competencies on the not widely known expert field (it shows too low values), and social overemphasizing in general. A need to get independent indicator for expertise and skilful communication is obvious. There should have to be possibilities to evaluate SNA results with tools, which are not themselves leaning to same principles.

Complex and rapidly changing networks entail challenges to research methodology. Until now collaboration among members of an organization has often been studied through examining the routine exchanges of various kinds of resources, such as information, pieces of advice, emotional support, and so on. Local practices and regularities of these transfers and exchanges are assumed to shape the structure of collaboration, e.g. in multifunctional or multidisciplinary workgroups. Recently, specific statistical tools and models have been developed to identify these exchanges in order to analyse structures of collaborative activities that go beyond individual resources. These approaches allow an examination of participation in collective action at the level of subcultures rather than mere dyads. In networks, this kind of approach allows an examination of indirect or generalized structural relation of exchange. The new methods, therefore, provide an important contribution towards the theory of collective action since they extend our understanding of how collegial action creates structure. This might help individuals to find indirect ways to manage their resources, including information, advice seeking, emotional support, and many others.

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## **NETWORK ANALYSIS IN WORKPLACE MANAGEMENT**

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### **INTRODUCTION**

Traditionally workplace has been seen as physical entity consisting of walls and ceilings. Nowadays it is evident that there is much more to that. Someone has to take care of the premises, and there should also be some value adding services that help the tenants to concentrate on their core business. Without these, the premises would not add value to the tenants or to the contract managers. The services in a workplace are produced in a complex network consisting of service providers, building owners and tenant.

This service network is an integral for efficient service production in workplace environment. The aim of this article is to present a framework for studying network service organisation in workplace environments. The paper, first, gives some general insights into social network theory and, then, presents the general network model. After this, the model is applied to service network in workplace. This paper is based on the dissertation *Network Service Organisation – Interaction in Workplace Networks* by Antti Tuomela (2005). This dissertation is among the first attempts to study workplace networks as an entirety.

The methodological part of this paper is based on a literature review. The empirical findings presented are based on some 150 interviews made in several research projects in Helsinki University of Technology. Grounded theory has been used as a tool in utilising this huge amount of material.

### **SOCIAL NETWORKS**

Social and communication networks have been a research topic of increasing importance since early 1970s (Mitchell, 1974; Tushman, 1979). Today network analysis is increasingly applied to a variety of topics, from the study of personal networks to the analysis of complex inter-organisational linkages (Borgatti & Foster, 2003). While the early forms of network

analysis were used for studying individuals in groups, currently it is used to analyse inter-organisational networks from several different perspectives.

Network relationships can be justified by referring to diverse theoretical backgrounds. A large number of conceptual studies have contributed to the explanatory advancements of inter-firm organisation. The literature provides a long list of different approaches emphasising different aspects of networking (see e.g. Zettinig, 2003; Easton & Araujo, 1996), transaction cost reduction (Williamson 1975), increases in power (Pfeffer & Salancik, 1978), cost and benefit consideration (Powell 1990), obtaining legitimacy (Meyer & Rowan, 1977), and interaction and long-term adaptation (Håkansson, 1992; Möller & Wilson, 1995).

In this paper, an interaction approach of network analysis (Håkansson, 1992; Möller & Wilson, 1995; Turnbull et al., 1996; Olkkonen et al., 2000; Axelsson, 2003; 2004; Leek et al., 2003; Valk et al., 2004) is used for the exploration workplace networks. The interaction approach focuses on the relationship rather than the transaction as the unit of analysis, and it aims at understanding the patterns of dependencies between companies.

### **Social network model**

Central concepts in social network theory are nodes and ties. Nodes are the actors in the network. Ties are the relationships between actors. The simplest model of network is a map of nodes and ties between them (Figure 1). The nodes (in this case persons) in such a map are presented as points and their ties as lines between nodes. This model is next applied to sketch the workplace networks.

#### *The organisations*

In workplace management, organisations can be divided into three categories: contract managers (building owner), service providers and end-users (Bröchner, 2003; Tuomela, 2003; Kadefors & Bröchner, 2004; Tuomela & Toivonen, 2004; Riihimäki & Siekkinen, 2001).

Additionally the roles of different organisations may be addressed. One interesting approach is to study, how the power is distributed among the organisation. Many times the networks are studied through firms that have somehow become central in the network. These centrally acting firms are commonly known as *focal firms* (Gadde & Håkansson, 2001; Möller & Halinen, 1999; Tikkanen, 1998) or *central firms* or *hub firms* (Jarillo, 1988; Piercy & Craves, 1995). Tuomela (2004) has studied workplace networks with such an approach and has depicted building owner's role as a focal firm.

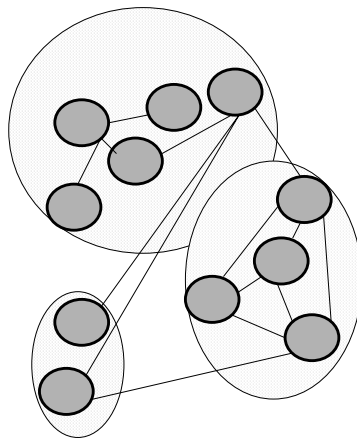


Figure 1. Network as nodes and ties. Ties are the lines and nodes are the bumbles. Shaded circles show organisational boundaries.

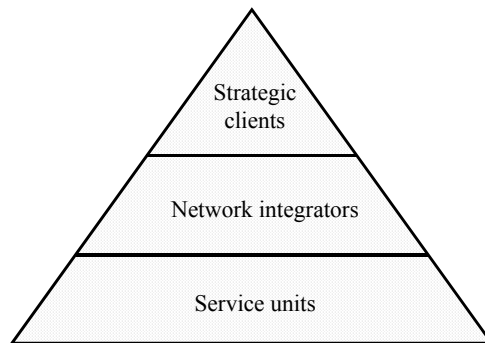


Figure 2. The actor groups in workplace network (Tuomela 2005).

*The actors (nodes)*

In these organisations there are again three groups of individuals: strategic clients, network integrators and service units (Figure 2). As Tuomela (2003) state “the parties responsible for the contractual arrangements are the strategic clients, the CRE, HR and IT executives defining the service policies and strategies.” The *strategic clients* define the company-wide policies and corporate standards for internal and external corporate real estate (CRE) service provision and choose the partners with whom to build relationships.

The *middle management* of the workplace service network focuses on the operational management on the decentralised business unit level. The network integrators, on the tactical level, function as a hierarchy of authority between the centralised management and the local

service providers. Network integrators consist of in-house facilities managers, external FM, PM and service providers and part-time contract managers. (Tuomela 2003)

The third actor group is the *service unit*. The operative level of the network organisation consists of several functional, in-house or contracted-out service units containing a bundle of different service products. Support service organisations are organised in the majority of location by the type of services being provided, such as food service, engineering, property management, security and real estate (Tuomela, 2003)

#### *Ties / interaction*

As can be seen in Figure 3 all actors do not necessarily interact with each other. Tuomela's research (2005) suggests that the interaction of strategic clients takes place in isolation from other actor groups. The co-operation is also more formal in strategic clients level than in other levels.

Interaction between different actors can be divided into formal and informal interaction (Baker (1992)). Formal interaction is based on agreed meetings (for example weekly or annually), whereas informal interaction is based on the voluntary interaction between individuals. In workplace networks there are both formal and informal networks.

Tuomela's research (2005) backs up the notion of Joroff and Bell (2001) suggesting that information must flow freely between groups with connected functions and up and down the corporate hierarchy. Thus Tuomela (2005) concludes that the more there is information the better the workplace network functions.

One of Tuomela's main findings is that an integral part of well functioning network is formal interaction. If formal interaction channels exist, also informal interaction channels are bound to work well. Vice versa lack of formal interaction decreases informal interaction. Thus it could be recommended that workplace networks create formal interaction channels.

#### *Service network organisation*

The model presented previously presents the service network in general terms. To handle this entity, Tuomela (2005) developed terms "network service organisation" and "workplace network". He defines workplace network as a "co-operational network of several core business support functions such as corporate real estate management, facilities management, property management and different out-tasked services".

## GOVERNANCE MODEL OF WORKPLACE KNOWLEDGE

The previous chapter outlined workplace service network from the social network theory perspective. To utilise this understanding of workplace network Tuomela (2005) created a governance model of workplace knowledge (Figure 3). This is presented here to illustrate the potential of using social network approach in workplace context.

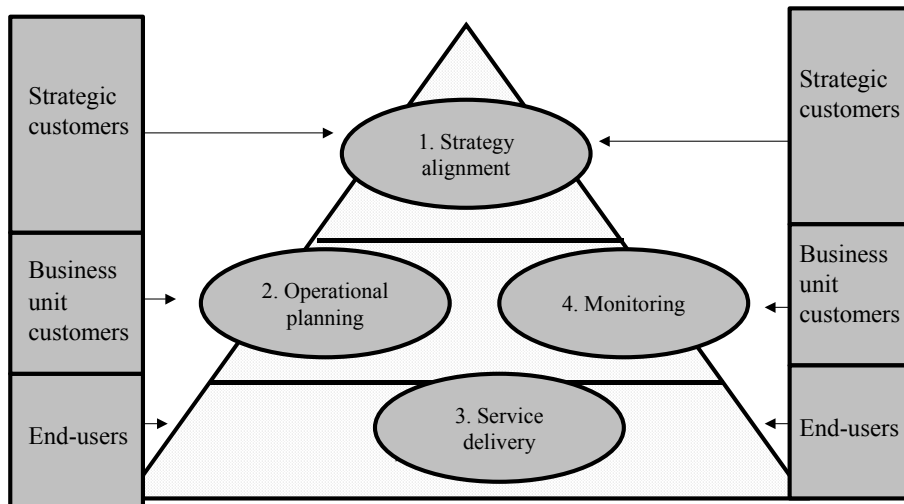


Figure 3. Governance model for workplace knowledge (Tuomela 2005).

Lambert and his co-authors (Lambert et al. 1995) has defined collaborative CRE operating strategies as strategic programming in which organisational systems of policies, procedures and information networks are built to standardise and customise services. The best operating strategies are designed jointly with the stakeholders on whom the service success ultimately depends.

The primary step for creating centres of excellence would be identifying and assembling the stakeholders of workplace knowledge. Since assembling for such collaboration can be expected to be passive, or at least unorganised, the initiative should be made at the top of the network organisation.

A workplace knowledge system should ensure learning and continuous improvement of and between all network organisation levels. Knowledge should flow from strategic clients to service units and vice versa. The model formed for workplace knowledge governance follows the principles of several quality management processes (Roberts 2001) Continuous



improvement and learning is based on joint strategy alignment, operational planning, service delivery and monitoring.

The teams in the model are formed in a similar way to the teams introduced by Lambert et al. (1999) for the CRE environment. These teams include task forces, executive teams, internal and external professional service teams and service delivery teams. The teams establish the foundation for the four-stage governance model for network organisation's extensive communication.

**1. Strategy alignment.** Performed by the executive team consisting of strategic service providers, contract managers and customer representatives to address major service and workplace decisions. The executive team defines a collective strategy on the basis of association strategies of the network organisations. Shared policy deployment defines organisation-wide goals for services and oversees workplace knowledge creation in the network organisation. A linkage is made to the network integrators by planning and programming the aligned strategy.

**2. Operational planning.** Performed by professional service teams consisting of workplace knowledge holders within the decentralised business unit. The professional service teams plan and oversee decentralised client and network engagements. The assembled network integrators ensure operational implementation of workplace services, transfigure the aligned strategy to plans and operative goals, and design operational service delivery systems. Professional service teams identify the requirements within the business units. Operational plans are implemented by setting business objectives for service units. Defined input-based and output-based service levels, performance indicators and goals ensure empowerment and leverage performance inside and between service units on the operational level.

**3. Service delivery.** Is performed by the front-line service staff. Monitoring daily service needs and performance gaps in the operative work ensures continuous improvement in service processes. Operational workplace knowledge can offer considerable support for upper-level decision making.

**4. Monitoring.** Performed by professional service teams, ensuring workplace knowledge integration between operational work and strategic management. By monitoring and analysing customer feedback, the network integrators are able to adapt operational data and information for executive level workplace knowledge.

The generic model and process ensures the exchange of workplace knowledge between the decentralised centres of excellence and centralised workplace management. Building a formal and efficient feedback system for workplace knowledge, the existing channels of both informal and formal interaction should be identified.

## **RESEARCH METHODOLOGY**

This chapter describes the research methods used in the study by Tuomela (2005). The general analytical strategy of Tuomela's dissertation is multiple triangulations that integrate empirical and theoretical information to the grounded theory. The research was based on interpretivism (Burrell and Morgan, 1979), hermeneutics (Gummesson, 1991) and abduction (Peirce, 1931-1935; 1982).

Primary source of reasoning were the interviews conducted during three research phases. Primary method was to gather the information through interviews. The interviews were semi-structured. Before each data collection phase, the themes for the interviews were chosen by each research phase on the basis of the research question at hand. Interviews lasted about one hour each and they were audio taped and transcribed verbatim. The total number of interviews was 153.

In addition to interview some other methods were used to complement the research findings. Six focus group discussions were arranged during the research process. The goal of these focus groups was to increase the validity and reliability of the interview analysis. Tuomela also made some participatory observations to increase the holistic nature of phenomenon he studied.

Fourth method was to gather data by documentary analysis, even though the role of documents as data sources was limited in Tuomela's research. Still formal written contracts of cooperation were used to some extent for planning and analysis purposes. Document analysis was also used to get a holistic picture of the researched phenomenon.

## **CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH**

A new term "workplace network" emerges from the network analysis and it's application in workplace environment. This paper presented all this and then went on to present the static model of workplace network, it's actors and interaction. Some comments about the research methods used were also made. Some suggestions for further research may be made:

- The research on this topic has concentrated on Finnish workplace networks. It would be interesting to study, how these networks differ in other countries and cultures?
- Network analysis could be utilised in identifying network holes, problems and roles in creation of workplace network co-operation.
- A more thorough analysis of the networks in asymmetric network environments could be made.

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# **VISUALISATION OF COMPLEXITY - SKETCHING AND PHOTOGRAPHING**

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This paper introduces sketching and photographic self-documentation as methods for visualising and explicating subjective realities and perceptions of employees of three R&D organisations. The visualisation methods were used as additional elements of individual thematic interviews. Sketching and photographic self-documentation as complementary tools provided the chance to quickly establish a common frame of reference for discussing a complex topic. During two separate individual interviews, sketching was used for illustrating the perceived process of 'innovation', and self-documented photographs for approaching the subjective experiences of space and social situations during the same process. The data was collected in a research project carried out at Helsinki University of Technology, Finland, during 2002 – 2004.

## **BACKGROUND AND ARGUMENTATION**

### **Description of the research project**

Empirical evidence of the effect of spatial context on innovation processes and knowledge creation is scarce. The intention of the research project was to contribute to the body of knowledge in the fields of Innovation and Knowledge Management and Corporate Real Estate Management by opening new insights into the interrelationship between innovation process, communication, and physical settings of work. The initial challenge driving the whole research was to find out whether innovation and creativity could be supported and even inspired by spatial solutions. On the other hand, there was a need to understand how to avoid blocking creativity by locating people in inappropriate settings. The primary focus of interest was on the first phases of innovation – understanding how tacit knowledge sharing is supported by informal organisational and spatial contexts before the initial idea becomes explicit, controllable, and before it can be shared by using 'official' media in more formal contexts.

