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WORLD-WIDE WORK STRESS: MULTI-CASE STUDY OF THE STRESS-COPING PROCESS IN DISTRIBUTED WORK

Niina Nurmi

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<p>Abstract</p> <p>The changing world of work is increasing demands on workers through greater need for flexibility in global collaboration. Many organizations utilize distributed teams in which a group of people with a common purpose carry out interdependent tasks across locations and time, using technology to communicate more than face-to-face meetings. Prior literature on distributed teams shows that distributed work creates several challenges for team members' well-being, but our knowledge about the unique stressors that arise from these new work settings is limited and calls for further investigation.</p> <p>This multiple-case study uses a qualitative research approach to study context-specific job stressors that contribute to employees' psychological strain, and the coping mechanisms employees use to alleviate that strain. Ninety-seven team leaders and members from ten distributed real-life work teams were interviewed. The semi-structured interview data was analyzed qualitatively on team and individual levels.</p> <p>Results reveal the unique stressors and coping mechanisms of distributed work and model their relations to psychological strain. Geographic distance, electronic dependence and cultural diversity hinder the information flow and task coordination in distributed teams, creating stress-evoking ambiguity and uncertainty for team members. Not only these job stressors but also some of the strategies used to cope with them contribute to overload and strain. In particular, certain team-level coping strategies, such as frequent traveling to face-to-face meetings, prolonged work hours due to synchronous computer-mediated communication, and email overload create secondary sources of work overload when people use them continuously to manage uncertainty and ambiguity in distributed collaboration. To cope with the team-level coping strategies, team members rely heavily on individual coping resources, because spatial and temporal distance hinder the mobilization of social resources related to emotional, instrumental and informational social support.</p> <p>This dissertation suggests that the team-level coping strategies that are effective in managing certain job demands may, however, create other stressors and overload for individuals. Experienced workers, who have good self-management skills, may succeed in coping with these secondary sources of strain by prioritizing and setting clear limits for workload. Less experienced workers may feel more overloaded and need more social support from their leaders and teammates. As a practical implication, this dissertation suggests that the self-management skills in coping, employees' efforts in setting clear limits and prioritizing tasks should be better supported by organizations.</p>			
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<p>Kansainvälistyminen on lisännyt työelämän haasteita ja vaatimuksia työntekijöille. Monissa organisaatioissa kansainvälistä yhteistyötä tehdään tiimeissä, jotka työskentelevät yhteisen päämäärän eteen hajautuneina moneen paikkaan ja viestien keskenään pääasiallisesti tieto- ja kommunikaatioteknologisin välinein. Hajautetuista tiimeistä tehty aiempi tutkimus osoittaa, että hajautettu työ luo tiiminjäsenille uusia hyvinvointihaasteita. Tutkimustieto hajautetun työn stressitekijöistä on silti vielä puutteellista.</p> <p>Tässä väitöskirjatyössä olen käyttänyt laadullista tapaustutkimusmenetelmää selvittääkseni hajautetun työn kontekstispesifejä kuormitustekijöitä ja coping keinoja, joita työntekijät käyttävät psyykkisen kuormittuneisuuden vähentämiseksi. Teemahaastatteluaineisto kerättiin kymmenen tosielämän työtiimin jäseniltä ja vetäjiltä. Yhteensä haastateltiin 94 henkilöä. Haastatteluaineisto analysoitiin sekä tiimi- että yksilötasolla.</p> <p>Analyysin tulokset paljastivat hajautetulle työlle ominaiset kuormitustekijät ja niiden lievittämiseksi käytetyt coping keinot. Maantieteellinen hajautuneisuus, sähköisesti välittynyt viestintä ja kulttuurierot heikentävät tiedonkulkua ja tehtävien koordinoitua hajautetuissa tiimeissä luoden epäselvyyttä tiimityöhön ja aiheuttaen stressaavaa epävarmuutta tiimin jäsenille. Nämä kuormitustekijät sekä osa niiden säätelyyn tarkoitetuista coping keinoista lisäävät psyykkistä kuormittuneisuuden tunnetta työssä. Erityisesti tietyt epävarmuuden vähentämiseksi käytettävät tiimitason coping keinot, kuten jatkuva matkustaminen kokouksiin, työpäivien ulkopuolella järjestettävät virtuaalitapaamiset sekä sähköpostitulva lisäävät entisestään yksilöiden työkuormaa. Selviytyäkseen tästä tiimitason coping keinojen aiheuttamasta lisäkuormituksesta tiimin jäsenet joutuvat turvautumaan yksilöllisiin coping keinoihin ja resurssiin, koska maantieteellinen ja ajallinen etäisyys ehkäisee sosiaalisten resurssien, erityisesti sosiaalisen tuen hyödyntämistä tiimityössä.</p> <p>Tämän tutkimuksen perusteella voidaan todeta, että tiimitason coping keinot ovat tehokkaita tiettyjen työn vaatimusten säätelyssä, mutta ne voivat aiheuttaa uusia kuormituksen lähteitä yksilöille. Kokeneet työntekijät, joilla on hyvät itsensä johtamisen taidot, voivat selviytyä näistä uusista "toisen asteen" kuormitustekijöistä priorisoimalla työtehtäviä ja asettamalla selkeät rajat työmäärälle. Novisiitit, joilla on vähemmän työkokemusta ja oman työn johtamisen taitoja, voivat tuntea enemmän psyykkistä kuormitusta ja kaivata enemmän sosiaalista tukea työyhteisön jäseniltä. Organisaatioiden tulisi tukea työntekijöitä omien rajojensa asettamisessa ja puolustamisessa sekä työtehtävien priorisoinnissa, koska nämä itsensä johtamisen taidot edistävät hyvinvointia hajautetussa työssä.</p>			
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I am heartily thankful to my advisor, Associate Professor Pamela Hinds, for inviting me to Stanford University for the last two years of my graduate studies to write my dissertation and to work with her. She is the best advisor I could imagine. She commented manuscript after another offering constructive insight and concrete development ideas. Her academic enthusiasm and encouraging guidance inspire me to pursue ambitious academic goals. If I will ever work as a leader and/or instruct anybody else's work, I will try to follow Pamela's example.

It should also be recognized that my colleagues in vmWork Research Unit have significantly contributed to this thesis by collecting, transcribing, and analyzing research data, writing papers with me, and commenting the drafts of my solo papers. Working with them in several research projects over the years has been a great pleasure. I am also grateful to my insightful and meticulous pre-examiners, Professor José Maria Peiró and Professor Gunn Johansson for their help in the finishing touch. I thank Sarah Weaver for helping me with the grammar and tone of my writing.