## **Research approach**

*Innovation* was approached from process viewpoint, with specific emphasis on the first exploratory phases: preparation, recognition of opportunity, idea generation, and conceptualization (e.g. Roberts, 1988; Van de Ven, 1986; Rosenfeld & Servo, 1990; March 1991) of the idea with others at the workplace. Since the first phases of innovation are frequently referred to as the ‘creative’ stage of the process, creativity literature was also reviewed (Amabile, 1983 & 1988; Leonard & Swap, 1999). The ‘SECI’ cycle of knowledge creation by Nonaka et al. (Nonaka & Takeuchi, 1995; Nonaka & Konno, 1998; Nonaka, Toyama & Konno, 2000) was helpful in developing a framework for the study, and for structuring some of the questions.

*Communication* was mainly approached as a way of sharing knowledge with colleagues in the workplace – and outside the workplace – during the perceived innovation process. The focus was on face-to-face communication. However, the question of distributed collaboration was discussed in order to understand how the interviewees experienced face-to-face interaction in relation to technologically mediated communication, and how the content of knowledge and information exchange differed in these cases. In many respects, the study follows the trails of Thomas J. Allen, whose pioneering work from the 1970’s on interrelationships between spatial arrangements and communication in R&D environments has inspired later research (Allen, 1980, 1985 & 1997).

*Place* was seen as a space-time entity, comprising both built (office) environment and temporal aspects, e.g. changes in a work process affecting use of space and spatial needs. In addition, ‘Place’ could also be a virtual environment extending to the outside world, especially when there was a link to collaborators in other locations, and when technological tools were frequently used for collaborative communication.

‘Place’ also refers to meanings and values people attach to specific environments. The emotional aspect was important to address in order to understand the complex human-environment relationships from the social-psychological viewpoint and the ways people react to specific environmental features. Environmental psychology provided a framework for studying spatial aspects, especially when focusing on interpersonal relations, i.e. on “...role of the physical environment in the way people perceive one another, communicate, regulate their interaction, and form groups” (Sundstrom, 1986; p. 215). Another abundant source of existing

knowledge about human - space interaction were studies on work environment by academics in the real estate field (e.g. Becker & Steele, 1995; Duffy, 1998; Horgen et al., 1999).

However, in contrast to what might be expected from a research focused on 'workplace', in this study specific spatial arrangements, i.e. location or size of particular spatial components like meeting rooms, distance to support facilities, or satisfaction with indoor climate, were not the primary points of interest. Hence, the objective of the research was not to develop prescriptions for organising specific spatial components within a building envelope. The target was on the underlying spatial features and needs that would influence planning and design of spaces, but not restrict architectural creativity. Some of those primary features may also be described as polarities, e.g. openness – enclosure, privacy – communality, owned – shared. For example, it was more relevant to know if the need for privacy was affected by the phase of the innovation process than to know how many and what kind of meeting rooms were needed, although the information might have an impact on the number of meeting rooms in the future as a result.

### **Research questions**

The research questions of the study are:

- What happens in existing workplaces occupied by teams or groups with an 'innovation agenda', i.e. teams that research, design and develop in order to contribute to new or improved deliverables?
- What are the critical factors affecting the innovation processes and their outcomes of those groups?
- How the current contexts support the aforementioned processes and critical factors identified in the case studies?

## **RESEARCH PROCESS AND METHODOLOGY**

### **Case descriptions**

Three companies based in Finland participated in the research. Company A is a global telecommunications corporation, Company B is a countrywide real estate organisation, and Company C is a local software company based in one of the largest cities in the country.

Although different in size and level of distribution of operations, the three companies provided a good variety of research and development activities for investigation.

Five groups (Cases 1-5) were involved in the study: three groups at Company A (n=21), one group at Company B (n=7), and one at Company C (n=6). The scope of tasks of the different teams varied: one of the teams worked on highly conceptual research and development of ideas, two on ideation of solutions and adoption of innovations, and two on more incremental development projects.

### **Methodological considerations**

Due to the complexity of the multidimensional research question, and the exploratory nature of the study, I used diverse ethnographic methods to approach the topic. The methodology was a combination of thematic individual interviews, focus group interviews, non-participant observation, electronic diaries, and visualisation and self-reporting exercises carried out by the interviewees.

Prior to starting the actual data collection at the participating companies, I carried out a pre-study at a research organisation in Finland to test and assess appropriateness of the chosen approach and data collection methods. Visualisation exercises like photographic self-documentation and sketching had not so far been much used concurrently with the established ethnographic data collection methods like interviews, and there were no previous examples readily available to build on. The experiences from the pre-study indicated that the new combination of methods was usable, and it provided an effective tool for quickly establishing a common understanding between the interviewer and the interviewee. With minor adjustments, I adopted the set of methods into the actual case studies.

The next chapters discuss the individual interviews, and the value of the visualisation methods to the interview process and its outcome.

### **Data collection process and methods**

To understand the perceived processes of the interviewees within a theoretical framework, the structure of the interview was designed to loosely follow the SECI cycle and the concept of 'Ba' of Nonaka (especially in Nonaka & Konno, 1998). The SECI model describes, how the two forms of knowledge - tacit and explicit - existing in any organization are shared within a company to create new knowledge. Tacit knowledge, i.e. values, norms, beliefs, and know-



how that the individuals and teams possess, gradually becomes explicit when expressed in a format that is sharable with others, i.e. data, stories, graphs, memos etc., and finally back to tacit knowledge of individuals in its refined form. The process of knowledge transformation is a cyclical process, where tacit knowledge is first shared between individuals (Socialization), then explained to others thus converted in a more explicit form (Externalization), combined in its explicit form with the existing knowledge base (Combination), and adopted into individuals' and teams' own work processes by learning (Internalization).

According to Nonaka and Konno, four different types of 'Ba' (space-time entity) correspond the four stages of the SECI cycle: Socialization takes place in and is supported by 'Originating Ba', Externalization in 'Interacting Ba', Combination in 'Cyber Ba', and finally Internalization in 'Exercising Ba'. All these Bas represent different kinds of contexts where the cycle of knowledge creation can be brought on the next level of refinement.

However, the SECI cycle mainly addresses incremental knowledge creation and sharing taking place within the organisational boundaries. Ideas are the result of definite managerial actions where the management intervenes with the status quo by imposing 'creative chaos' into the existing system. To expand the framework to include other areas of life besides the organisational context into the process, I chose to begin the interviews with a question related to idea generation in general, complementing and extending the SECI framework with an open approach toward the context ('Ba') where the initial idea first appears.

Generally, the interview process tested the following methodological questions:

- Does sketching/mapping help to understand the perceived reality of the interviewee?
- Does the sketched image/map help to reflect the perceived process more deeply?
- Does the sketching/mapping help in getting new insights into the way people usually describe their work in interviews?
- Does the photographing exercise help the interviewees to identify and analyse factors and features of their environment ('Ba') by forcing them to look and focus?
- Do the photographs help to discuss the important environmental features during the interview?

## **Individual interviews**

The most important source of information was the individual thematic interviews, which were carried out twice with the same participants.

*The first individual interview* focused on the subject's work processes, mainly from the innovation standpoint. During the first session the interviewee was asked to illustrate his or her personal "innovation process" by freely sketching an image or a map that would represent it. However, the word "innovation" was rarely used since its definition is not well known, and I wanted to avoid any concept that would make the interviewee uneasy, or create a source of misunderstanding.

The following example generally describes the flow of the first interview, its objectives and example questions:

(1) Objective: to know how, where and when a new idea is generated, e.g.: "Can you tell me how you get your ideas? Are there differences between ideas, e.g. in how radical/novel they are? Where and when do you get your best ideas?" In many cases, this question could not be posed at the beginning, although some of the interviewees seemed to be ready to handle more conceptual phenomena, being able to describe their thought processes. The others had to be approached differently.

(2) Objective: to get a visual presentation of the perceived process (handing a piece of paper and pens to the interviewee): "Would you be willing to sketch an image/picture/map of the idea generation you described?" Those interviewees who were asked first to start thinking about their work were asked to sketch their work process, after which the discussion was directed to idea generation and knowledge sharing.

Next, the following topics were discussed using the sketch as a reference. Most often the interviewee elaborated and modified the sketch, adding texts and new links between parts etc. Some started a new drawing, especially in those cases where the initial request of sketching a conceptual phenomenon was seen as overwhelming, and the question had to be formulated in another manner to get started.

(3) Objective (SECI/Socialization & Externalization): to know how, where and when the new idea is explicated and shared at the workplace (continuing the sketching and also writing on the paper), e.g.: "What happens next to your idea? Do you tell about your idea to

someone at your workplace? What happens next, does it become a project/does it get realized/does it get an official (project) status?"

(4) Objective (SECI/Originating and Interacting Ba): to know what the situational and contextual features of idea generation and knowledge sharing are, e.g.: "Who is the person you tell about your new idea? Why that person / why those people? What is the situation like? Where do you usually talk about new ideas? Why there?"

The data collected in the first individual interview was a combination of various drawings, the recording of the interview and its verbatim transcription, and field notes on the most important issues and observations.

*Self-documentation / photographing exercise* followed the first interview session. The main reason for choosing the perceived process (described in the interview) as the frame of reference was to link the subjective experience of the intangible reality with the subjective experience of the tangible environment.

Despite of the materiality of the physical elements of space, it seems to be a challenge for people in general to analyse spatial factors, much less the influence of space on their well-being and behaviour. Photographing exercise was aimed to overcome the problem of verbalizing spatial experience. The task included photographing the environment(s) where the previously described 'innovation process' takes place, and further, to focus specifically on items either supporting or frustrating the process. The motives of the pictures could vary from objects in the physical environment to social encounters of people, or even symbolic items, and the instructions encouraged people to use their imagination in visualising their 'environment'.

The photos were taken with a digital camera and sent by e-mail in advance to be reviewed and printed. The number of pictures varied from the minimum number of five to fifteen, depending on the photographer's interest in the topic.

During the *second individual interview*, the photographs were discussed in detail, and the questions aimed to address the contextual concept of 'Ba' especially from spatial and social perspectives. The previously sketched process maps and drawings were also used as a frame of reference. The following questions describe the beginning of a generic interview:

(5) Objective (Originating and Interacting Ba): to gain deeper understanding about the (a) contextual and (b) spatial enablers and disablers of idea generation and knowledge sharing, e.g.: "Tell me what happens in this photograph. Why did you choose to photograph

this motif? Is this something that helps you in the process we discussed? What do you have here on the table? Who are these people? What is the situation like?”

The data collected in the second individual interview and during the self-documentation exercise consisted of the set of photographs, recording of the interview and its verbatim transcription, as well as field notes on the most important issues and observations.

## **EXAMPLES, EXPERIENCES AND RESULTS**

The following example “Lisa” describes, how the visualisation methods helped to establish a common understanding of the subjective, perceived reality of the interviewee. Lisa’s work did not represent the highly conceptual research, however, she had the possibility to participate in the whole solution development process without being constrained by strict division of tasks; in that respect she represents the ‘average’ interviewee. She also was quite open to discuss and think about her work. However, like with many of the interviewees, I had to approach innovation themes indirectly, by asking her to sketch her work process. The example follows the process of the interviews.

### **First interview**

After the first general introductions and background information gathering, Lisa was asked to sketch an image of her work: “Could you draw an image of your work? For instance, do you have any specific phases in your work? How would you visualise your work process?” Lisa appeared puzzled, and needed more instructions, which were given: “...you could think about a project, for instance, how it starts and continues...”. Lisa started sketching (see Figure 1): “Here we get the requirements, coming from the clients or... or that we generate them for the client ourselves. Then we start thinking about them seriously, sketching and planning, wondering, and then we come up with some kind of documentation about the... I think we could have something like this here... meaning that we write documents and review them with the clients and so...and then we start doing it. There are different stages, longer and shorter, and finally we get one version out... after which we develop it further and again. Some versions are ready here (points to the drawing) but most of the versions are developed and developed...”.

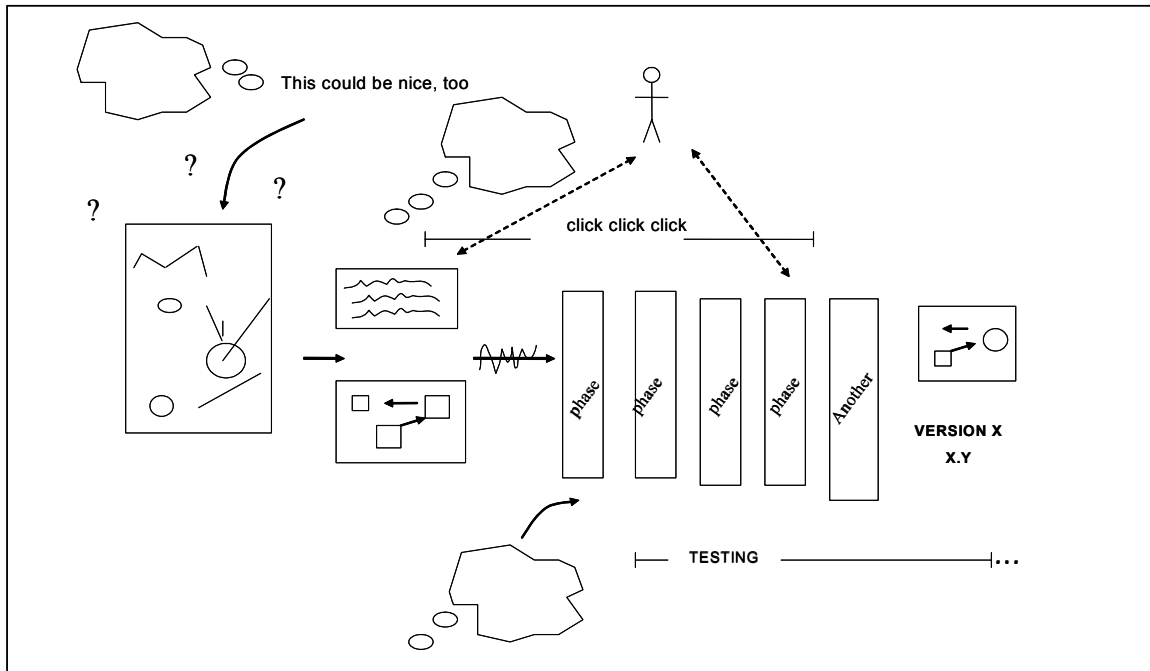


Figure 1. Lisa's drawing.

The discussion continues with the drawing in focus; the questions are triggered by the features of the drawing: "You seem to have drawn clouds...of thoughts... at the beginning. Is it usually so that you get the requirements from the client?" Lisa explains: "Yes, yes. We have more clients who know what they need than those to whom we should...I mean that if the normal client...the kind you learn about at school is the one who says: 'I need a bicycle', and if you start asking questions like: 'Why don't you want a car...or are you sure you want to have a bicycle like this'... well, we have those clients who know what they want, which is really quite close to what it eventually turns out to be..."

Discussion goes deeper into ideation of a solution:" How about these different phases you have here...the planning phase and the coding phase. Would you think a little bit about the different phases and the ideas you get...are there differences between the ideas in the different phases?" Lisa answers: "Well, at least here (points) we are at a higher level than here (points) where the problems are such that... kind of technological and about small things... but here we look at things from a higher perspective, like models and such... anyway, those are similar at least in principle, it depends on where you are, on which level."

The interview continues to dig deeper into ideation, knowledge sharing, and contexts where they take place, using the sketch as a frame of reference from time to time.

## Photographs

Lisa was asked to take pictures of the environments that either enhance or disable her working and thought process, as previously discussed. She took six pictures at the office, three of them showing her colleagues working and interacting. The other three showed details of the environment. (See figures 2 and 3.)



	
Window	Personal items

Figure 2 and 3. Lisa's pictures about enhancing environments.

## Second interview

The second interview started with review of the photographs: "Ok, you could start by telling about the pictures you've taken." Lisa says: "The first one is my window, my PC is here and this is my 'dream window'. I thought about what we discussed, like ideation and such, and I thought that ...well, perhaps when you look out into the distance you can ponder about things. Here is another picture with important things like...well, my job is like the picture here where you have all the 'bonk bonk bonk' and finally someone catches the ball. Then I have here my stress toy, which I sometimes need...and when I had to take this again I forgot technology, like I have my phone always plugged into the socket because the battery dies so often, meaning that technology cannot solve everything. My coffee cup and my book...". Lisa continues describing the motives, explaining what happens in the pictures showing her colleagues, and what the situations are like. After the first review round, the questions go deeper into the features on the pictures: "Why is this window good for you, what is there to make it good – a nice view?" Lisa continues: "Well, yeah... we have those terrible housing complexes built in the 70's over there and that's why I try not to look at them directly (laughs), and I tried to focus the picture on a slightly better direction on a building that is not that awful, it's not great but not the worst either... however, it is enough to see far." Question

follows: “Why is it good to see into the distance when you think?” Lisa explains: “It’s kind of calming.” Question follows: “Why do you have to be calm when you think?” Lisa continues: “Well, maybe...when you try to force it, it does not happen... for instance if you have stared at the screen for two hours and wondered, it is a real relief when you have... something else to look at.”

## **DISCUSSION**

The objectives of trying a new combination of methods and using visualisation as a diagnostic tool in the context of semi-structured interviews were:

- To create a concrete representation of a subjective experience (a map) to better understand the reality of the interviewee.
- To use the map for getting deeper into the perceived processes.
- To use the map as a learning tool and for gaining new insights.
- To help people to (a) look at and see the features of their environment, (b) analyse that environment in its various levels (physical, social and emotional).
- To help people discuss the important environmental features during the interview.

### **Usability of drawings and photographs**

The idea to use visualisation as diagnostic tool is not new. ‘Cognitive mapping’ was first used to discover how rats found their way to food by using external cues; the method was quickly adopted to environmental psychology and used to study orientation in a larger context like city (Bechtel et al., 1987). Mapping has been applied in other fields of study, e.g. in organisational studies (McKenna, 1999), consumer research (Mano & Davis, 1990), analysing texts (Carley & Palmquist, 1992), discovering public’s view of the world (Robinson & Hefner, 1968), and exploring forest ownership objectives (Tikkanen & al., 2005). Usually, mapping exercises have been used to help establishing an understandable explicit representation of a subjective reality of an individual or a group. Most of the time the mapping exercise uses a specific tool as a way of producing the image, which is sometimes generated by a computer program. However, mapping as a method has not been well defined, and the name of the same tool may be different in different studies. In most cases, the maps are simplistic charts illustrating process steps or systems and connections between variables.

Self-documentation by photographing (Mannonen, Kuoppala & Nieminen, 2003) or videotaping has been used in research, especially when there is a need to understand usage patterns of artefacts and behavioural processes, or for documentation purposes. Self-analysis of the material is mainly done in studies focusing on specific targets of the pictures, like concrete objects.

In this research the objective of the visualisation was to quickly establish a common vision and understanding of the interviewee's mental reality. It was intended to help the interviewee explicate a complex conceptual framework, which could be seen as a simplistic image of her experience of the specific 'slice' of her world, and to help the interviewer relate the questions to the experience of the other.

In that sense, the approach is similar to the approach and methods used in the development cooperation research. The Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) methods (e.g. Chambers, 1994) were created to help quickly learn about the complexity of a culture alien to the development project personnel, and to help involve the local people in the learning process. The RRA tool kit includes various mapping methods, like pairwise comparison matrix and 'wealth mapping', as well as an exercise where the participants create images of a year of their life without being constrained by any specific drawing format.

The perceived reality of a person is as alien to the next individual as a foreign culture to a development project team. To find a method for getting closer to the other person's inner world and her experience of the reality would help understand not only the words but also the meaning of that experience. I found visualisation tremendously helpful in many ways. The objectives and outcomes of the methods are discussed below.

The drawing exercise was extremely helpful in understanding, how the interviewee perceived his/her work process: it provided a common framework for the discussion, and also helped to get back to some of the features coming up during the interview. The features on the 'map' could be picked up for a more detailed scrutiny. It also served as a roadmap of the thought process of its creator, and the interview process in general. Compared to a 'normal' interview, the drawing helped better grasp the interrelations and connections between the components and actors, and added the element of time into the whole - instead of following only the verbal flow of words it opened up a landscape in which to wander. The landscape was always different and strengthened the initial impression of the interviewee's readiness to



analyse conceptual topics. The more flexible the mindset, the more diversity was included in the sketch, e.g. process phases, people, other explanatory symbols etc, or the more creative the overall presentation - expression was not restricted. Flexibility of mind also appeared in the discussion as ability to describe the topic in a rich manner, and to include influences from outside the immediate 'project flow'. Another important feature of the drawing was that it allowed the interviewee to analyse the whole complexity instead of analysing a specific question brought up by the interviewer, and it was easier for me to follow the self-analysis with the roadmap in sight. The sketches also helped me later to recall the situation and the personal style of the interviewee. They helped my analysis by providing another angle to the subject: the things heard and then read were enriched by the things that were seen.

The photographs helped understand how the interviewees perceived their environment. Most of the interviewees could not easily explicate or analyse the content of the pictures in the context of their work or thought processes, although the reason they focused on a specific target was clear to them. Sometimes getting to the point where the interviewee related his or her environment to the previously discussed work or ideation process required a few rounds of questions approaching the topic from different angles. Most of the pictures were taken at the office, mainly of the workstation, showing the desk and the chair. Some of the picture sets did not include other people at all, although the previous discussions and the instructions were clearly directing the thoughts towards social and emotional contexts as well. Those who had taken pictures of details of the environment (like Lisa in the example) could talk about the topic in a slightly more creative manner. A very small minority had included pictures of their other environments like home and hobbies, which was originally the intention: to include the world outside the office into the 'landscape'! Still after the first interview where the contexts were discussed, and the instructions for photographing, it was surprisingly rare to see the environment to extend outside the immediate office settings. However, having taken the pictures was helpful to the interviewees to reflect and talk about their environment. Another important outcome of the analysis of the pictures was that they triggered discussions that went deeper into the ideation and work processes and helped focus on some of the previously discussed topics in more detail or approach them from another viewpoint.

### **Things to develop and improve**

Using visualisation as a part of the interviews required a flexible semi-structured interview framework. The topic, i.e. innovation process in spatial context, itself was complex enough,

and therefore had to be approached differently almost with every interviewee. Adding a sketching exercise to the interview process offered an important insight into the mental construct, but also proved to be a difficult task to some. There was an element of surprise: people are not used to describing their complex realities by drawing, how well they otherwise may be equipped to sketch a process map of their projects. Therefore, in most of the cases I had to modify the approach to lead into the actual topic from the more familiar work process viewpoint. Clearly, the whole process requires more developing, and practice from the interviewers' part, and also ability to read and interpret visual material.

### **New implementations**

Visual material created in this research project is abundant. The material was mainly used for facilitating the discussions, however, with the verbatim transcriptions of the interviews, it could be analysed from different angles, e.g.:

- Richness of the visual presentations, i.e. sketches and photographs, without considering artistic talent: How does richness relate to personality and even intellectual capacity? Is it a consequence of the nature and complexity of task, or does it reflect a personal trait leading to a specific field of expertise? How does creativity relate to complexity and richness of the visual presentation? Is there a difference between men and women?
- Analysis of the features of the space and perceptions of the workplaces: what is the reason why some include people (social aspect) in their pictures and the others don't (if they have a choice)? What is the relationship between the perception of work and the perception of the work environment reflected in the pictures?

In sum, visualisation proved to enrich the whole interview process, providing new insights into the complexity of the interviewee. It also helped the interviewees reflect their processes and environments from an unusual angle, thus introducing an element of surprise into the 'normal' way of discussing work related topics. The ability to see reality from another viewpoint from time to time is one of the prerequisites of innovation – in that sense the visual tools also added an element of creativity into the data collection process.

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# **STUDYING IDENTIFICATION STRATEGIES IN VIRTUAL TEAMS: A COMMUNICATIVE PERSPECTIVE**

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## **INTRODUCTION**

In recent years, studies concerning virtual teams, virtual work and virtual organizations have mushroomed in different disciplines. Research has been conducted for example in the area of trust in virtual teams (Coppola, Hiltz & Rotter, 2004; Jarvenpaa, Knoll & Leidner, 1998; Walther & Bunz, 2005), virtual team development (Chidambaram, 1996; Rasters, Vissers & Dankbaar, 2002; Sarker, Lau & Sahay, 2001) and technology issues in virtual teams (Huang, Wei, Watson & Tan, 2002; Scott & Timmerman, 1999; Sivunen & Valo, 2006; Vartiainen, Hakonen & Kokko, 2003). In addition, a couple of extensive literature reviews have been published covering virtual team inputs, processes and outputs (Powell, Piccoli & Ives, 2004; Martins, Gilson & Maynard, 2004) and virtual team management from the perspective of a team's lifecycle (Hertel, Geister & Konradt, 2005).

When it comes to qualitative research in the field of virtual teams, the number of studies falls substantially. In addition, organizational teams have often been neglected and the focus has been on studying groups in laboratory settings or ad hoc groups, such as groups of students. Most of the qualitative virtual team studies are either case studies (see e.g. Lahenius & Järvenpää, 2004; Majchrzak, Rice, Malhotra, King & Ba, 2000; Rasters et al., 2002) or use ethnography (see e.g. Kotlarsky & Oshri; Majchrzak et al., 2000) and/or grounded theory (see e.g. Ocker, 2005; Sarker et al., 2001; Sarker & Sahay, 2004, Shockley-Zalabak, 2002) in their data collection and analysis. However, many authors fall short in their descriptions of the philosophical premises behind their studies. Several qualitative studies claim implicitly to be interpretative or hermeneutic pieces, but only a few of them present their philosophical perspective explicitly. Especially within case studies, there are also numerous studies using a positivist approach. However, interpretive research emerges as a growing strand also in case research (Dubé & Paré, 2003, p. 604).

Virtual team research has pervaded many disciplines, and communication scholars among others have been interested in studying virtual teams. Communication has been seen as

an important factor for successful virtual teams and studies have compared the frequency of communication or the variance of communication tools with team identification (Scott & Timmerman, 1999; Wiesenfeld, Raghuram & Garud, 1998) and performance and satisfaction issues (Lurey & Raisinghani, 2001). However, studies exploring the actual communication processes and their implications have got shorter shrift in virtual team studies. Yet it could be said that overall, teamwork is about communication, and teams' task performance and social relationships are founded on communication. Therefore, it is important to study the communication itself, and not only the instrumental sides of it.

As the number of studies exploring communication in organizational virtual teams remains low, it is important to use qualitative research methods and an interpretative approach in order to understand how virtual teamwork is constructed through communication. As virtual team members communicate mainly through technology, co-operation and membership in the team may be different than in traditional teams. It may be challenging to become a part of a team and identify oneself with the team when the communication is mainly computer-mediated. The cues that lead to identification with one's team in traditional organizational contexts may not be as apparent in virtual contexts, due in part to the reduced possibilities of face-to-face interaction (Wiesenfeld et al. 1998). This presents the virtual team leader with the challenge of how to get team members to identify themselves with the virtual team through computer-mediated communication. It is therefore interesting to study how team leaders attempt to foster team members' identification with the virtual team through communication.

Identification is a critical variable in work relationships. It can be defined as "the forging, maintenance, and alteration of linkages between persons and groups" (Scott, Corman & Cheney 1998, 304). The majority of organizational identification studies have relied on quantitative research methods using organizational identification questionnaires (e.g. Mael & Ashforth, 1992). However, various researchers (e.g. Barge & Schlueter, 1988; Cheney & Tompkins, 1987; Ashforth & Mael, 1989) have argued that the operationalization of organizational identification has not reached a consensus within the existing literature. Additionally, Barge and Schlueter (1988, p.131) state that communication strategies and tactics have not been incorporated into these widely used organizational identification measures.

This article examines these issues in the following paragraphs. In the sections 'Data and methods' and 'Findings', I present a study, which has been covered more thoroughly in

Sivunen (2006). The focus of the present article is therefore more on the methodological issues of the study in question than on its findings and implications.

## DATA AND METHODS

To find out communicative strategies used by virtual team leaders' to construct and increase identification with the team I selected qualitative, interpretive research methods (see e.g. Lincoln & Guba 1985), which give priority to the perspective of those being studied, rather than to the prior hypotheses of the researcher. A qualitative, interpretative research approach can give a deeper understanding of the actual conceptions and experiences of the people working in a virtual team, which in turn may serve as a basis for the better operationalization of identification. The research question to be answered was: *how do virtual team leaders attempt to strengthen their team members' identification with the team through computer-mediated communication?*

### Participants

The participants in this study were four virtual team leaders from four international organizations. For the purposes of this article, I have labeled the teams in alphabetical order, as "A", "B", "C" and "D" and described the characteristics of each team in Table 1.

Table 1. Team characteristics.

	<b>Team A</b>	<b>Team B</b>	<b>Team C</b>	<b>Team D</b>
<b>Team Age</b>	1 year <sup>1</sup>	2 years	1 year	3 months
<b>Team Size</b>	8 + team leader	5–6 + team leader	11 + team leader	9–11+ team leader
<b>Team Locations</b>	3 sites, 1 member at 2 of them and the remaining 7 members at 1 site	4 sites, 1 member at 1, 2 members at others	5 sites, 1 member at 4 of them, and the remaining 8 members at 1 site	10 sites, 3 members at 1 of them, and the remaining 9 members in different sites
<b>Team Languages</b>	Finnish only	English, Finnish & Swedish	English & Finnish	English, Finnish & Swedish
<b>Gender Distribution</b>	3 female, 6 male	6 female, 1 male	9 female, 3 male	6 female, 6 male
<b>Functional Areas</b>	Information Technology	Human Resources	Information Technology	Communication and Marketing
<b>Communication Technology used for team communication</b>	E-mail, telephone, video conferences	E-mail, telephone, conference calls, instant messaging system (not with the whole team)	E-mail, telephone, conference calls, instant messaging system	E-mail, telephone, electronic discussion forum, videoconferences (not with the whole team)

<sup>1</sup> Current team leader joined 4 months later

The number of members in each team varied from six to thirteen. However, the boundaries of the teams were often fluid. For example, team leader D was not sure if some of the people would actually become members of the team, as the team had recently been constituted and it was still in the process of establishing itself. In addition, some of the team members from other teams worked only part-time for the team.

## **Procedure**

Qualitative, interpretive research approach gives no privilege to one single methodology over another. According to this perspective, objective reality can never be fully captured, but triangulation of methods serves as a way to “secure an in-depth understanding of the phenomenon in question” (Denzin & Lincoln, 1994, p. 2). To best address the research question, I used three methods of data collection: interviewing, observation and the recording of actual communication.

First, I interviewed the four team leaders face-to-face in Finnish. The interviews were in-depth theme interviews held at the team leaders’ workplaces, and the themes dealt with the communication routines and habits of the team, virtual team leading practices, communication technologies used in the team, and team identification-related issues. This offline interaction was especially important for the next phases of data collection, as the face-to-face interviews enabled the formation of trust between me and the participants. I transcribed all the interviews verbatim and saved them to text-files. There were 152 pages of transcribed interviews.