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List of Publications

The dissertation consists of an overall summary and the following original publications:

1. Kokko, N. & Vartiainen, M (2007). Hajautetun työskentelyn kuormitustekijät. (Job stressors in distributed work) *Työ ja ihminen*, 21, 142–159.
2. Nurmi, N. (2010). Work stressors related to geographic distance and electronic dependence in virtual teams, *International Journal of Business and Systems Research*, 4, 311-329
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4. Nurmi, N. (2009). Unique stressors in cross-cultural collaboration through ICTs in virtual teams. In Proceedings of HCI International 2009, San Diego, CA, July 2009, LNCS Digital Library (<http://www.springer.com/computer/>)
5. Nurmi, N. (2010). Coping with coping strategies: How distributed teams and their members deal with the stress of distance, time zones and culture. *Stress and Health*, Early View, DOI: 10.1002/smi.1327.

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1. Introduction

Julia (not her real name) is in her 30s and works for a global software company. She is highly educated, well paid and manages impressive global software development projects collaborating with talented people all over the world. However, Julia is also surrounded by exacting superiors and works 70+ hours per week to meet her goals. After business hours, she continues working at home, emailing and attending to webconferences with global collaborators. She is unmarried, suffers from work-related stress-induced illnesses, does not see much daylight, and has grown apart from her boyfriend. After a sleepless night, she walks to the HR department to tell them that she needs a long vacation to recover from her fatigue. She wants to use her 500 flexhours, which she has earned during the past four months. She has suddenly realized that she has been giving everything to the corporation that, in turn, has taken everything.

Although undetected at the time, Julia was suffering from burnout. I saw it time and again with colleagues in the software industry before I changed jobs and started research work at Helsinki University of Technology. In fact, people like Julia gave me the reason to start studying the job demands of global work, which threaten workers' experienced quality of life. I wanted to learn how people manage the stress of globally distributed work.

The changing world of work is increasing demands on workers through a greater need for flexibility in global collaboration. Many organizations utilize distributed teams in which a group of people with a common purpose carry out interdependent tasks across locations and time, using technology to communicate more than face-to-face meetings (adapted from Lipnack & Stamps, 1997; Maznevski & Chudoba, 2000). Advanced information communication technology (ICT) makes it possible for employees to be “at work” virtually any time, anywhere. Although the technology certainly has a number of positive effects for organizations, including enhanced productivity, cost savings, and use of remote expertise, less attention has been given to its possible negative impacts on individuals' lives.

Work without spatial and temporal boundaries can trigger several challenges to employees' well-being, e.g., susceptibility to workaholism characterized by excessive and compulsive working, presenteeism (i.e., working when sick), insufficient recovery, and burnout. There seems to be an on-going challenge to set clear boundaries between work and leisure, and to regulate work hours, and being reachable. Availability is one of the potential impacts of using mobile technologies.

Field studies indicate that distributed team members face different challenges and job demands from their counterparts in traditional, collocated teams (Kiesler & Cummings, 2001). Lack of proximity, face-to-face communication and spontaneous interaction complicate collaboration in distributed teams (e.g. Hinds & Kiesler, 2001). In addition, distant partners may be unavailable for simultaneous communication across time zones (Armstrong & Cole, 2001; Espinosa, Cummings, Wilson & Pearce, 2003). Misunderstandings may occur because of cultural and language differences (Carcia & Canado, 2005) and because of the difficulty of communicating nuances when using less rich communication media. Distance from co-workers triggers such dysfunctional emotional and cognitive reactions as feelings of isolation and role ambiguity, as well as such behavioral reactions as absenteeism and social loafing (Hertel, Geister, & Konradt, 2005, Jarvenpaa & Leidner, 1998). Evidently, distributed work creates several challenges for well-being, but our knowledge about the unique stressors that arise from these new work settings is limited and calls for further investigation (Cooper, Dewe & O'Driscoll, 2001). **This study aims at identifying those particular stressors that contribute to employees' psychological strain, and the coping mechanisms employees use to alleviate that strain in distributed work.**

Information about the context-specific work stressors of distributed work and their buffers such as individual and social resources is potentially valuable to global organizations as they attempt to reduce work-related stress. Reducing the psychosocial risks in organizations is not only a moral, but also legal imperative. Work stress is one of the biggest health and safety problems in the EU (European Agency for Safety and Health at Work, 2002). Stress not only has a deteriorating impact on those affected and their families but is also very costly to organizations. Between 50 and 60 percent of absenteeism has been tied to work-related stress. Together with other related health costs, the annual bill for job stress in the EU is an

estimated 20 billion EUR, a figure that does not count productivity losses. Job stress costs U.S. industries nearly \$300 billion a year in absenteeism, employee turnover, diminished productivity, and medical, legal and insurance fees, according to the American Institute of Stress. However, the impact of mismanaged stress must also be viewed in terms of costs associated with poor performance and productivity, increased accidents at work, high labor turnover, forced early retirement, ill health, job dissatisfaction, and unhappiness (Sutherland & Cooper, 2002). But what price do employees of global organizations and their families pay for job demands that exceed their resources for coping?

As distributed work arrangements are becoming more and more prevalent in global organizations, it is important to identify those properties of distributed work that make it potentially harmful or threatening for people and require new coping efforts in addition to task-related coping. The number of U.S. employees who worked remotely at least one day per month increased 39% in two years from approximately 12.4 million in 2006 to 17.2 million in 2008 (Grantham & Ware, 2009). Gareis and colleagues (2006) estimated that every third worker in the EU is involved in distributed teamwork. Global teams offer a new field of study to the research of stress and coping due to the new contextual demands of geographical distance, electronic dependence, and cultural diversity. Richter's and his colleagues' (2006) empirical study indicates that certain contextual demands of distributed work, such as dynamic work environments and network organizations, may increase team members' distress. Yet, whether distributed workers are a highly stressed group is not known.

The purpose of this dissertation is to gain better understanding of the stress-coping process in distributed work. The five studies presented in the appendices are designed to shed light on the main constructs of stress the coping process (stressors, strain, and coping) and their relations in this new work context.

Objectives, research strategy and research questions

The main objective of this dissertation is to model the stress-coping process in distributed work, including the unique stressors and consequent coping and their relations to psychological strain. Much of the prior research on work stress has focused on examining the sources and outcomes of psychological strain and the

coping strategies (the moderators of stressor-strain relationship) that might be used by individuals and organizations to confront strain and its associated problems (Cooper et al. 2001). Similarly, I started this dissertation by identifying, describing and categorizing the new context-specific stressors of distributed work and the coping mechanisms that individuals use to deal with the stressors (studies 1 - 4). Identifying the critical categories involved in the stress-coping process was needed for studying the *process* itself in the study 5. In this final study, I headed towards building a model of a dynamic stress-coping process in distributed work by following the transactional framework (Lazarus & Folkman, 1984). According to the transactional approach, stress is embedded in an ongoing process that involves individuals transacting with their environments, making appraisals of stressful encounters and attempting to cope with these encounters (Lazarus, 1991).