Secondly, I wanted to observe the online interaction of the team leaders in their daily work. Therefore, I collected data by observing the communication the team leaders shared with the team members through videoconferencing (team A) and conference calls (team B). I selected these technologies based on what the team leaders had said in the interviews about the technologies they often used for team communication. I participated in two videoconferences of team A and three conference calls of team B, and made notes on them. I also recorded both types of conference meetings (on audiotape only).

Thirdly, I recorded parts of the text-based communication of team leaders C and D. I asked each member of team C to select and submit for analysis some of the peer-to-peer discussions they were going to have with the rest of the team via the instant messaging system during the next month. The system enabled synchronous online discussion through personal computers. Seven members submitted messages, which varied in number from two to



nineteen. In total, the data comprised 49 messages. Some of the discussions involved people outside the team as well, but most of the conversations involved team members and the leader.

With team D, I recorded the data from an electronic discussion forum, which was just being implemented for the use of the team. I had access to the discussion forum over the Internet during the first 11 months of its operation. I copied all the messages from the forum and saved them to text-files. The total number of messages gathered from the discussion forum was 170. The data provided in the analysis is presented in Table 2.

Table 2. Data of the study.

	<b>Team A</b>	<b>Team B</b>	<b>Team C</b>	<b>Team D</b>
<b>Data provided</b>	Team leader interview, 1 hour 29 minutes; resulted in 39 pages of transcribed text	Team leader interview, 1 hour 37 minutes; resulted in 44 pages of transcribed text	Team leader interview, 1 hour 25 minutes; resulted in 35 pages of transcribed text	Team leader interview, 1 hour 12 minutes; resulted in 34 pages of transcribed text
	Videoconferences: 2 (in total 2 hours 54 minutes; resulted in 49 pages of transcribed text)	Conference calls: 3 (in total 2 hours 5 minutes; resulted in 41 pages of transcribed text)	Instant messaging discussions: 49	Electronic discussion forum messages: 170

In selecting the communication technologies for observation and analysis, I was more interested in technologies that were designed to support group communication than technologies supporting interpersonal communication. I therefore preferred the technologies used by organizations primarily for team communication. I also considered it important that the technology chosen was either already a significant communication tool in the team or was becoming one (as was the case with team D). The conversations also needed to be easily accessed from outside the organizations or otherwise easily recorded by the informants. As e-mail, for example, is a communication tool that flashes enormous numbers of messages to its users daily, and as the team boundaries in virtual teams are not always clear, I thought it would be too laborious for participants to separate out the team's internal communication from other e-mail messages and to send them for investigation. These were the reasons why I excluded e-mail from the observation.

## **Analysis**

The data gathered were analyzed qualitatively. I used an approach influenced by Miles and Huberman (1984) and Lincoln and Guba (1985). The latter base their analysis method

exclusively on Glaser and Strauss (1967), but limit their scope on the data processing aspects instead of theory development, as in grounded theory (Lincoln & Guba, 1985, 340). It should also be noted that the approaches of Miles and Huberman (1984) and Glaser and Strauss (1967) are more committed to the positivistic paradigm of qualitative research (Lincoln & Guba, 1985, 339, 356), whereas the starting point of this study was interpretive.

The focus of analysis was on the messages the leaders shared with their team members. As I wanted to understand the situations and contexts, which surrounded the virtual team leaders and their workings, I did not have any pre-existing theoretical framework to determine the course of the analysis. I therefore first carefully examined the data gathered from the interviews, observations, and recordings and uploaded the data to the ATLAS.ti© qualitative data analysis software. Then I started the coding by adding broad, simple categories and thus reduced the data to manageable portions. The unit of analysis varied from short sentences to longer paragraphs. This phase of analysis was guided by the research question, and by my tacit knowledge of the data and theory. As Lincoln and Guba (1985, 340–341) state: “errors made as a result of using such knowledge are correctable on successive review, but incidents recognized tacitly, once eliminated, are virtually impossible to recapture”.

As the coding process continued, I constantly compared the new, emerging codes with the previous incidents in the textual data labelled with the same and different codes. Reading through the data extracts in their specific contexts, it was possible to discover the properties of each code. This guided the analysis further, enabling the creation of subcategories and the integration and redefinition of some of the former categories. With the data analysis software, I was also able to retrieve chunks of textual data that shared a common code and could aggregate instances and map their incidence (Coffey & Atkinson, 1996, 28). The findings retrieved from this analysis process are presented in the next section.

## **FINDINGS**

The tactics the team leaders used to foster virtual team members’ identification with the team fell into four categories: 1) catering for the individual, 2) giving positive feedback, 3) bringing out common goals and workings and 4) talking up the team activities and face-to-face meetings. These tactics were found both in the team leaders’ actual communication and in their interviews.

All the four tactics the team leaders used to foster team members’ identification with the team can be seen to be related to the fact that the team is a virtual and not a traditional one. As

the team members in virtual teams are geographically separated from each other and communicate mainly through computer-mediated channels, the team leaders considered catering for the individual crucial. Catering for the individual meant that the team leaders were aware of the different time zones and working environments their remote team members were in. In addition, the team leaders saw it important that they were available to the remote team members. In some of the teams the team leaders had agreed upon particular rules concerning how the team members should prioritize each other in answering e-mails coming inside the team, as this would reduce the feelings of loneliness and create trust that there is always someone who can help with difficult tasks.

The role of feedback was also related to the teams' virtual nature. When the team works in a virtual environment, such as an electronic discussion forum, the relevant positive feedback might have an even greater role in team identification, because the messages are saved in the forum and can be read and reread months later. In a discussion forum or a team meeting, the team leader's praise is also more public than in a one-to-one situation, and this may enhance other team members' identification with the team as well. This might be especially critical in virtual teams, where the team members cannot see each other very often and the successes of the team may remain unnoticed.

Bringing out common goals and workings was seen important as all of the virtual teams had faced some kinds of organizational changes in their lifecycle. Virtual team boundaries are often fluid and a virtual team may be constituted around a specific project or when there is a need in the organization to rationalize or integrate operations. In such situations the common goals and working must be made clear to all team members.

The fourth tactic, talking up the team activities and face-to-face meetings was important in virtual teams, as the computer-mediated communication was not always seen as a sufficient way to interact with the team. In team leader D's opinion group identification can be maintained by computer-mediated communication once face-to-face activities to build up the team spirit have taken place. In virtual teams, these kinds of meetings were seen as crucial for strengthening the team spirit and to get to know each other better.

The findings were partially similar to those of a study where managerial identification strategies were investigated in traditional workplaces (Cheney, 1983). Catering for the individual was seen as important in virtual teams, as was the expression of concern for the individual in Cheney's (1983) study. However, some of the tactics, such as 'talking up the

face-to-face meetings and team activities', were found to be particularly important in identification with virtual teams, but were not found in traditional workplaces (Cheney,1983). It might be that these kinds of activities were important because people are not used to spending time and effort getting to know each other in work situations through computer-mediated means. If virtual team members paid more attention to the social relationships and the feeling of social presence through computer-mediated communication, face-to-face meetings would not necessarily be as crucial as they still seem to be for identification with the virtual team.

## **EVALUATION OF THE METHODOLOGY**

Qualitative, interpretative research methods turned out to be a fruitful approach in studying virtual team leader's identification tactics through computer-mediated communication. Mann and Stewart (2000, 17–30) have listed many kinds of practical advantages and challenges in conducting a study by collecting samples of computer-mediated communication. For example, computer-mediated communication gives access to people who work far away and their work may also be mobile, such as in global virtual teams. It would be impossible for one person to visit every site of a global virtual team and to observe face-to-face the team members' daily communication with their team leaders. Travel costs would also make this kind of fieldwork a lot more expensive than the observation of online communication through technology. In addition, communication technology enables the researcher to minimize the time spent in collecting data in the field, and compromises do not have to be made when selecting the participants.

Collecting team members' computer-mediated communication for data is also more convenient for the participants than it would be for them for example to keep a diary of their daily communications. The participants' communication can be saved (and is sometimes saved automatically by the system) regardless of where they are or at what time they work. If a team leader sends a message to the team's discussion forum in the middle of the night from his/her home, the message is saved automatically and s/he does not have to make an extra effort to report the communication to the researcher. When it comes to data analysis, the data consisting of text-based computer-mediated communication provides the researcher with easier organization, storage and handling of the data. As Mann and Stewart (2000, 24) argue, "textual data from research interactions can be moved effortlessly into other computer functions", such as qualitative analysis software.

However, as more than half of the data in this study was captured by more traditional ways, such as by face-to-face interviews and recording meetings, all the benefits of computer-mediated data could not be used. The interviews could have been conducted online by e-mail or in more synchronous ways through an instant messaging system, which would have made the transcriptions of the interviews unnecessary, but it can be argued that writing is often more laborious for participants than speaking out their opinions in an interview, and the data gathered through writing might have been more condensed. Also an important factor related to qualitative interviews is the emergence of trust between the researcher and participant (Kvale 1996, 125). Scholars have been debating whether or not developing trust and rapport is a particular challenge in online interviews (see e.g. O'Connor & Madge, 2003; Vaida, Mynatt, Erickson & Kellogg, 2004; Ward, 1999). As all of the team leaders were Finnish and located in Finland, I wanted to have the initial contact with them face-to-face. I saw the development of trust with the team leaders as important since a trusting relationship would also help in gaining access to the other data I wanted to collect.

In addition, not all of the computer-mediated communication systems support the automatic saving of messages. For example, the version of the instant messaging system that team C was using did not save logs automatically, and team leader C had to remember to copy and paste the discussions she was having with her team members to a separate text file. It might therefore be that not all messages have been saved and some important data have been left out. Due to the nature of the study this is not, however, as crucial as it would be if the research interest was, for example, in the density of virtual team leaders' communication networks.

Collecting computer-mediated data brings also special challenges to the research (see Mann & Stewart 2000 for a comprehensive review). Some people may be afraid of creating permanent written text and giving it to outsiders for analysis. Other participants may want to opt out of a study because of the expertise needed when using computer-mediated communication tools. This may be the case in laboratory studies, but not in studying organizational virtual teams, in which the team members are usually used to using the communication technology the researcher is interested in. Also other issues, such as the internet access of mobile workers or the technology provided for the remote team members, may complicate studies using computer-mediated data collection methods in virtual teams.

However, collecting computer-mediated communication serves as a way to understand the daily social experience created by virtual team members and their leaders. As leadership is

in many ways symbolic action (Connaughton & Daly, 2004), the symbols the leaders share with their team members may be used to facilitate members' identification with the team. Therefore, by analyzing the communication the team leaders share with their team members through technology, computer-mediated data may provide important insights into the communication processes of a virtual team and the attempts of the team leaders to promote identification in these teams.

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# **ANALYSIS OF WORK LOAD FACTORS AND WELL-BEING IN MOBILE WORK**

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## **INTRODUCTION**

Well-being is an experience arising in relation to a phenomenon (cf. Utriainen & Kyngäs, 2003). When speaking from well-being in work, the experience is created in relation to work and to its factors. To study well-being at work is a challenging task, as not only the work and its load factors, but also intervening adjusting factors, such as personal characteristics, social support and the coping mechanisms used by an individual, affect well-being experiences (see Niemelä & Teikari, 1984). A central problem related to developing types of work, such as mobile work, is that the work, its new methods of execution, its new working environments and load factors are not known well enough. It is difficult to connect the consequences of well-being to the unknown characteristics of the work.

The purpose of this article is to reveal the complexity and load factors of mobile work. The work is defined “mobile”, if the employee works more than ten hours per week outside of the primary workplace and uses information and communication technology (ICT) for communication. (Hyrkkänen & Vartiainen, 2005, 24; Gerais, 2006 ). The complexity factors of the work refer to the wide range challenges, which are included in the work and can be examined as dimensions. With the dimensional model, it is possible to assess the extent of the factor found in the work. The model of six complexity factors of Vartiainen, Kokko & Hakonen (2004) functions as a frame of reference in this study. In this model, the complexity of the work of individuals, working pairs, teams, projects, organisations or cooperative networks is described with the help of six dimensions (Figure 1). The complexity of each factor increases as it transfers from the centre to the outer layers of the circle. Work community and its members on the outer circle move a lot; they work in several places, which have dispersed widely; they communicate and cooperate with help of ICT-tools; the actors they work with diverse widely; their working times are asynchronous and they form periodic and temporary groups.

This paper shows the load factors related to the different dimensions of mobile work, i.e. geographical dispersion, mobility, diversity of actors, asynchronous working, temporary structure and mediated interaction. The questions to be studied are:

- How the dimensions manifest themselves in six different types of mobile groups?
- What are workers' well-being experiences related to each complexity-factor?

## RESEARCH METHOD AND DATA COLLECTION

The study was carried out as a qualitative multi-case study, in which six mobile employee groups were explored. The number of employees in each group varied between five and eight. There were altogether 41 interviewees. Groups were divided into two categories: three groups moving globally and three groups moving locally. The data was gathered by interviewing each member of the groups by a semi-structured interview. In addition to the interviews, three different surveys were used: virtual team questionnaire (VTQ1), well-being in dispersed work (WDW) and Job Engagement (see: Schaufeli, Salanova, Gonzalez-Roma & Bakker, 2002; Hakanen, 2004).

A model of the complexity factors of work (Vartiainen, Kokko & Hakonen, 2004) was used in analysing the data. In the model, the complexity of the working environments of individuals, working pairs, teams, projects, organisations and co-operation networks is illustrated with the help of six dimensions.

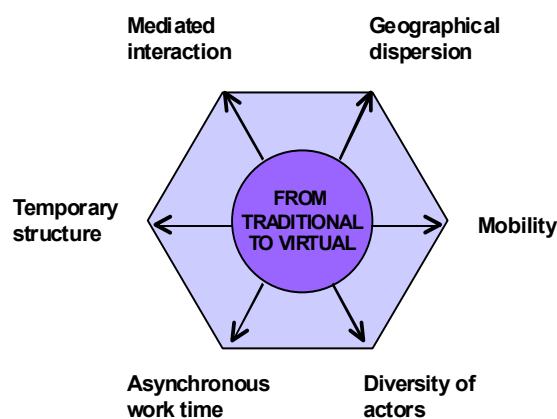


Figure 1. Complexity factors of working environments (Vartiainen et al. 2004, 22-23).

The interview material was coded and classified according to complexity factors using the AtlasTi programme. A parallel coder was used to confirm the reliability of coding. After the parallel coding the parameters of code classes were defined. The variables of the questionnaires were dealt with the SPSS programme.

After complexity factor coding, each of six factors was examined separately. Within each factor the descriptions and main statements, with which interviewees described well-being as either positive or negative were selected to analysis.

## **RESULTS**

In the following, the complexity factors of work are compared between those moving globally to those moving locally.

### **Modes of Mobility**

According to Lilisckis's model (2003) the researched groups of maintenance men, security personnel and community nurses were 'local movers' using certain routes within a defined area. Those moving globally were, depending on their way of transportation, either 'jojoes' or 'nomads'. Globally travelling representatives of a large and a small company can be considered as jojoes, because they travelled to different secondary places from the home base, with which they were in touch using information technology. Nomads, representing the European Parliament (EP) group, work in several different locations rotating on a fairly regular basis.

### **Mobility as a complexity factor**

Comparison of locally and globally mobile groups showed that local groups considered themselves to be more mobile than global groups (Table 1). Locally mobile groups were continuously on the move during their everyday work. Security personnel and community nurses visited their primary workplace once a day while, on the other hand, maintenance men only once in a fortnight. Trips of those moving globally form a different pattern. Travelling to the secondary workplace might take a day with the actual job perhaps lasting from several days to weeks. Time spent at the primary workplace was also longer than of those locally mobile. According to a virtual team questionnaire, there were 66 travel days per year on average with the deviation being quite great. Deviation was greatly affected by the conception of a "travel day". Travelling within everyday working area did not constitute a travelling day,

for example, for maintenance men or security personnel. A travel day was something other than the routine of a standard working day, e.g. travelling to training.

**Table 1.** Means and standard deviations of self-evaluated complexity factors of mobile groups. (1=little, 5=a lot).

	Global movers		Local movers		Total	
	M	SD	M	SD	M	SD
Mobility	2,40	1,30	3,02	1,11	2,71	1,23
Geographical dispersion	3,27	1,43	2,35	1,55	2,81	1,54
Diversity of actors	3,29	1,37	2,37	1,49	2,84	1,48
Mediated interaction	2,52	1,35	3,14	1,38	2,82	1,38
Asynchronous working	2,04	1,52	1,76	1,46	1,91	1,48
Temporary structure	1,69	1,43	1,12	1,34	1,41	1,40

According to the WDW-questionnaire both groups felt that travelling was a burden from time to time. There were no significant statistical differences between the locally and globally mobile groups.

The interviewees attributed the following load factors to being mobile:

- A long period of immobility in vehicles caused a load on the individual's physiology and led to muscular, circulatory and structural problems. Cramped quarters made recovery difficult.
- Spaces associated with travel have not been designed for work or for rest. The poor quality of premises became especially significant problem during long trips to different time zones.
- If you have to drive a car, problems will follow by a lengthy stay demands, constant vigilance and familiarity with local transport regulations. To those locally mobile, load was caused by, for example, bad weather conditions and driving in the dark or driving while tired. Problems relating to the functioning of communication devices in cars added the load and increased the risk of accidents.

In general, travelling was seen as a necessary nuisance associated with mobile work and employees priced easy transportation ways with as little inconvenience as possible.

## **Number of work locations and dispersion as a complexity factor**

As expected, the geographical dispersion was greatest with those moving globally, i.e. representatives of a small and a large company operating globally work on different continents, and the EP-group moving within Europe. Locally mobile groups worked in a local area, which varied in size from tens, to hundreds of square kilometres.

In this study work locations were divided into five different places (Table 2). Groups were compared according to how often they worked at home, at the primary workplace, in means of transportation, at secondary workplaces i.e. places on secondary sites of own company or places belonging to customers, and at third places, i.e. restaurants, hotel rooms and other places normally associated with free or leisure time.

Of the *locally mobile group*, only the maintenance men worked from home on regular bases. The group used palm computers to receive work orders and send reports, and as a result there was no need to visit the primary workplace for days or even weeks in some instances. Where the home was used as a base from which to travel to working area and back, it was also necessary to plan and organise the working day from home. Despite free time being used for planning, it was not regarded a problem. Concurrent with planning, workflow was enhanced which in turn increased revenue. It was considered that working from home gave a better grasp on work in the field and as such was associated with a greater sense of well-being. Security personnel and community nurses rarely worked at home. During free time, calls from colleagues were answered but were hardly ever of a professional nature. Community nurses whose job description entailed teaching occasionally had to mark student papers at home. They felt that they could best concentrate on texts written by someone else in the privacy of their own home at a time which best suited them.

Security personnel and community nurses visited their primary workplace daily but maintenance men only once a week. Maintenance men's use of palm computers in receiving and reporting jobs had diminished the necessity of visiting the primary work place. Those mobile locally had as their secondary workplace all the locations they visited within the working area: nurses had 6-10 locations, maintenance men around 10-20 and security personnel a few contracted locations along with several emergency calls.

Of the locally mobile group, security personnel and maintenance men met up with colleagues in coffee shops during which informal discussions about work related subjects were held. Community nurses met colleagues during the afternoon at their primary workplace.

All those mobile locally stressed support and the meeting of colleagues face-to-face during the working day as a significant part of well-being.

Of the *globally mobile groups*, members of the large company and the EP-group worked in each of the five workplaces. Employees of a small company did not work at home or while travelling because they were not provided with the means to e.g. a laptop. Working hours were always long in secondary work places. The group of assembly personnel did not work in hotel rooms, restaurants or in other leisure places. Instead they used leisure facilities during travel for the purposes of rest and recuperation.

The work of members of the large company and the EP-group travelled with them. In the pursuance of commitment to globally tasks eight hours work changed into working hours around the clock. Workplace facilities set boundaries to the tasks that could be fulfilled. All of the interviewees were experienced in mobile working and were familiar with the available technology and the limits inherent. This affected, e.g. what particular jobs were to be done in each of the workplaces employed.

Globally mobile individuals worked at the primary place for a few consecutive days and then spent several days or even weeks at secondary workplaces. Several locations were visited in the target country or continent and as such, there were numerous client meetings during one trip. Only the group of assembly personnel stayed in one location for the whole duration of the job.

The interviewees described their feelings of well-being and the load factors of their jobs. Concise explanations are given in Table 2.

Table 2. Workplaces and well-being.

Place	Experience	The annotations of local movers	The annotations of global movers
Home	+	Job control. Concentration.	Job control. Concentration.
	-		Poor work-life -balance.
Primary workplace	+	Support from management and official work community.	Support from management and official work community. Usable ICT -tools.
	-	Conflicts between teams. Vague management culture.	Tasks piling up.
Means of transport	+	Relaxation after customer contact, focusing on the next contact.	

	-	Long period of immobility, a prolonged period of concentration added by the stress of foreign traffic regulations. Bad weather and darkness.	Long period of immobility. Means of transport are not designed for working or resting. Cramped areas.
Secondary workplace	+	Advantageous and successful interaction.	Advantageous and successful interaction.
	-	Hard human relationships. Poor working of ICT -tools.	Hard human relationships. Poor working of ICT -tools.
Third places	+	Unofficial supportive work community. Encouragement from informal colleagues.	Unofficial supportive work community. Encouragement from informal colleagues.
	-		Isolation and loneliness.

Experiences of well-being related to working at *home* were attributed to the ability to successfully concentrate, attain results and an added sense of autonomy. The challenge of working from home was that of allocating time for leisure activities and the family. Load caused by imbalance between work and non-work time.

Experiences of well-being at the *primary place of work* were described as receiving support from colleagues and superiors and a generally good atmosphere. Positive experiences were also associated with well-equipped communication devices, which enabled one to control work and work related travel. Often there was no need to leave when the matter at hand could be resolved with, for example, a video conference. Load created by issues relating to work, were general challenges within the organisation i.e. problems and conflicts of interest between different groups, and also long periods of absence from the workplace resulting in a backlog of work.

Community nurses and security personnel were the only groups to associate experiences of well-being with the *means of transport*. A car was considered as a place to rest between two assignments. Transport-related load factors were explained as follows:

1. A long period of immobility stresses the physiology and circulatory systems.
2. Means of transport are not designed for working or resting. The areas are cramped.
3. If the means of transport are controlled by oneself, a prolonged period of concentration added by the stress of foreign traffic regulations can be a burden. Bad weather and darkness can exacerbate this.

At the *secondary workplace*, one met with clients, members of one's own team and experts from other areas of influence. In order for the mobile worker to be successful in their job they had to perform well in this work environment. Experiences of well-being were explained by positive achievements in interaction whereas failure led to feelings of discontentment.

Feelings of well-being at the *third workplaces* were associated with an unofficial comradeship where support and advice for performing one's own job were received. Experience of isolation and loneliness, however, caused load along with the malfunctioning of communication equipment.

### **Individual differences as a complexity factor**

Interviewees responded to questions about the differences between individual workers, namely their age, religion, gender, education, nationality and mother tongue and the effect on their working environment. Since the basis of a mobile job was to meet clients face-to-face, one encountered a multitude of different individuals. Still they were homogenous within the working team. The differences between members of a team were mainly in education, age and the number of years on the job.

Interviewees compared the diversity of other individuals in relation to their own experiences. As such, not only did one's age, gender, culture or language differentiate individuals from each other but also one's ethics and general outlook on the world. Security personnel, for example, felt that they encountered individuals who were completely different from they themselves. Meeting people of different origins and backgrounds was a similar challenge for both globally and locally mobile groups. Confronting different individuals proved to be a burden if they were very dissimilar to oneself and more so if the individual belonging to the focus group had an inferior education or experience of the job. On the other hand, successfully dealing with the challenge was a rewarding experience, which added to one's self-esteem.

The mental load questionnaire revealed the effect that experience and know-how had on the complexity of the working environment. There was a statistically significant difference between the globally and locally mobile groups in how they estimated the need to communicate and the ability to communicate in a foreign language. Those globally mobile had both the need and necessary skills to communicate in a foreign language (Table 3).



**Table 3.** Communicating in a foreign language.

Communication with foreign language						
	Global movers		Local movers		Total	
	M	SD	M	SD	t	p
Communication with foreign language required	4,53	0,70	2,40	0,75	4,01	0,00
Communicates fluently with foreign language	4,47	0,61	2,85	1,31	3,10	0,01

Difficult decision-making situations, in which the individual was alone were also considered as causing load. In these situations, clients or people belonging to another company represented a “foreignness”, which accentuated the workers feeling of inequality. An integral part for the feeling of well-being was the support one was able to receive through channels of communication.

### Interaction as a complexity factor

The basis for communicative interaction within the researched groups differed. Service men and security personnel used the phone and text messaging to communicate. The need for mediated interaction differed between the researched groups.

Table 4 illustrates how often different means of communication and collaboration were used by both globally and locally mobile groups. It should be noted that face-to-face meetings were the most common means of communicating with the locally mobile groups, whereas those mobile globally relied on the telephone, e-mail and text messaging. There was a statistical difference in the usage of the phone, ( $p < .05$ ), e-mail ( $p < .001$ ) and text messaging ( $p < .01$ ) between the two groups. Of the means for collaboration the most frequently used were databases. In general, the use of devices for collaborating was negligible. There was no statistical difference between the groups.

**Table 4.** Frequency in the use of communications and collaborating devices.

Communication tools	Global movers		Communication tools	M	SD
	M	SD			
Telephone (one-to-one)	4,65	0,49	Scheduled face-to-face meetings	4,27	1,10
E-mail	4,65	1,00	Informal face-to-face conversations	4,20	1,08

Informal face-to-face conversations	4,50	0,82	Telephone (one-to-one)	3,93	1,03
Text messages (SMS)	4,50	1,22	E-mail	3,33	1,05
Scheduled face-to-face meetings	3,94	0,93	Text messages (SMS)	2,67	1,11
Fax	2,53	1,59	Postal mail	1,53	0,74
Teleconference (audio)	2,29	1,21	Teleconference (audio)	1,50	1,02
Postal mail	1,82	1,82	Fax	1,40	0,83
Multimedia messages (MMS)	1,53	0,87	Instant messages	1,07	0,27
Instant messages	1,13	0,34	Videoconference	1,07	0,26
Videoconference	1,12	0,33	Multimedia messages (MMS)	1,00	0,00
Chat	1,00	0,00	Chat	1,00	0,00
<b>Collaboration tools</b>	<b>Global movers</b>		<b>Collaboration tools</b>		
	M	SD		M	SD
Shared databases	3,41	1,54	Shared databases	3,00	1,69
Shared team calendar	2,35	1,66	Team work space	1,93	1,62
Shared directory in intranet	2,29	1,61	Project management groupware	1,60	1,24
Team's website	2,12	1,45	Shared team calendar	1,57	1,45
Data conferencing (e.g. NetMeeting or shared Excel)	1,88	1,36	Shared directory in intranet	1,53	1,13
Team work space	1,76	1,48	Learning environment	1,40	0,83
Project management groupware	1,53	1,07	Team's website	1,40	0,91
Learning environment	1,29	0,69	Data conferencing (e.g. NetMeeting or shared Excel)	1,07	0,26
Web conferencing (e.g. webcam and voice)	1,00	0,00	Web conferencing (e.g. webcam and voice)	1,07	0,26
Group decision support system	1,00	0,00	Group decision support system	1,07	0,26

The load experiences associated with indirect communication were related to the interpretation of a message sent with a means communicating. Experience of well-being increased with the opportunity for indirect communication especially if during a difficult decision-making situation one received direct support. In these instances, it was crucial that the communication devices being used worked faultlessly and that the goals and plan of

action within the group was clear. A factor that increased well-being was the knowledge that a colleague, expert or superior could be reached at any time of the day should a problem arise. The significance of the functioning channels of communication was further enhanced when during the interviews many ideas for improvement and development were presented.

In general, devices used for communicating and collaborating were a means to better control and handle one's work. However, those mobile globally also ran the risk of being available and therefore at work constantly.

### **Complexity of asynchronous work**

There were great differences in what was comprehended as asynchronous work factors. Representatives of the global company had experience of asynchronous time, having worked in different time zones. This related to one's own mobility as well as that of work colleagues, e.g. in planning a meeting it had to be taken into account that one was in Mexico, one's colleagues in Finland, the Ukraine and India. The Finnish inclination towards unconventional working hours with evening and weekend work, along with the need to be constantly available, affected the experiences of the globally mobile group. A group of globally mobile assembly workers described their work as being simultaneous and working as a team even though they operated on different continents. The assembly workers compared the concept of similar working times to the lifestyle and time zone of the country in question. If the duration of the job was to exceed a fortnight the group would try to adapt to local time. Upon returning home, it was necessary to readapt to the routine and working hours of the factory.

With the group that was locally mobile, e.g. security personnel, working times were dissimilar to the rest of society, i.e. predominantly working at night-time. Dissimilarity in working hours was also determined in comparison to the working times of colleagues. Security personnel only met other co-workers at the end of each shift.

Of the locally mobile group community nurses and maintenance men had the same working hours as their colleagues.

In general, a comparison of the weekly working hours of the locally and globally mobile groups revealed a significant statistical difference ( $p < .001$ ). According to a VTQ1 questionnaire, the globally mobile group ( $m = 49$  hours/week) worked ten hours more on average per week than the locally mobile group ( $m = 39$  hours/week).

## **The complexity of temporality**

Upon evaluation of the constancy of working groups and collaboration, i.e. the length of a project, and time spent with the team, it came to light that members of large global companies and the EP-group performed more project work than the remaining groups. According to a virtual team questionnaire, members of a group worked on two projects simultaneously on average (n=20). All in all, co-operation within groups was somewhat stable with the average time spent in each group being 32 months (n=30) and the average length of time spent in a company being 9 years (n=29). According to the interviews, the temporary nature of projects was considered a load factor. On the other hand, the importance of change within groups was deemed important for the development of a project.

## **CONCLUSIONS**

Vartiainen, Kokko & Hakonen (2003a) found the demands of mobility to increase depending on how many places are visited, what the distances between the places are and how often one needs to change the place. According to this case study, as the number of places and the distances between them increase, so do the complexity and demands of the work. Particular challenges included the physical load caused by travelling; load caused by asynchronous working and long working days in the target country; the diversity of actors encountered; the constant coordination of one's affairs necessary due to continuously changing one's place of residence, as well as the different working cultures encountered in different places. In the load caused by travelling and moving around, there were no statistically significant differences between those mobile locally and those mobile globally, according to the survey. To those mobile locally, load was caused by e.g. bad weather for driving, traffic jams and darkness.