Investigating stress as a transaction in a new work context requires adopting research methods that enable identifying new constructs and recognizing the dynamic nature of the stress-coping process. A majority of the traditional stress-coping studies have several methodological limitations (for reviews Cohen, 1987; Latack & Havlovic, 1992; Dewe, Cox & Ferguson, 1993; O'Driscoll & Cooper, 1994), and they catch only *a priori* assumptions about the constructs instead of examining the unique thoughts and actions of those undergoing the stressful experience. The deductive research tradition, which has been dominant in the research field of stress, has merely used cross-sectional designs using self-report questionnaires to assess stressors, strains and coping mechanisms (Spicer, 1997). This kind of approach does not capture the unforeseen categories in the stress-coping process or the dynamics of the relationships between these categories. In this dissertation, I applied inductive, qualitative methods (Miles & Huberman, 1984) with the objective of capturing the subtlety of the stress-coping process and its unique constructs in geographically distributed work settings. Inductive case study makes no assumptions about how people might respond in specific situations and is therefore more likely to produce new insights about the stress-coping process in the specific context of distributed work.

Another reason why I chose the qualitative multiple case study method is that it allowed me to produce accumulative in-depth knowledge of the stress-coping process in a modern work context (Yin, 2009). When entering research on new forms of work

procedures, existing structured methods and instruments, e.g., questionnaires, structured interviews, and rating scales, are not satisfactory. Even those instruments, which have been designed for use in a multitude of occupational areas, do not serve their purpose well. They will certainly detect stressors that have been recognized in previous research on work processes, but they will miss those new types of job demands and stressor elements that I aimed at identifying in this dissertation. Therefore, I applied inductive qualitative methods to in this explorative study.

The research was guided by three key questions:

RQ1 What are the context-specific job stressors related to distance, cultural diversity, and electronic dependence in geographically distributed teams?

RQ2 How do distributed team members cope with these job stressors?

RQ3 How does this coping process affect their psychological strain?

2. The potential of distributed work to cause stress

The studies investigating stress in heterogeneous and real-life organizational teams, and in geographically distributed teams in particular, are recent and have received limited empirical attention. There are many *beliefs* concerning stress effects and their sources in distributed teams, but very little is known based on empirical research. Such dysfunctions as feelings of isolation, low individual commitment, increased chances of misunderstandings, conflict escalation, role ambiguity, goal conflicts due to commitments to different work-units, absenteeism, and social loafing have been suggested (but not empirically shown) to be exacerbated in distributed work context (Jarvenpaa & Leidner, 1998; Hertel, Geister, & Konradt, 2005).

Various characteristics of distributed work environments (e.g., the use of mediated interaction and asynchronous communication) are likely to add complexities to work that contribute to its stressfulness (Vartiainen, 2006). By comparing the characteristics of collocated and distributed work, Richter and colleagues (2006) found that work in distributed teams has more enriched job characteristics, such as amount of organizational tasks, learning requirements, and level of participation than in

collocated jobs. In their data, these enriched job characteristics were associated with increased symptoms of job stress.

It has been suggested that distributed workers' mental load is influenced by the multiple contextual demands and boundaries of distributed teams: 1) geographical distance, 2) time differences, 3) electronic dependence in communication, 4) cultural diversity, and 5) mobility (Vartiainen, 2006). Next, I will discuss these contextual job demands in terms of their potential to affect distributed team members' psychological strain.

Geographic distance. One of the central aspects of distributed teams is the physical dispersion of some or all of the team members. Separation of team members increases coordination challenges, role ambiguity and goal conflicts, communication problems, process delays, and differences in feedback cycles (Carmel, 1999). Distant team members are less familiar with each other (Hinds & Bailey, 2003) and suffer from psychological effects such as feelings of isolation and loneliness (Macik-Frey, 2006) that may lead to adverse health and well-being outcomes over extended periods of time. Behavioral reactions such as absenteeism and social loafing are also observed among distributed team members (Hertel et al. 2005; Jarvenpaa & Leidner, 1998).

Time differences. Globally distributed collaborators are often separated by time due to differences in working hours, time zones, and/or working cycles. Global teams can leverage time to their advantage by crossing time zones and being productive over more than one work period. When team members are scattered from east to west, they can collectively work around the clock and increase speed and flexibility in response to market demands. But respectively, time differences reduce the time available for synchronous interaction (Espinosa, Cummings, Wilson & Pearce, 2003; Espinosa & Carmel, 2004). Positioning global team members across different time zones makes synchronous communication and events like conference calls difficult to schedule. Synchronous team communication requires someone to attend meetings outside their normal workday. Their only alternative to working synchronously is to extend the workday or travel for face-to-face meetings (O'Leary & Cummings, 2007).

Electronic dependence. When distributed team members are physically distant, technology is required as a mediator in their communication (Axtell, Fleck & Turner 2004). Teams with greater geographic distance between the members clearly find it more difficult to meet face-to-face than less distant or collocated team members. Electronic dependence causes special challenges as people endeavor to complete a joint task, such as misunderstandings and conflict escalation (Mortensen & Hinds, 2001; Armstrong & Cole, 2002); reduced informal or spontaneous communication and social cohesion (Kiesler & Cummings, 2002); difficulties in establishing mutual knowledge (Cramton, 2001); reduced interaction and shared understanding of the task context (Malhotra, Majchrzak, Carman & Lott, 2001); and lower levels of collective knowledge (Griffith, Sawyer & Neale, 2003). Sosa and colleagues (2002) found that as distance increases, email usage increases. Technology-mediated communication has been noted to create harmful well-being effects at work. For example, email has a tendency to create additional work and lengthen workdays (Barley, Meyerson & Grodal, 2008). Prior research shows that longer working hours contribute to emotional and physiological symptoms of strain and have a marked effect on family life (e.g. Cooper, Davidson & Robinson, 1982; Sparks, Cooper, Fried & Shirom, 1997; Mann, 1965).

Cultural diversity. Ways of thinking, feeling, and behaving vary between cultures, making collaboration and communication more difficult in distributed teams (e.g. Jarvenpaa & Leidner, 1999; Mortensen & Hinds 2001; Gibbs, 2007; Carmel, 1999; Orlikowski, 2002; Watson-Manheim, Chudoba & Crowston, 2002). Global team members usually need to bridge language differences within the team, which can be an impediment for global collaboration, particularly when there is ambiguity and lack of visual channels in the task (Olson & Olson, 2000). However, diverse backgrounds and mindsets can lead to superior innovation performance, if distributed team invest in rich internal communication, e.g. define goals well, develop work plans, prioritize and coordinate work (Ancona & Caldwell, 1992).