Out of the complexity factors asynchronous working has, among other effects, been found to increase the need for coordinating one's use of time. (Vartiainen, Hakonen & Kokko, 2003). In this study, especially in the groups working globally, asynchronous working had the effect of changing the hours and rhythm of the work. Employees did not have uninterrupted working days starting at a particular time and ending at another, but instead altered the rhythm of their days as well as their weeks according to the demands of their tasks. Working periods could take place, e.g. early in the morning, in the afternoon and in the evening. Work might be done to some extent on every day of the week. Following the working rhythm dictated by the task and working at different times of the day were some reasons for including one's home in the possible working environments. The interviewees

emphasised the importance of their own rules and felt that they were capable of controlling their working hours. They emphasised that the flexibility regarding working hours works both ways. Based on the survey study (VTQ1) there was, however, a statistically significant difference in weekly working hours between the globally and locally mobile, so that the globally mobile worked on average ten hours more per week when compared to the locally mobile. The difference in working hours may be explained by the dissimilarity of the groups in addition to the differences in their mobility. The locally mobile were employees, whereas the globally mobile groups also included some organisational management. In earlier studies professionals of high standing have been found to be more flexible and to work longer hours when compared to other professionals (Uhmavaara et al., 2005). On the other hand, those working mobile in general have also been found to work significantly more hours per week than other employees (Uhmavaara et al., 2005).

Physical mobility increased the diversity in the cultures of the encountered working environments (Vartiainen et al., 2003a). For the locally mobile, clients' different lifestyles and other differences were challenges, among others. For those mobile globally, the different linguistic, religious and cultural backgrounds of actors increased the complexity of client work, but at the same time the internal working culture and the common orientation to the work in their organisation might decrease the effect of differences. The values and working principles of the company formed a basis for work that was stronger than the cultures of the different actors.

To counter the complexity the interviewees emphasised the importance of skills. They had the impression that they were in many ways, i.e. substance skills, language skills, and social skills, experienced and qualified workers and thus capable of independent and mobile work, in which it is necessary to be away from the support of the senior and the rest of the community. Likewise, according to the VTQ1 survey both the global groups and the locally mobile considered themselves motivated and qualified workers, who belonged to a mobile group out of their own choice. They felt that they had opportunities to affect the way the work is performed and were pleased with their work performance. In addition, many of the interviewees emphasised that they had consciously sought out international tasks and mobile work. They had considered the requirements and motivational factors of the job in relation to their goals, opportunities and skills. Many stated that they would not be happy with a job to be performed exclusively at one workplace or with a job without enough varied challenge. In the study by Vartiainen, Kokko & Hakonen (2003b), the interviewed leaders of dispersed teams expected the employees in their team to be experienced workers and good at their job.

The leaders named as the characteristic traits of those working in a dispersed organisation independence, initiative, "instability" and ability to withstand isolation, reliability, credibility, activeness and responsibility. From the point of view of the work team it was important not to lose track of the mutually agreed direction.

In light of the example cases, it would seem that the expectations of the leaders and the conceptions of the employees about the qualifications for mobile work are similar. In mobile work as well as in a distributed team (Vartiainen et al., 2003b), in addition to profound substance skills, wide-ranging skills for encountering different kinds of situations are needed (see Rantanen, 2000). Good organising skills, interaction skills, skills for self-management and the ability to work with different types of people from different cultures were mentioned as characteristics of a good team member both in this study and in earlier studies on dispersed teams (Vartiainen et al., 2003b).

From a complexity factor perspective, the following challenges arise in the relationship between work and the well-being of the worker:

- Employee taking responsibility to perform their job description successfully.
- The defining factors in belonging to a work community.
- The usability of work areas and devices.
- The monitoring and support of a worker.

Mobile workers commit themselves to a *task*. Through experience, workers have developed an understanding of the demands of a job in relation to their strengths and abilities. However, not all assessments of abilities are realistic. One might over commit oneself to one particular job or take on too many and demanding tasks. In mobile work, the team leader cannot assess the nature of the task at hand in relation to the resources of the worker. In order to support the worker and the team leader some standards should be set in defining the job. This research does not investigate such standards, their existence or quality but the interviewees, however, brought to light factors relating to work and well-being, which could benefit discussion and a general agreement. The interviewees felt that in general non-work-related support and training was lacking especially if the job demanded global mobility and one's own experiences and educational background was exiguous. In addition, the importance of considering and representing the organisation and a common direction was emphasized to the dispersed group as well as each mobile individual (Vartiainen, 2004). It was also deemed important for the worker to anticipate challenges that might be met in different situations and discussions on how to best support the worker. These issues, as well as guidelines for

monitoring work progress, should be agreed upon so that barriers for even informal communication between a worker and his superiors would be diminished. Rosseau (2003) has written about a psychological work contract with which implicit expectations and understandings are brought to light in discussions between the worker and his superior. How the mobile worker is introduced to and trained for his job and how a particular job is agreed upon should be researched.

The mobile employee works as a part of different working communities. Continually on the move and having to fit into different organisations establishes challenges in understanding the feeling of belonging as well as the development of the social capital of an organisation. The crossing over of organisational borders requires so called horizontal expertise (Engeström, 1995). Other working environments can enrich working habits and knowledge. The importance of the social network of the primary workplace was described in the research. Establishing a network, in which trust played a key role, was found to be time consuming and laborious. Modern educational methods should be used for training workers of the future about how to function across borders and on towards expertise as well as how the needs of workers can be met with this new work concept.

The usability of work areas and devices and their appropriateness are still challenges, which must be resolved in order to serve the mobile worker. Mobile workers currently have to plan their work around working areas, which are not flexible according to the job at hand. A flexible working environment, the repetition of concepts and work area solutions, which support different areas of production, are important when outlining the diverse circle of locations in which the mobile individual works. One's own personal working space is not of primary concern but a location in which to settle down is needed. The actual concept of a workspace must be expanded upon: on the one hand, it must be seen as a physical working environment and, on the other hand, as a virtual surrounding. Both of these must have the possibility for group and individual work. The aforementioned feeling of attaining social belonging through the working environment is not only significant to the mobile individual but also the freedom from time and place enabled by technological developments. The workplace of the future will in increasing amounts become a meeting place as work done by oneself can be done anywhere.

The mobile individual, as a crosser of organisational borders, might experience the significance of borders in making work area decisions. Transitional phases and associated areas are often a significant part of the environment in which the mobile individual works and

thus make their planning relevant. Tacit knowledge, which has its origins at the border, is usually a significant part of the information producing process. It is probable that the mobile worker recognises its significance better than a so-called traditional immobile worker. The expansion of the intensity and demands of work run into the limits of human capacity. Overstepping psychological and physical boundaries could backfire as a consequence of overloading, fatigue and a weakening of work capacity. For defining and planning optimal levels, research and development is needed. In order to support healthy surroundings that face the working conditions of mobile work there is a need to develop new methods, which reach the different locations of the mobile individual and understand the physical, social and virtual spaces he is confronted with better than the modern, e.g. methods used by the health services. Modes of operation must be considered with the aid of which the worker can identify possible risks in well-being for himself, prevent them and in doing so increase well-being. A change in work habits requires that tools used by support mechanisms such as occupational health services and industrial safety services personnel are renewed. Work related to the promoting of occupational well-being is also in search of new and different concepts to manage work, e.g. the concept of social ergonomics used by Nenonen and Leväinen (2003), which considers the relationship between the privacy of work and community as a builder of occupational well-being.

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**DISTRIBUTED AND MOBILE WORK**  
**- PROMOTING COLLABORATION WITH THE TEAMWORK GAME**

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## **INTRODUCTION**

This paper focuses on the simulation game called the Teamwork Game for studying and promoting collaboration and teambuilding in organizations. First, the Teamwork Game, its aims and contents are introduced. Second, a case study describes how the game is applied within the context of distributed and mobile teamwork in a building project at its launching phase. Finally, the paper shows empirical results with follow-up and discusses the outcomes and effectiveness of the game.

## **DESCRIPTION OF THE TEAMWORK GAME**

*Simulation games* are a commonly used teaching and training method in a variety of areas, like business, management and social sciences, both in classrooms and in companies. Simulation games provide a learning environment to cope with real problems and situations that are close to reality. They offer an opportunity to train social skills and develop real social systems. Simulation games are applied to develop communication, collaboration and teamwork that are relevant at work and business. (e.g. Ruohomäki, 2002).

*The Teamwork Game* is a pragmatic tool for teambuilding and teamwork training in organizations. It is an action-based card and board game, where players discuss together about work related issues and solve problem situations. It is meant for practicing of collaboration skills and forming of the team's ground rules. The game is targeted at industrial, clerical and administrative personnel that form a team, like production teams or customer service teams. The Teamwork Game is next described in a nutshell based on previous publications (e.g. Jaakola, Ruohomäki & Teikari, 1999; Jaakola & Ruohomäki, 2000; Ruohomäki, 2001).

*The aims* of the Teamwork Game are to increase team members' abilities and skills to work in a team and to increase the team's functionality. More specific aims are:

- To develop collaboration, interactive and communication skills.

- To get acquainted with group phenomena and to form common concepts.
- To practice anticipating, identifying and solving problems.
- To get to know one another better as team members.
- To lay a foundation for norms or rules of the team.

*The participants* are those employees who are working together as a team including supervisors and managers if possible. A team of three to eight employees participates in the game with a trained game facilitator. Typical game facilitators are human resource developers, personnel trainers and consultants who have experience in teamwork and team training.

*The content* of the game is based on the idea that social phenomena, themes and concepts of the teamwork are illustrated at a level of everyday activities at the workplace. The game simulates essential teamwork situations and typical conflicts that have emerged in practice within various organizations and presented in the literature under the following themes: communication, common goals, group cohesion, fairness, autonomy and leadership in teams. Additionally, the game includes questions regarding knowing others as team members, because in teamwork, it is necessary to understand and tolerate diversity and individuality of team members. The idea is to provide a systemic concept of working in a team, because a larger organizational environment has an influence on a team and its members. Therefore the various levels of teamwork are handled in the game: a team as a part of an organization, internal relationships in a team, and an individual member in a team.

*Materials* of the game are packed in the box including the following components: question cards (145 pieces), game board with different routes and colored spaces, the answer cards with alternatives (“I agree”, “I disagree”, “I partly agree”, 1, 2, 3), eight pawns of various colors, one dice, score boards, Collaboration Survey and the manual for the game facilitator. The Teamwork Game includes different types of question cards (Table 1). Red cards (“knowing others”) are meant to practice knowing others as team members and to self-evaluation. Green cards (“teamwork themes”) present the themes of teamwork with the alternative statements on the cards. In the yellow cards (“problems”) typical problems of teamwork are illustrated as small episodes, which are used to practice identifying and solving problems. Each game is tailored for the specific needs of the team by selecting relevant question cards of the game.

Table 1. Examples of the question cards of the Teamwork Game.

<b>I prefer working</b> 1. by myself 2. as a pair 3. in a team	<b>The team should receive feedback on the results of its work</b> 1. as often as possible 2. regularly 3. only when necessary	Two subgroups have emerged within the team. They cannot cooperate. The result of the whole team is getting weaker, What should be done?
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*As for length of teamwork training*, a two- or three-day intensive course is possible, or it can be carried out over a longer period of time. The Teamwork Game is most useful when its use is connected to broader context of personnel training, team building and organizational development. The use is typically divided into the following stages:

Collaboration Survey and discussions before the game day (1-2 hours). The participants prepare for the playing by answering a Collaboration Survey. Other company specific questionnaires can also be used as context information. The game facilitator analyzes and summarizes the results. Interviews or discussions with the management and the personnel are suggested for the game facilitator, who selects relevant question cards for that team.

Playing the game (1/2 day). Participants proceed by casting a dice, moving on the game board, answering questions, arguing about them, solving problems, and collecting points. Different viewpoints of the players and constructive discussions are encouraged. The game facilitator helps the group processes, facilitates discussions and takes care of safe atmosphere.

Debriefing discussion immediately after the game session (at least ½ hour). Participants share and reflect their experiences in the game and in the team with the help of the game facilitator. Team members select those cards of the game that need further processing when creating team's ground rules.

Ground rule workshop for the team after the game day (1/2 day <). Participants discuss about the relevant topics of the game and their own team. A game facilitator structures discussions. The purpose is to formulate and agree on ground rules or norms of the team, for example, concerning clarifying team goals or communication procedures.

*Application experiences* of the Teamwork Game have been encouraging. It is applied by more than 150 Finnish organizations so far. Based on the reported case studies, interviews of the game facilitators and questionnaires among the participants, the result show (Jaakola et al. 1999, Ruohomäki & Jaakola 2000, Ruohomäki 2001) that:

- Topics and questions dealt with in the Teamwork Game are relevant.

- Participants have been motivated and interested in playing.
- The Teamwork Game has facilitated open and constructive discussions.
- Participants have understood different kinds of opinions and viewpoints.
- Participants have learned to know each other better as team members.
- Participants have regarded playing useful for promoting collaboration in teams.
- Participants have presented improvement ideas, which have been implemented.

The follow-up study in the pharmaceutical company (N=130) showed that effects of the game became evident on two levels: first, in the increasing of collaboration within the team, and second, in promoting the concrete development activities. At its best, the game led to large-scale changes in the entire company, like division of work within the teams, change of roles and hierarchical positions of supervisors of the teams, and collaboration between different teams. (Ruohomäki and Jaakola, 2000).

The Teamwork Game is highly adaptable and can be applied flexibly for supporting multicultural teams. In an international context with multicultural teams (N=140), the game encouraged communication and showing various cultural aspects. Different answers to concrete questions and various ways to solve problems led to a deeper understanding of cultural diversity. Perceiving that there are differences in modes of operations was the key for understanding, accepting and utilizing them in multicultural teamwork. This perception created the foundation for agreeing on the norms that are necessary for the team's functioning. (Ruohomäki, 2001).

*A new challenge* is to apply the Teamwork Game for promoting collaboration in distributed work teams, in which members are geographically dispersed and coordinate their work via information and communication technologies. Despite the growing prevalence of this new work form, little is known about team training concepts and methods to support the teams for the challenges of distributed work (e.g. Hertel & al., 2005).

## **CASE STUDY: DISTRIBUTED AND MOBILE TEAMWORK IN A BUILDING PROJECT**

*Case company* is a Finnish building and renovation organization that is geographically distributed and functionally segmented. The case company employs over 200 people, around half of them work in the central office at Helsinki, and the other half is distributed in the

seven property regions throughout Finland. All the major decisions are made and special services reside at the Helsinki headquarters. Actual projects are located and the regional staff operates in the regions. Additionally, several consultants including architects, external workplace consults and special designers are involved in projects. In a typical building and workplace renovation project, a group of knowledge workers form a team or a network of experts each specialized in performing some essential aspect of the company's business activity. (Report by DWork reseachers, 2005).

'*Workscape thinking*' (Harrison et al., 2004) was applied to described mobile and distributed work in the case company. Analysis of 'physical spaces' showed that the employees were working mainly in their office, meeting in other places and at home. They spent a considerable time outside their office, i.e. traveling or attending meetings and inspections. During business trips, they worked also in airports, trains, hotel rooms and in customers' offices. The personnel had flexible working hours, and were used to work with mobile phones, laptops and videoconferences provided by the company. We also described 'social spaces' and group processes of the employees, e.g. how a mobile and distributed team is operating in practice. That study revealed three major problems of distributed and mobile teamwork: the lack of shared project identity, the lack of shared understanding of the project totality, and the lack of trust and collaboration between headquarters and regions. (Report by DWork reseachers, 2005). Therefore, the next phase of the study focuses on development of collaboration of project teams.

*Aim of the study* was to develop teamwork and collaboration in distributed and mobile work with the help of the Teamwork Game (Working Plan for the case company by DWork-reseachers, November 2005). The study describes the use of the Teamwork Game and evaluates the effectiveness of the intervention within this context.