Mobility and business traveling. Mobility is an essential part of marketing, technical support, and other functions and has become the dominant aspect of jobs in global organizations. Business travelers have been found to file medical claims at a rate three times greater than non-travelers (Liese, Mundt, Dell, Nagy & Demure, 1997). Fisher

and Cooper (1990) suggest that workers who travel suffer from distress because of the frequent changes in location and daily routine to which they must adjust. On the other hand, Lilischkis and Meyer (2003) found out that overall work satisfaction is slightly higher among mobile workers than among non-mobile workers. They note that mobility may be just one feature of an interesting job that leads to higher satisfaction. The fact is that mobile workers are more often self-employed or employed professionals and managers than manual workers. In a survey study by Borg and Kristensen (1999), the main stressors of traveling salespeople were long working hours, many customers, non-day work and high perceived psychological demands in general. Borg and Kristensen did not find any association between poor mental health and factors such as the number of working hours away from the firm, nights away from home, and a low degree of perceived support from colleagues and superiors.

Along with the abovementioned contextual demands, some of the traditional stressors, such as qualitative and quantitative work overload, responsibility for people, interpersonal relationships and conflicts, non-existent career development, and deficient physical environments (e.g. Brief, Schuler & Van Sell, 1981; Cooper & Marshall, 1976; Ivancevich & Matteson, 1980) are probably also present in distributed work settings, but they may have distinct manifestations in distributed work. Yet, no empirical study has tested the effects of these demands. Overall, our knowledge about the unique stressors that arise from working in distributed settings is very limited (Cooper et al., 2001).

On this account, the starting point of this dissertation was to identify the psychological and social factors of work that are potential contributors to the psychological strain of distributed team members. Finally, I investigated how distributed team members cope with these stressors, and how this stress-coping process affects to psychological strain.

3. Metatheory, key constructs, and theoretical model

This dissertation goes beyond the traditional focus on just the individual stress experience by embedding it within a social context of distributed teams. Because the emphasis is on the distributed work, I focus more on situational aspects (e.g. workload demands, social support) than on individual variables such as personality (e.g. Type

A) and physical health (e.g. cardiovascular disease), which have commonly been the focus of prior research on stress. Moreover, this research applies a transactional, process- and meaning-centered approach to stress (Lazarus & Folkman, 1984) in the distributed work context. In the research tradition that has been dominant, antecedent variables of psychological strain, including environmental conditions and personal characteristics, are treated as separate and static causes of strain. Using the transactional approach, this study aims at investigating the dynamic stress-coping process, i.e., the actual stressful transactions that take place between workers and distributed work environment, coping, and changes in stress.

Metatheory: Transactional approach to stress

Two metatheoretical principles, transaction and process, underlie the approach I am advocating in this dissertation. *Transaction* means that in a particular encounter, the person influences the environment and vice-versa. Stress is seen as the overall transactional process between the individual and the environment, including the individual's perceptions, expectations, interpretations, and coping responses. Since we usually attempt to change that which is undesirable or distressing, stress implies a process rather than a statistic arrangement (Lazarus, 1995). Transaction between the person and the environment is stressful only when it is appraised and evaluated by the person as harm, threat or challenge to his or her well-being. First, the person appraises whether or not there is any personal stake in the encounter (primary appraisal), and then he or she evaluates the available coping options for dealing with the harm, threat, or challenge (secondary appraisal). Coping influences whether or not psychological strain will result. Because cognitive appraisal rests on the individual's subjective interpretation of a transaction, it is phenomenological.

Phenomenological tradition in psychology refers to the subjective experiences of study subjects—individuals' private ways of thinking that have no necessary relationship with objective reality. I base my research on this ontological perspective, focusing on analyzing the thoughts and behaviors of people and their interpretation of actions in the social context. Hence, inductive research methods suite this dissertation better than deductive methods, which have been dominant in the stress research.

Process means that the psychological state changes over time and across diverse encounters. People differ in their sensitivity and vulnerability to certain types of events and encounters, as well as their interpretations and reactions. Thus, qualitative observations of what the person actually thinks or does in a stressful situation within a specific context of distributed work are the focus of this dissertation. Coping actions are always directed toward particular conditions. Coping with strain is thus a dynamic process in which a person must rely more heavily on different forms of coping at different times and under different circumstances.

Key constructs: work stress, job demands, stressors, strain, and coping

Wide discrepancies exist in the way stress is defined and operationalized in the stress literature. For example, the concept of stress has variously been defined as both an independent and a dependent variable (Cox, 1985) and as a process (Lazarus 1990). In this dissertation, I follow the definition of the transaction approach, which focuses on the cognitive, evaluative, and motivational processes that intervene between the stressful stimulus and reaction (Le Blanc, de Jonge & Schaufeli, 2000).

Work stress

Work stress results from the process of appraising events or demands at work as harmful, threatening or challenging, then assessing potential coping responses, and applying coping strategies to manage the demands (Lazarus & Folkman, 1984). As Lazarus (1990) has illustrated, no one variable can be said to be “stress” as they are all part of the transaction process. In other words, stress is the overall transactional process.

Following the transactional model of the stress process and the terminology suggested by Cooper and colleagues (2001), I adopt the following conceptualizations in this dissertation:

- *Stress*: the overall transactional process
- *Job demands*: the events or properties of events (stimuli) that are encountered by individuals
- *Stressors*: unmanageable job demands

- *Strain*: the individual's psychological, physical, and behavioral responses to stressors
- *Coping*: any cognitive or behavioral effort the individual uses to master, reduce or tolerate the internal or external stressors to avoid strain.

Job demands

Job demands refer to those physical, psychological, social, or organizational aspects of a job that require sustained physical and/or psychological (cognitive and emotional) effort and are therefore associated with certain physiological and/or psychological costs (Bakker, Demerouti & Verbeke 2004). Job demands consist of both quantitative demands, such as workload, and qualitative demands, such as task difficulty and poor environmental conditions. (Hambrick, Finkelstein & Mooney, 2005; Janssen, 2001; Karasek, 1979). Job demands related to this dissertation include work overload (Bakker, 2008; Bakker & Geurts, 2004; Demerouti et al., 2001; Schaufeli & Bakker, 2004), working hours (Peters & Van der Lippe, 2007), commuting time (ibid.), physical and emotional demands (cf. Bakker & Geurts, 2004; Schaufeli & Bakker, 2004) and work-home interference (cf. Bakker & Geurts, 2004).

The effects of job demands on individuals are well documented (for reviews, see Kahn & Byosiere, 1992; Sonnentag & Frese, 2003). For example, when experiencing a high degree of job demands, an individual's mental load increases and she or he may react with fatigue symptoms, including disturbed mood and impaired cognitive functioning (Jones & Fletcher, 1996; Meijman & Mulder, 1998; Repetti, 1993; Zohar, 1999). However, mental load does not necessarily have to lead to fatigue or strain. This happens only when the individual has no or insufficient possibilities for adequate coping (Meijman & Mulder, 1998). Therefore, the discrepancies between job demands and the resources available to the individual may be the genesis of strain (Kahn & Quin, 1970).