The company introduced *the case team* as an example of a distributed or virtual team, that is, a group of people who worked interdependently with a shared purpose across space communicating mainly via information and communication technology (Lipnack & Stamps, 2000). The case team consisted of five members who are knowledge workers and experts of the company. The team's joint task was to plan a renovation of a building that is located in East Finland, in the North Karelia. The team had a mutual goal in fulfilling the objectives set in the project, but each of the team members assessed the objectives and means to achieve it differently depending on their professional standing.

The case team is geographically distributed; the team members' primary offices are located in Kuopio, Joensuu and Helsinki. Due to the long distances, the team members met face-to-face quite rarely. They communicated mainly with telephone and e-mails. The team members traveled to meetings and to the buildings under renovation mainly by their own car or by an airplane. Some experienced the traveling as tough and time consuming. Others considered the car as an own 'mobile office', where all the needed material traveled with them. For work, a lot of paper documents, such as drawings and plans were needed, which were stored in project folders.

*Research approach* was action research oriented characterized by the co-operation and mutual learning of the researchers and employees working in the context of the research. The longitudinal case study started from the first meeting of the project team and continued for six months. We studied the team at the early launching phase of the renovation planning process since that was found to be fuzzy. Qualitative and quantitative data was collected with observations, interviews, questionnaires and drawings.

*The phases of the study, interventions and research methods* are presented in time order:

- Observations (November 2005): The researchers observed the first project meeting of the team, and made notes of the discussions of the team members.
- Interviews (November-December 2005): The researchers interviewed the team members under the themes like work tasks, distribution, mobility and collaboration.
- Questionnaires (January 2006): The state of project team was measured in the launching phase with the Virtual Team Questionnaire (VTQ) developed at HUT. In the WWW-based questionnaire, team members were inquired central issues on distributed and mobile work.
- The Teamwork Game (January 2006): The team members participated in the Teamwork Game in a half-day workshop aiming to promote their collaboration. The researchers tailored the game for the team by choosing relevant questions (e.g. communication and leadership) and by creating some new questions timely for the situation of the team (e.g. workload). Team members discussed intensively on the question cards and reflected their own situation. During the debriefing discussion, the team selected those cards of the game that need further processing when creating team's ground rules. One of the researchers had a role as a game facilitator, while the other made notes about the discussions of the team members. Human resources consultant of the case company observed the game

session and evaluated the usefulness of the game from the perspective of the human resources management.

- Ground rule workshop (January 2006): The team members discussed about the most relevant issues raised by the game in the half-day workshop. The aim was to define and to clarify norms or ground rules of the team. As new elements of the game, a set of pictures and drawings was applied in order to visualize distributed work. At the end of the workshop, the team members draw a picture about their distributed collaboration, which was named as “The Team Map”.
- Questionnaires (March 2006): The development of the team was measured again using the VTQ. Longitudinal measurement gave an opportunity to evaluate the effects of the developmental actions.
- Reflection workshop (April 2006): In the half-day reflection workshop, the team members reflected their experiences on the Teamwork Game and discussed their ways of working in practice. The researchers presented the results of the questionnaires, and the changes in teamwork were discussed among the team members by comparing the results from the two measurement. That workshop closed the research with that project team.

## **RESULTS AND REFLECTIONS**

*During the project's launching phase*, the distributed and mobile team faced the following challenges: lack of shared understanding of teamwork, missing leadership and weak communication of the distributed members. The team members had only a vague idea of the entity of teamwork, and the tasks and responsibilities of other team members were unclear. For example, the team members even did not have a common understanding of who belonged to particular teams. Limited communication between team members led to misunderstandings and even to conflicts when the expectations were contradictory or ambiguous.

*Lack of shared understanding* of teamwork was revealed in a concrete way during the Teamwork Game. For example, it was realized that the key client contact person of the team didn't know that a major client intervention was ongoing. He was caught in an embarrassing encounter with the client boss who asked if he would joint the meeting regarding the intervention. This occurred because the member responsible for the intervention assumed that this person had nothing to do with these kinds of client activities, although they worked in the same team. The team members' tasks and responsibilities had not been clarified.



*Lack of leadership* of the team became apparent during the Teamwork Game. The team was self-managing autonomous team without an appointed leader. For example, the team members presented different views of a person who should lead the team during the ongoing early planning process. The company had formal guidelines for the projects but they were considered rather ambiguous. The different expectations and limited communication within the team led to the situation where no-one clearly had the leadership responsibility. This, in turn, complicated the cooperation and led to feelings of stress among some team members who found themselves in the middle of conflicting and ambiguous expectations from different colleagues.

*Heavy workload and feelings of stress* were reported by the team members during the Teamwork Game and in the reflection workshop. According to the team members, the reasons for stress were e.g. information overload, assignments coming from different directions, and sudden requirements from the customers, which confused plans and schedules. They worked often overtime in order to stretch to the wishes of the clients. The team pointed out that they could not solve these problems by themselves. Therefore they needed for management support and other guidance from the company, e.g. from a human resources development unit.

*As a result of the Teamwork Game*, the team created themselves a few norms or ground rules concerning their distributed collaboration. Examples about the tailored question cards and norms of the team are presented in the Table 2.

Table 2. Questions of the Teamwork Game and solutions provided by the team members.

Theme	Question	Solution
Shared understanding	The team members know poorly others' tasks and expertise areas. How could you increase shared understanding?	At the beginning of the project you have to have a kick-off meeting, where team members' responsibilities, tasks and roles are jointly agreed.
Cohesion	The team members work in several places and only a small fraction of the time in the group. How can you develop the team's togetherness?	Regular meetings will be arranged in different places. To them you prepare yourself thoroughly. Communication technologies will be utilized.
Workload	The team members receive assignments from several different parties. The workload becomes too big. Whose task is it to set assignments according to priorities?	The team members cannot solve the situation by themselves. The situation must be discussed together with the representatives of management and human resources department.

*Feedback concerning the Teamwork Game* was very positive. The team members were satisfied with their game experience. The game promoted open and concrete discussions in work-related topics. They considered the game useful for their team building process. They also expressed their wish to take part in the game again and to play it with other teams as well. The human resources development unit of the company reported that the game is useful training and development tool in their context and it can be applied with other teams throughout the company.

*The distributed and mobile team* consisted individuals working with several team and projects at the same time. They spent only a small fraction of their time, about 5-20 per cent, to work with this particular team. Working in different projects was burdening to the employees, and the management of the entity was difficult. They described their relationships more as a project network. The team members visualized their distributed collaboration by drawing “The Team Map” (Figure 1). They told that it helped to form a shared understanding about the distributed collaboration and relationships.

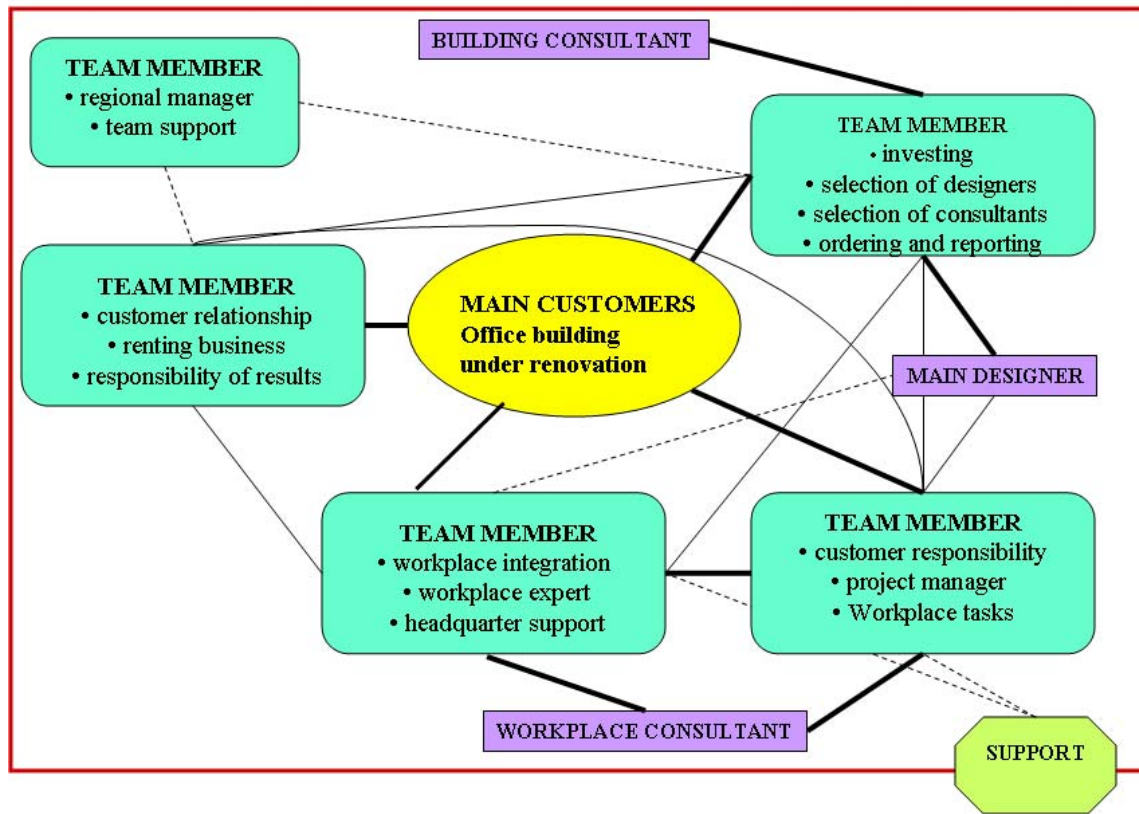


Figure 1. “The Team Map” about distributed collaboration.

Following results were obtained from some selected scales of the VTQ. The first measurement (M1) was conducted in January 2006, and the second one (M2) in March 2006. The questionnaires show (Figure 3) that:

- Roles of team members had been clarified and job satisfaction was slightly increased.
- Trust between team members had slightly increased. This was in line with decreased monitoring inside the team.
- Perceptions of procedural and interactional justice were also slightly increased.
- Task interdependence had decreased. It was suspected that the current work needed less coupling of tasks than the work phase during M1.
- The level of stress was high in both measurements. The same trend was observed in company’s internal survey by human resources professionals.

Generally, the attitudes had developed positively except cooperative (extra-role) behaviors. The team members suspected that in the current phase of work no intense cooperation was needed. However, the problems in cooperation were one reason for this research and development.

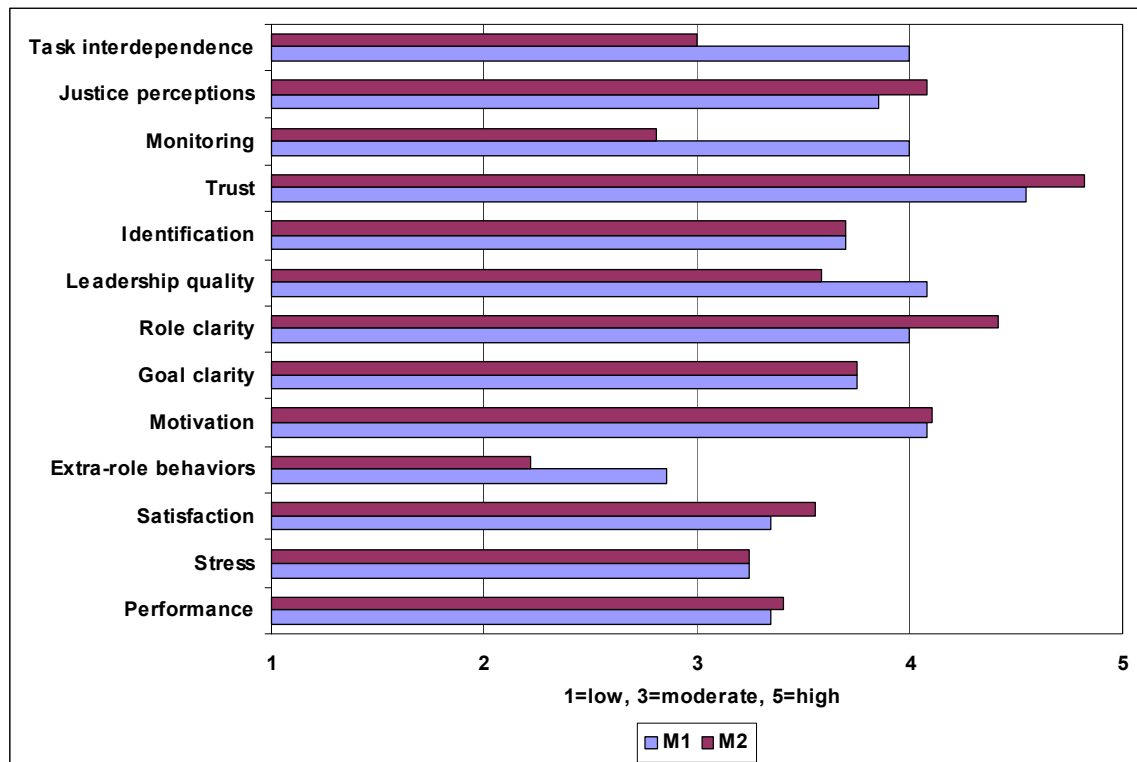


Figure 3. Collaboration of the distributed project team. Comparisons of VTQ results between the launching phase (M1) and after interventions (M2) three months later.

## DISCUSSION

Simulation games and other interventions can be used for personnel and team training. The Teamwork Game is an appropriate training method to prepare teams for the challenges of distributed and mobile work. The game was successfully applied in the company that is geographically distributed, and the employees are working around the country in several ‘physical spaces’. The game was used to develop collaboration of the distributed team (or virtual team), in which members communicate and coordinate their work mainly via information and communication technology (Lipnack & Stamps 2000). The game was carefully tailored and planned for the distributed team. The case team had lack of shared understanding of teamwork, missing leadership and weak communication. These are typical problems of distributed work and virtual teams (e.g. Hertel & al. 2005).

The Teamwork Game proved to be a useful tool for promoting collaboration of distributed and mobile teamwork, especially at the early phase of teambuilding. In the lifecycle of teams (e.g. Hertel et al. 2005), the game is recommended to be used in the launching phase when it is relevant to get to acquainted with the other team members and their roles, and to clarify common goals and norms for teamwork. As a result of the game, the team members became aware of their internal problems, and they created themselves a few norms or ground rules concerning their collaboration.

As a new outcome of the Teamwork Game, we draw “The Team Map” in order to visualize roles, communication and collaboration of the team members working geographically distributed. “The Team Map” described their shared common idea of distributed teamwork. That is quite close to the concept of ‘social space“. The Team Map” is a concrete and easy way to visualize distributed teamwork and to support the process of team building.

The follow-up study showed positive effects of the teamwork training with the Teamwork Game. The participants had high job motivation and they perceived that their team roles had been clarified, their mutual trust and justice as well as job satisfaction were increased. These results suggest that teamwork training is possible and advisable. Feedback concerning the Teamwork Game was mainly positive from the participants and the human resources consultant of the company. However, it is worth noting that all the problems can not be solved by the team themselves. For example, the team members had heavy work load and their level of stress was high. Therefore, the distributed and mobile teams need for management support, structure and guidance from the company, e.g. from human resources consultants.

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## **MULTIDICIPLINARY WORKPLACE RESEARCH**

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Though most research is still monodisciplinary, research involving more than one discipline has become more frequent during the last few decades, and has widened the spectrum of innovative research. The same phenomenon also takes place in workplace research. Multi-disciplinarity defined as research comprising different, formalized specialities has posed a number of challenges for the researchers themselves. This paper's objective is to describe the challenges of multidisciplinary workplace research. It provides an overview of different workplace research approaches as well as it presents one research example 'The nature of the workplace for knowledge creation' more closely.

The workplace research needs a better understanding of the variety of perspectives possible to investigate the phenomena. Moreover, it requires a discussion about qualified criteria and relevant reasoning for multidisciplinary approach in order to develop appropriate, rigour research.

### **INTRODUCTION**

This paper seeks to discuss and describe the challenges of multidisciplinary workplace research. To achieve this, the paper addresses the following issues:

First, the phenomena of multidisciplinary research, which has ventured into formerly divergent fields tries to find compromises regarding study designs and methods for data collection and analyses while putting emphases on theoretical frameworks (often based on different paradigms). These are challenges, which have been overcome with varying degree of success so far. The workplace as a research target has many perspectives and has to be developed within a wide scale based on multidisciplinary research.

Secondly, a framework for the research space of workplace is explored, by applying Anttila's (1999) model. Workplace as research object can search for its focus between several different dimensions. Based on Anttila's allocation one can understand both paradigm and methodology behind different approaches and construct the multidisciplinary reasoning in a logical way.

Finally, the objective is also to explore experiences from the research ‘The nature of the workplace for knowledge creation’. It is introduced and discussed in order to understand, how a multidisciplinary workplace research can be further developed from the theoretical and methodological perspectives. Such knowledge should make it possible to create innovative methods for facilitating the workplace. It will also provide a deeper understanding of the consequences of multidisciplinary, both in theoretical frameworks and methodologies in workplace research.

### **INTER-, MULTI- AND CROSS-DISCIPLINARITY CHALLENGES**

Interdisciplinary characterises research actions that combine knowledge from more than one research field. Multidisciplinary characterises research fields, journals, groups of researchers, organisations etc. that comprise different research fields. Multidisciplinary fields or organisations can comprise purely disciplinary research processes (Chubin, 1976). That said the systems that serve as infrastructure for cross-disciplinary research activities have according to (Aagaard-Hansen et al., 2004) mainly developed in mono-disciplinary environments.

This creates a challenge for the scientific community to work further to the direction of multi-, inter- and cross-disciplinary principles, criteria and relevancy, both in theoretical frameworks and the empirical parts of research. A growing number of researchers in a wide range of fields values e.g. activity theory for its descriptive conceptual framework and the insights it provides into the myriad reasons why human behaviour and consciousness so effectively evade totalizing theoretical explanations (Dayton, 2000).

A theoretical approach to workplace research that is both pragmatically empirical and consistent with a post-modern research ethic is needed. According to Dayton (2000) activity theory accommodates a range, or mixture, of qualitative methods, which can be selected to afford maximum flexibility in designing workplace studies. It values triangulation between a holistic view of an activity system and particular viewpoints within that system. It further encourages the construction of multiple perspectives by emphasizing the social, procedural, and technological mediation of relationships among activity system components.

Workplace issues can be found also from facilities management. Based on analysis of scientific articles in the branch of facilities management Salonen et al. (2005) indicate that workplace issues are the interesting topics besides technical aspects of facilities management. This field of study seems to have a normative approach as a common way to write scientific



papers about facilities management, which as a scientific discipline seems to be maturing. The challenge pointed out was to link practice and research more tightly - articles should be related to the prior body of knowledge and previous research. For this purpose Pullen (2005) defines Evidence-Based Facility Management (EBFM) as the process of systematically finding, appraising and using contemporaneous research findings as the basis for FM decisions. There is a need for range and mixture of methods, holistic view and the linkage with practice. However some more theoretical considerations about workplace research are needed.

## **WORKPLACE RESEARCH SPACE**

Anttila (1999) presents the model of a prism to illustrate the research space to which the different approaches of the workplace research can be connected. On one hand, workplace is for human being as an individual person and, on the other hand, workplace is a pattern of society as well as for the smaller groups. Besides this it is both a technological product and cultural artefact. It also has significance in the natural environment as well as a part of business and economy. The research space includes altogether six dimensions: human, social, cultural, technical, economical and natural environment. In the prism model the workplace as a studied object can be set into the prism and allocate it to different positions. It offers a framework for holistic understanding.

The workplace as a research object can be placed in the middle of the pattern and in order to understand the perspective the focus can be positioned. It can primarily be a target ecologically or it can be a cultural target or an economic target. The workplace and the control of the technique to produce and maintain it is an as relevant approach as the workplace in real estate business and asset management.

### **Workplace for individuals and organisations**

In the workplace research the psychological or human aspects are important. Human behaviour in space or spatial memory can be approached from the personality of the human being and from the psyche (Horelli, 1982). Cognitions, spatial patterns and perceptions of workplace and environment can be approached from cognitive physiology and nerve functions, neurophysiology. For example Küller (1991) used the SMB-scale – semantic environmental scale to describe the perceived environment systematically.

Ergonomics, work psychology and wellbeing themes arise from health and welfare and biology in workplace, for example the requirements of environment, the balance between rest and work, the challenges of mobile work (Vartiainen et al. 2005). Environmental aesthetics and arts belong to aesthetic experience and experiencing the world and art expression and architecture.

Workplace is important for different actors within an organisation. The user of the workplace is daily experiencing the results of workplace management and has a major role in this respect. On the other hand, workplace is a value adding object for the real estate owner. The service provider maintaining the workplace and supporting the organisation's core business has again a different approach to the workplace. So far the roles, tasks and work processes around workplace and its management differ both, between various actors and different organisational levels. The research around Usability of Workplaces approaches this issue (2005) by pointing out: "Current, predominant ways of thinking are not effective in arriving at usable solutions for work environments because problem definitions and evaluation of outcomes are not made from the perspective of users, but rather dictated by the structure and thinking of the professions that deliver the solutions" (Granath and Alexander, 2006).

Social psychology pays attention to the workplace as a part of society indicating that e.g. workplace can send a strong message about a high status or a stable position in society Eräsaari (1997) and Paalumäki (2004). It presents also brand of the company (Viitanen, 2004). The Workplace is also interesting from the perspective of communication sciences – including the internal and external communication. The number of organizations for which the workplace is a strategic tool is increasing. In order to succeed in strategic workplace management it has to be based on both hard data and soft data – however the latter is difficult to quantify. However corporate goals are increasingly tied to workplace and there is still inadequate consideration of workplace resources. In the context of workplace, there is a need to make rational decisions about resource allocation, because rapid technological change requires an inclusive approach to planning. The challenge for strategic workplace management is to integrate systems, which requires planning and coordination – as exemplified by the principle of bits, bricks and interaction (Früchter, 2005).

## **Workplace in culture and economy**

The culture environment connects the workplace research, among others, to history, cultural history, art history, architecture, ethnography, anthropology and applied aesthetics. Even theatre science has been used in design of workplaces: E.g. it is used in the theories of experience economy where the Workplace is seen as a stage for work (Pine and Gilmore, 1999). Nevertheless social anthropology, anthropology and psychological anthropology are touching the workplace as a continuity of human development in civilization. Workplace design has been an interest of researchers like Becker and Steele (1995) Penn et al. (1997) and Duffy (1997), who describes this development towards tomorrow's office by using club, den, hive, cell metaphors.

The workplace research in economic environment is connected with the following research focus: national economy, asset management and investments. In business economics the ways to organise workplace, its ownership, leasing, service concept etc. are a matter of research interest. On the other hand, the life cycle of the building is a matter of economic perspective too. From the perspective of marketing research around workplace, it is dealing with brands in real estate sector as well as it is part of human resource management and recruitment. This area includes also a whole series of researches around facilities services and facilities service management.

Workplace as a part of the natural environment is a research interest for urban planning. The environmental issues and the significance of corporate social responsibility are also important scopes. Environmental responsibility has already been the interest for long time (Turkulainen et al. 2006) but social and economical responsibility needs still more attention, both practical and scientific.

## **Workplace in technology and natural environment**

The technological and production environment connects the workplace research to the following viewpoints: technique and technologies of especially different technical methods in construction and maintenance. One example of such research is Productive office by Seppänen (2005). In the construction phase of the workplace, production economy is interesting. The basic research around chemistry and physics guide the product development in building technology while computer sciences deal with virtual work environments and its various applications connected both to ways to work and to tools to work.

Workplace as a managed unity is evidently more than only tangible square meters and rent based on the amount of square meters. It is as well more than an end product of building technology. It inherently has many possibilities to serve as a resource for the organisation. In order to manage this resource a thorough understanding of workplace and its management is needed. The knowledge about human and organisational behaviour – user and customer knowledge – has to be linked more closely with knowledge about the building and technological management.

The gap between building and behavioural management is even more obvious now, when the ICT development provides many new possibilities for organising work, which have an instant effect on the management of workplaces (Ellis et al., 1991; Pekkola, 2002). The increasing knowledge about information systems, workflow management and computer supported collaborative work has to be linked to the wider workplace management concept. One attempt can be seen in Harrison's (2002) definition of workplace design parameters, which include consideration of degrees of privacy and relations between physical and virtual spaces.

### **Summary**

The workplace still is an interesting research target and a demanding subject of investigation. An overview is given in Table 1 indicating the variety of disciplines and research areas around it.

Besides this variety of research disciplines the challenge lies in the present and future of Workplace Management. The information and communication technological revolution is changing both the ways to work and the places and spaces to work. Every discipline is facing these new research challenges. Individual needs for work and workplace are changing. The role of work and workplaces in society are transforming, e.g. from the perspective of work life-balance. Instead of offering workplaces, the interest is in providing workplace experiences. The work takes place in physical and virtual environment and the significance of mental and social environment increases. The understanding of these three elements of work environment have been the driver in the multidisciplinary research case which is presented in following chapter.

Table 1. Summary of disciplines for workplace research.

<b>DISCIPLINE</b>	<b>Research areas</b>
Individual	Individual behaviour at the workplace Cognitions and schemes Usability of workplaces Environmental psychology – psychological field, affordance etc. Ecopsychology
Social	Social behaviour in workplace Workplace and social capital Workplace in society
Technological	Building techniques and functionality Intelligent buildings Product development Materials ICT
Nature environmental	Environmental issues / Sustainability Urban planning Corporate social responsibility
Cultural	Spatial structures Architecture Usability History of culture
Economical	Brand building by workplace image Asset management – investments Life cycle Service management Experience economy Brand

## **NATURE OF THE WORKPLACE FOR KNOWLEDGE CREATION – A CASE STUDY**

The doctoral dissertation ‘The nature of the workplace for knowledge creation’ (Nenonen, 2005) aimed to understand the nature of workplaces for knowledge creation, which can take place in the physical, social and virtual environment. The understanding of the connections between the learning process and the workplace is essential in identifying, which elements in workplaces support the organisational and individual learning. Due to the intangible characteristics of the knowledge creation process, the research concentrated on finding out the quality and characteristics of the workplace for knowledge creation – concentrating more on the soft, emotional perceptions than the hard, tangible components.

In the research a systematic way to gather information of individual perceptions of the workplace in the context of knowledge creation was developed: what kind of workplace might or might not support knowledge creation and learning. The empirical data, combined with a multidisciplinary approach in the theoretical sources, finally lead to a classification and descriptions of the nature of workplaces for knowledge creation. This classification serves as

a analytical framework of different workplaces. The practical implementation of this research was to develop a way to analyse and describe the nature of the workplace for knowledge creation. This piece of research work presents typically multidisciplinary challenges in three levels:

- The theoretical framework included many perspectives – and at the same time many paradigms.
- The methodological approach is based on the case study method utilizing different research methods and enabling triangulation.
- The results of the study are the outcome of an iterative cyclic process.

Table 2 indicates the variety of theoretical paradigms used in the framework. The significant factor in this variety is to indicate the most important similarities and differences in paradigms and explain how they do or do not effect on the research. The second important issue is to articulate a relevant and logic way for choosing the criteria for the literature presenting different theoretical approaches.

The research approach and methodological decisions are important. This research was explorative. The concepts and theories were developed during the enquiry directed by proposition. Hermeneutical research refers to methods that aim understanding the phenomenon. Thus, the findings cannot be generalized as such to all various circumstances and environments. The hermeneutic approach, although in most cases based on qualitative data, also allows for more freedom in the choice of methods (Gummesson, 1991). This research also had elements of a case study approach. The case study itself is a research strategy, which focuses on understanding the dynamics present within single settings (Eisenhardt, 1989). Yin (1994) defines a case study as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and the context are not clearly evident. It is a method, which uses versatile data gathered in several different ways. The case study approach is useful whenever good background information is required. As an intensive method it makes it possible to find out essential factors, processes and relationships, on which other methods can focus afterwards. (Yin, 1994.)

Table 2. The multidisciplinary challenges in the Nature of the Workplace for Knowledge Creation (Nenonen, 2005).

<b>Part of research</b>	<b>Discipline</b>	<b>Research area, method and outcomes</b>	<b>Challenge</b>
Theoretical framework	Individual	Individual perceptions of work environment	Paradigm of psychology
	Social	Social work processes	Paradigm of sociology
	Technological	Virtual work environment	Paradigm of technology
	Cultural	Workplace design	Paradigm of architecture and design
	Economical	Knowledge creation, knowledge management Organisational behaviour Learning organisation	Paradigm of business sciences and organisational sciences
<b>Methodology</b>	Literature review	Knowledge management Organisational behaviour in space Individual behaviour in space Workplace design Sociology of work	Setting criteria for chosen literature
	Type analysis	Individual perceptions	
	Observations	Objective perceptions	
	Interviews	Additions, clarifications and comments in iterative process	Triangulation Reliability and validity
<b>Results</b>	Classification	Physical centres Virtual centres Social centres	Theoretical, but combining the centres and places in between the centres (boarder zones)
		Physical boarder zones Virtual boarder zones Social boarder zones	- Based on knowledge management and workplace design and social behaviour
	Design proposal	In order to support tacit knowledge, the attention has to be in social, informal open areas, which support both individual and social identity  In order to support explicit knowledge the attention has to be in private, formal, structural and task supportive areas, which support individual and social concentration.	Practical in all levels (virtual, social and physical)  - Based on workplace design

In this research, the case studies in different workplace solutions have been conducted and different data collection methods (type analysis survey, observations and interviews) have been used. This research aimed to describe and classify workplaces in the context of knowledge creation in order to generate classification schemes. The results were presented in

classification of workplaces and design proposal. Table 2 indicated the challenges in results: they aimed to be both theoretical and practical and in the end they were indicating mostly workplace design and knowledge management perspectives. This outcome presents the danger of ending up to monodisciplinarity – the variety of approaches is hard to keep along during the iterative research process in a logically sustainable way.

## CONCLUSIONS

It is essential to understand in workplace research that most disciplines are basically based on mono-disciplinary advancements. The evaluation is also mostly based on mono-disciplinary criteria. The current research example covers some challenges of multidisciplinary research in general. Innovation in multidisciplinary research has to be in focus as well as what can be learned from the research processes. Often there are points made about the need for nonpositivistic criteria for multidisciplinary research. To achieve more analysis of multidisciplinary research is needed.

Reflecting on current research and challenges we can see that there are two different logics in research traditions, but only one logic for research criteria. This lack of criteria we conclude is not addressed to a large extent, if at all. An increased focus on the criteria is needed. This is important as the changes in working life and world around, including workplace are so turbulent that the research has to be adaptive. The developments and discussion presented above challenges the traditional role of positivistic science. There is a need of choosing logic for multidisciplinary in theoretical framework, methodology and criteria for relevant research – this does however not diminish the need for methodologies for more traditional positivistic approaches.

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