Not all job demands provoke strain in all individuals, nor will the same demands always provoke a similar response in the same individual. Much of the impact of a stressor depends on an individual's perceptions. Job demands may also lead to balance of the cognitive-emotional-environmental system, depending on the available coping resources (Demerouti et al., 2001). Therefore, I prefer to use the term

“stressor” only when an external factor has the potential to exert a negative influence on most people in most situations.

Stressors

Stressors, i.e. the unmanageable demands, are harmful and can lead to strain (Kahn & Byosiere, 1992). Earlier studies have identified several categories of work stressors (e.g. Brief, Schuler & Van Sell, 1981; Ivanchevich & Matteson, 1980). Intraorganizational work stressors most commonly represented in stress literature can be grouped into six categories:

- (1) *Physical environment stressors*, such as light, noise, temperature, vibration, chemical or toxic substances, polluted air, poor ergonomic conditions at the work place, and accidents. (e.g. Seeber & Iregren, 1992)
- (2) *Job characteristics stressors*, such as high time pressure, requirement to concentrate, high task complexity, monotonous work, dangerous work, and disruptions (e.g. Le Blanc, de Jonge & Schaufeli (2000)
- (3) *Role stressors*, such as role overload, role conflict and role ambiguity (e.g. Katz & Kahn, 1978)
- (4) *Work schedule-related stressors*, such as night- and shift work, long working hours and overtime (e.g. Sparks, Cooper, Fried, & Shirom, 1997)
- (5) *Social stressors*, such as intra- and intergroup conflict, lack of group cohesiveness, inadequate social support from leader and co-workers, (sexual) harassment and mobbing/bullying (e.g. Zapf, Knorz, & Kulla, 1996b)
- (6) *Employment stressors*, such as poor career prospects, flexible labor contract and job insecurity (e.g. Le Blanc, de Jonge & Schaufeli (2000)

Numerous stressors’ ability to produce stress responses in many individuals has been demonstrated successfully (see reviews by Jackson and Schuler, 1985; and Tubbs and Collins, 2000). Additionally, some studies on time pressure, requirement to concentrate, and interpersonal conflicts have found moderate or strong relationships with strain (e.g., Frese, 1985; Frone, 2000; Greiner, Ragland, Krause, Syme & Fisher, 1997; Spector & Jex, 1998).

As globalization and advanced ICT have produced an acceleration of working life changes worldwide, it appears that we may need to rethink the sorts of stressful job

conditions and job-related stressors we have been studying as well as undertake research to ascertain the impact of strain on employee well-being in the modern workplace. Toppinen and Kalimo (1995) found that the use of ICT changes the demands of work and the antecedents of well-being. Information technology makes the work more abstract and conceptual, increasing its cognitive requirements. Information overload, qualitative and quantitative work overload, low control on time pressure, and difficulties in detachment from work during non-work time increase computer professionals' psychological strain. Moreover, frequent technological changes create constant learning requirements at work, which may add strain (Kivistö & Kalimo, 2002).

Strain

Strain is the individual's psychological, physical, behavioral and motivational response to stressors. Examples of psychological strains are anxiety, frustration, tension, anger, and depressed mood. Physical reactions include headache, nausea and psychosomatic disorders such as gastric-intestinal disorders and coronary diseases (Kalimo, 1987). Strain can show in behavioral reactions such as hyperactivity, increased consumption of stimulants (caffeine, alcohol, tobacco), over- and under-eating, aggressive behavior, social isolation, withdrawal, declined productivity, turnover, increased sick leave, tardiness, and poor time management. Motivational symptoms of strain include loss of enthusiasm, loss of work motivation, disappointment, boredom, demoralization, loss of interest in others (e.g. Jex, 1998; Hakanen, 2002; Maslach, Schaufeli & Leiter 2001; Le Blanc, de Jonge & Schaufeli, 2000; Maslach & Leiter 1997).

Strains differ in their intensity. Only if the individual interprets the environmental stimulus to be threatening or harmful will it cause him or her strain. Sometimes, the strain can easily be overcome by recreation and relaxation. When stressors are absent, the psycho-physiological systems return to baseline levels. During recovery, the individual returns to the pre-stressor homeostasis and his or her physiological and psychological systems are restored. Typically, this process takes place in the after-work period, usually the evening. (Sonnetag & Zijlstra, 2006) However, in the case of prolonged exposure to stressors, the individual may not be able to recover completely before the next workday, and high activation levels are sustained. This can

increase chronic physical problems, for example coronary heart disease (Ganster, Fox & Dwyer, 2001; Kivimäki, Leino-Arjas, Luukkonen, Riihimäki, Vahtera, & Kirjonen, 2002), and/or psychological strain complaints such as fatigue, as well as disturbances of mood (Meijman & Mulder 1998) and burnout (Maslach, Schaufeli, & Leiter, 2001).

Coping

An individual adopts coping strategies with the intention of reducing the effects of stress like strain. Lazarus's and Folkman's (1984) transactional theory posits that when an individual appraises a situation as stressful (primary appraisal) and/or concludes that his or her resources are inadequate for coping with the situation (secondary appraisal), strain arises.

Individual coping resources affect the success of the coping process (Moos & Billings, 1982; Frankenhaeuser, 1986). To say that a person is resourceful means that he or she has many resources and/or is clever in finding ways of using the resources to counter demands (Lazarus & Folkman, 1984). Besides their individual coping resources, people use environmental and organizational resources (Burke, 1993; Eby, Adams, Russell & Gaby, 2000) as well as social support to cope with strain (House, 1981; Folkman & Lazarus, 1985). Social support includes emotional, informational, and instrumental support provided by others, e.g. superiors, colleagues, friends, and family. Research indicates that social support is positively associated with psychological adjustment (e.g. Baruch, Barnett & Rivers, 1983; Viswesvaran, Sanchez & Fisher, 1999). Moreover, good social relations at work have been shown to promote well-being (Feldt, 1997; Kalimo & Vuori, 1991; Karasek & Theorell, 1990). Workers with high levels of social support have been found to experience less negative stress symptoms (Amatea & Fong, 1991). In the context of distributed work, employees are at risk of feeling isolated and lonely (Macik-Frey, 2006; Zakaria, Amelinckx & Wilemon 2004) and possessing fewer social coping resources than their collocated counterparts, because distance diminishes their opportunities to give and receive social support.

As coping is a dynamic process, people change their coping strategies as the status of the person-environment relation changes. During the coping process, people

reappraise their coping efforts, evaluate the outcomes and decide whether further coping efforts are needed (Cooper et al., 2001). Depending on the available coping resources and the appropriateness of the used coping strategy, the coping process may lead to balance of the cognitive-emotional-environmental system (Demerouti et al., 2001). On the other hand, emotional, cognitive and behavioral efforts associated with the coping process (Cooper et al., 2001; Lazarus & Folkman, 1984) may also result in strains such as fatigue and exhaustion and may decrease work performance because they reduce energy that could be used to perform tasks (Cohen, 1980). How people cope with inappropriate coping strategies is not known.

Applying Job Demands—Resources (JD-R) model

The Job Demands—Resources (JD-R) model (Demerouti et al. 2001), the further development of Karasek's Job Demands-Control model, is a cognitive-motivational-relational theorization of the process view of stress. The studies 1 - 4 of this dissertation were built on the JD-R model. Demerouti and colleagues (2001) used the JD-R model initially to explain burn-out and to describe two central processes: 1) the exhaustion process; and 2) the motivation process. In the exhaustion process, job demands continuously use up energy reserves, which, in the long run, leads to exhaustion. Demands become stressors when time to recover is insufficient. Particularly in that case, too much effort leads to exhaustion (Demerouti et al., 2001).

In the motivation process, a lack of job resources leads to mental distance towards work (Demerouti et al., 2001: 502). Job resources refer to those physical, psychological, social or organizational aspects of work that are useful with regard to: (1) achievement of work-related goals; (2) the reduction of demands and associated costs; or (3) the enhancement of personal development. When job resources are not sufficient, goals cannot be realized, negative demands are not compensated for, and personal growth is not stimulated. (Demerouti et al., 2001: 501) As a consequence, workers may experience failure and frustration. To cope with this, workers develop a detached attitude towards work.

Recent studies of the JD-R model suggest that job resources may buffer the impact of job demands on job strain (Bakker & Demerouti, 2007; Bakker, Demerouti & Euwema, 2005). This assumption is consistent with the Demand-Control Model

(Karasek, 1979, 1998), but expands this model by claiming that several different job resources can play the role of buffer for several different job demands. Which job demands and resources play a role in a certain organization depends upon the specific job characteristics that prevail. Compared with Karasek's Demand-Control Model, the JD-R model is more dynamic since the most important job demand (or resource) may vary according to the work situation (Hakanen, Bakker & Schaufeli, 2006), and it is also more practical and useful in improving working conditions, because it is possible to take into account the specific features and complex reality of work done in distributed work settings.

Although the JD-R model is used in studies of telework (Pascale, 2009; Manssour, 2003), it has never been applied to distributed teams. Telework, unlike distributed teams, does not presuppose teamwork toward a common goal. Thus, telework research might not fully inform us about the potentially stress-provoking special group-level dynamics of distributed teamwork. The unique features of geographic dispersion may create new—still unidentified—demands with which distributed workers must cope.

In studies 1 - 4, I used JD-R as a framework for identifying the context-specific demands and stressors that have an impact on person-environment transactions in distributed work. This was an important stage for my later attempt to identify the coping resources associated with the specific stressors in distributed work settings in study 5. Thus, I disagree with Lazarus (1995) when he suggests that it is *not* that useful to try to identify stressors or conditions of work, which adversely affect most workers, because stress is ultimately an individual phenomenon. While I agree that stress essentially occurs at the individual level, I still believe that it is useful to try to identify modern stressors, which are likely to produce adverse health consequences for most distributed workers who are exposed to them. Knowing these health hazards would help distributed teams and their members to develop coping resources to manage stress better in global organizations.

4. Methods

In this dissertation I applied inductive, qualitative methods with the objective of capturing the subtlety of the stress-coping process in geographically distributed work

settings. The inductive approach was appropriate for my intentions in investigating yet-unidentified sources of strain in distributed work, and how people cope with them. The existing research literature on stress has mostly ignored this topic. Little is known about what individuals actually think and do when they attempt to cope with the strain of distance or how they experience different context-specific demands and coping strategies in distributed work.

There are three reasons for the lack of research knowledge on these issues: *First*, virtual collaboration is a relatively new way of working, with which employees are still learning to cope in global organizations. To my knowledge, no research has been done on the stress-coping process in distributed work before the studies presented in this dissertation.

The second reason is methodological. Work stressor and strain constructs have been developed and empirically tested primarily in collocated work environments. Their portability to distributed work has rarely been tested (Richter et al., 2006). The existing widely used stress evaluation questionnaires have been constructed with collocated work in mind and therefore often have implicit assumptions (e.g. about proximity) that do not hold true for distributed organizations. Using these scales for distributed workers may be problematic as there is a risk that the items of the scales will not show the real causes of felt stress and the actual state of distributed workers' well-being, because their indicators do not measure the substantial context-specific job demands and stressors.

Finally, a majority of the existing measures for studying coping strategies have several limitations (for reviews Cohen, 1987; Latack & Havlovic, 1992; Dewe et al., 1993; O'Driscoll & Cooper, 1994), and they catch only *a priori* assumptions about the used coping strategies instead of examining what people experience while coping. The critique of the deductive approach in stress-coping research asks how the coping responses identified through literature can actually reflect the experiences and responses of the research subjects (Dewe, 2000). The inductive approach makes no assumptions about how individuals might respond in specific situations and is therefore more likely to produce valid knowledge of the stress-coping process in a specific context.

Study design

I used multiple case study design to create theoretical constructs and a midrange theory (not a grand theory) from case-based, empirical evidence (Eisenhardt, 1989). Building theory from case studies is a research strategy that involves using multiple cases to create theoretical constructs and propositions from case-based empirical evidence (Eisenhardt, 1989). In the studies, I treated multiple single cases (three cases in Study 1, seven in Studies 2 and 4, four cases in Study 3, and ten in Study 5) as a series of experiments, each case serving to confirm or disconfirm the inferences drawn from the others (Yin, 2009).

The case study method allows the investigator to retain the holistic and meaningful characteristics of real-life events (Yin, 2009). This method gives priority to the perspective of those being studied, rather than to the prior hypotheses of a researcher. The strength of case research rests on its power of producing accumulative in-depth knowledge of the phenomenon in context. After all, I am interested in how the contextual complexity affects the stress-coping process in distributed work.

I followed a methodological roadmap that included qualitative methods (Miles & Huberman, 1984) and the design of multi-case study research (Eisenhardt, 1989; Yin, 2009). The roadmap included the following six steps: (1) Getting started (initial study design and literature review); (2) Selecting cases; (3) Crafting semi-structured interview protocol; (4) Entering the field; (5) Analyzing data; and (6) Drawing conclusions.

Selecting cases

I selected ten geographically distributed teams from seven corporations in the electronics, telecommunications, software, consultancy, pulp and paper, and banking industries. The headquarters of all the companies were in Helsinki, Finland. The selection of multiple corporations in six different industries allowed me to control environmental variation.

The criteria for the team selection was that the members or subsets of the teams worked in a dispersed manner, that is, they were located in different towns or countries, and communicated mainly via information and communication

technologies. The teams were selected to create a spectrum from small to large global distribution.

Prior to the data collection, I reviewed information about the companies from published sources and conducted pilot interviews in each company, which provided preliminary insights into the tasks, organization and work processes of the focal teams. The pilot informants were CEOs, HR Directors and other directors of the companies, who provided the access to the focal teams. I used the findings from these interviews to create an initial understanding of the contexts of the cases.

Case descriptions

The teams I studied were in many ways different from each other. Before giving more information about these teams, it is important first to point out that I use pseudonyms for them here. The description of the focal teams is presented in Table 1 and in the following paragraphs.

Case 1: GlobEle was a global research and development (R&D) project in a Telecommunications company. The project started in the beginning of 2002 and ended in 2005. The project team involved 29 engineers from three countries, Japan, Finland, and the United States. GlobEle was a mix of five different ethnic backgrounds. The Iranian project leader was located in Helsinki with one Finnish team member. Team members working in Tokyo were Japanese. Two team members working in Dallas were Chinese and others were American. Both of the Chinese employees were women and the other group members were men. The time difference between the sub teams in Tokyo and Dallas was 14 hours. Consequently, these sites did not share any overlapping working hours. The group members' tasks were interdependent, but they found it hard to collaborate due to the big time differences. The project leader acted as a central source of communication and information flow. The commonly used communication tools were: email, mobile phone, web-conferencing, videoconferencing, and documentation by using MS-office package. There was also the possibility of using other tools such as LotusNotes but they were never really used. Most of the team members had not worked together previously, so they had no common understanding or shared knowledge about relevant work processes, organizational norms, or even technical language. The leader coordinated

meetings and resources and also guided the technology development. No kick-off meeting was organized to start the project; people had joined the team one by one during the first year of the project. After one and a half years, the first team-building session was organized. That was the first time when all the team members gathered members to open up and talk freely. The second team-building was organized a year

Table 1 Description of the Ten Teams Studied

	Teams	Team member locations	Time difference between sites	Team size	Cultural backgrounds	Communication medium and face-to-face (FtF) meetings	Used in the studies
HIGH DISTANCE	GlobEle Product development team Industry: Telecommunications	Dallas, Tx, USA Helsinki, Finland Tokyo, Japan	14 hours	29 persons 3 sub teams	American Chinese Finnish Japanese Iranian	FtF meeting twice a year e-mail video conference web conference teleconference telephone text messages	1 2 3 4 5
	GlobPro IT team Industry: Electronics	Tucson, Az, USA Boulder, Co, USA Boston, Ma, USA Vantaa, Finland	9 hours	19 persons 4 sub teams	American Finnish	FtF meeting once a year e-mail telephone video conference document sharing system discussion forum chat	2 4 5
MODERATE DISTANCE	GlobSoft Customer Project Delivery team Industry: Software	Boston, Ma, USA Brussels, Belgium Stockholm, Sweden Helsinki, Finland	7 hours	36 persons	American Finnish Belgian Swedish	FtF meeting twice a year teleconference telephone e-mail document sharing system discussion forum text messages	2 3 4 5
	GlobTele Product development team Industry: Telecommunications	Boston, Ma, USA Helsinki, Finland	7 hours	4 persons	American Finnish Indian	FtF meeting twice a year e-mail telephone teleconference web conference	2 4 5
	GlobTech Product development team Industry: Telecommunications	Copenhagen, Denmark Helsinki, Finland Salo, Finland Tampere, Finland Tokyo, Japan	7 hours	7 persons	Danish Finnish Japanese	FtF meeting twice a year e-mail text messages telephone teleconference web conference	1 2 3 4 5
	GlobGate Global change project Industry: Electronics	Espoo, Finland Salo, Finland Pecs, Hungary Hong Kong, China Dongguang, China Tallin, Estonia	5 hours	12 persons	Finnish Hungarian Chinese Estonian	FtF meeting twice a year e-mail teleconference	2 4 5
SHORT DISTANCE	ScanSoft Product development team Industry: Software	Helsinki, Finland Jyväskylä, Finland Stockholm, Sweden Oslo, Norway	1 hour	9 persons	Finnish Swedish Norwegian	FtF meeting every two months e-mail telephone video conference	3 5
	EuroOff Offering Team Industry: Consultancy	Amsterdam, Netherlands Helsinki, Finland	1 hour	6 persons	Dutch Finnish	Monthly FtF meeting e-mail telephone teleconference text messages	4 5
	FinPaper Factory construction project team Industry: Pulp and paper	Kotka, Finland Savonlinna, Finland Vantaa, Finland Pietarsaari, Finland	0 hour	106 persons Sub teams at 3 different companies	Finnish	Monthly / Weekly FtF meeting telephone email document sharing system mail fax text messages	2 5
	FinBank Customer service team Industry: Banking	Helsinki, Finland Kuopio, Finland Oulu, Finland Tampere, Finland	0 hour	11 persons 3 sub teams	Finnish	Monthly FtF meeting telephone email	1 2 5

after the first one. The purpose of this meeting was to get to know each other better personally and to strengthen the team spirit. Despite the team-building efforts, cultural differences and long distance created tension between the team members.

Case 2: GlobPro IT team included 19 members in four sub-teams, which were located in Vantaa, Finland and three cities in the USA, Boston, Boulder and Tucson. Time difference between the headquarters in Finland and US offices was nine hours. Consequently, the team members did not have common working time with each other. Long spatial and temporal distance between the leaders and team members caused coordination problems in task delivery. Team members tended to prioritize local tasks over the GlobPro tasks. Motivating and communicating via email was ineffective. A web-based collaboration tool called Quickplace facilitated better task-related communication and sharing and filing project documentation. Awareness of local conditions and culture was low between the headquarters and the remote offices. Finnish and American employees had different attitudes towards management behavior and how to communicate with managers. Human Resources professionals tried to enhance cultural awareness in the organization by cultural training and discussion on different leadership styles. Team members visited the other team sites for shorter and longer periods. Exchange programs of two to three weeks were especially said to increase cultural understanding and decrease misunderstandings between the distributed team members.

Case 3: GlobSoft team was formed for the purpose of a specific project. Thirty-six team members from five different national offices (Finland, Sweden, England, Belgium, USA) participated in the project. The delivery phase of the project took four months, and maintenance continued for two years. The project was led initially from Finland and later on from Sweden and the United States. The technical staff worked in a dispersed manner in Helsinki and Boston. An outsourced help desk team worked in Brussels, Belgium, and was lead remotely from Finland by a Belgian leader. Cultural differences were noticed between Finns, Swedes, Americans and Belgians, but they were not always dealt with constructive manner. In the fast-paced working culture in the Helsinki headquarters, there was no room for the democratic needs for discussion of the Swedes or the greater needs for guidance of the Americans. With the help of common operational and delivery processes, a satisfactory level of cooperation

between the different countries was nevertheless achieved. In project management across national borders, the custom of daily reporting ensured staying on schedule. In difficult situations, trust in employees working far away sometimes decreased, and the amount of control was increased. People in offices outside Helsinki felt isolated and were afraid of being left in the dark as far as dissemination of information was concerned. Indeed, this fear was not always ill-founded, as communicating and anticipating issues were sometimes forgotten due to rushing, and people only remembered to provide information about certain issues when asked to do so. The flood of e-mails during the project was enormous. Telephone was rarely used for internal communication. Employees working in the Nordic countries met each other bi-monthly, but employees from the United States flew to Finland only once a year. Meetings between the national offices were most often handled via teleconferencing. An effective and straightforward operating culture supported teleconferences, which required clear structures. The meetings proceeded according to the agendas, and decisions were recorded in a version control system, where everyone could see them. Version control system was considered the most reliable means of information sharing. Shared operational regulations encouraged employees to always work based on the material available in the version control system. This helped to avoid working according to out-of-date information or in an overlapping manner. The time difference between Helsinki and Boston was seven hours. Intercontinental teleconferences took place either very early in the morning or in the evening. The employees were, however, used to being very flexible about such working time arrangements.

Case 4: GlobTele was a six month-long R&D project of the same global telecommunications company as GlobEle. Two Finnish and one Indian team members were located in Helsinki headquarters and one isolated American member worked in Boston, Massachusetts, USA. All team members were men. During the six month project the whole team met face-to-face only once in a two-day, intensive kick-off meeting. Other times they collaborated daily via email and telephone and weekly in combined tele- and webconference. At the busy end of the project, the Finnish team members collaborated daily face-to-face at the headquarters and emailed the daily deliverables in the evenings to Boston, where the work was continued. Due to seven hours' time difference, the audio/video meetings were usually organized after normal business hours. The interviewees said that even for people who knew each other and

had worked together before, a real-time audio/video connection was insufficient to support the same quality of work as that done face-to-face. The project didn't have a nominated leader or other roles in the beginning, but the team roles took shape along with the project's six months life span according to the members' personal strengths and competences. One member took the leadership and coordinated tasks during the project.

Case 5: GlobTech was a permanent team of the same global telecommunications company than GlobEle and GlobTele. GlobTech offered technology platform development and consultancy for internal R&D projects. An isolated Danish group leader was located in Copenhagen. Five Finnish team members were distributed in three cities in Finland: two in Helsinki, two in Salo and one in Tampere. One isolated Japanese sub team leader was located in Tokyo, Japan. All but one of the GlobTech members were men. The only female team member felt somewhat lonely among the men and missed her female friends with whom she used to work before moving to the Helsinki site from Tampere. The common language of the group (i.e. *lingua franca*) was English, which each team member spoke as his or her second language. To coordinate the daily activities, the members communicated using telephone, email, tele- and webconferencing tools. The whole GlobTech group gathered together for a team-building session once a year, but the leader tried to organize a face-to-face meeting with each member bi-monthly. The team had scheduled a regular monthly webconference, which everybody attended. The purpose was to go through the monthly reporting and inform other team members about topical issues. Team members rated the monthly webconferences high in quality with good use of time and wide participation. The meetings were most successful when they were formal in structure. The time difference between Finland and Japan is seven hours, and usually the meetings were organized so that the Finns and the Dane attended the meeting early in the morning and the Japanese late in the afternoon. Japanese working days were usually two hours longer than Finnish, and that provided the group with three overlapping working hours. GlobTech members were all experts in their own technical areas and did not consult each other in detailed technical issues. Thus, they depended on personal networks in finding answers to specialty area questions.

Case 6: GlobGate was a process development project of a global electronics company. In the global development project, the intention was to standardize and rationalize the functions of all the different factories of the company around the world. The needs of key customers were also mentioned among the reasons for this exceptionally extensive internal development project. The core team of the planning phase of the development project consisted of 12-15 individuals, depending on the situation. Half of the team members worked in the Helsinki headquarters in Finland, and the other half in Estonia, Hungary, and China. Despite the great distances, the core team met quite regularly face-to-face. Still, the main means of communication and cooperation were e-mail, the telephone, and teleconferencing. As the project progressed, especially the Finnish and some of the European members of the group worked more and more at the headquarters, away from their regular workplaces. The GlobGate development project was organized to be driven by the headquarters, but the core team also included representatives from the factories. Three out of twelve factories that were thought to be willing to test the new operating model were represented. At the time of the study, the project had progressed to the ending stages of the planning phase and had taken a little over a year.

Case 7: ScanSoft was a permanent, long-term team of a Nordic software company. The team worked as product management team analyzing international markets. A Swedish leader managed the team from Stockholm, Sweden. Three Finnish members and a Finnish sub team leader worked in the Helsinki headquarters. An isolated Finnish member was located in Jyväskylä, Finland, and a Norwegian isolated team member in Oslo, Norway. Geographic distance between the members in Sweden, Norway and Finland was relatively short. Time difference was one hour. The team members had traveled monthly to face-to-face meetings for two years before they tried video conferencing. This happened a few months before the time of my data collection. Their aim was to cut travel costs by developing virtual collaboration practices. Despite the fact that the video conferencing tool the team used was extremely clumsy and limited, people preferred attending the videoconferences from their offices rather than traveling to the face-to-face meetings in the headquarters. When given a choice, they chose to forego the time and stress of travel in favor of the somewhat altered but successful participation remotely with the videoconference technology.

Case 8: GlobOff was a sales support team of six people distributed in two European countries, Finland and the Netherlands. Four Finnish team members were located in the Helsinki headquarters and two Dutch members in Amsterdam. The team task was to create material to support new sales and to build a knowledge management system to enhance knowledge sharing and creation. The members of the team were selected based on their strong expertise on the subject area. They were very interdependent on each other in task completion. Geographic distance between Finland and Netherlands was relatively short with the time difference of one hour. The team members traveled to face-to-face meetings monthly and used email, telephone, text messages, and teleconferences for virtual communication.

Case 9: FinPaper was a factory construction project of three partnering organizations in the pulp and paper industry. The project team involved 106 persons in four Finnish cities: Savonlinna, Kotka, Varkaus, and Pietarsaari. The purpose of the project was to build a modern paper factory to Pietarsaari, where the top management of the project was located. Project organization was divided into several sub projects, which carried out different parts of development, construction and acquisition. I interviewed the project management of each organization and nine team members of inter-organizational pipe system design team. Geographic distance between the Finnish cities was relatively short. The members of organizational sub teams traveled to face-to-face meetings weekly by car to discuss large technical drawings of the pipe system. Telephone, email, text messages, fax, mail and two incompatible document-sharing systems were used in different organizations. The interdependence between the three organizational partners was relatively high. Due to different organizational contexts, different work and geographic environments, different technologies, and different cultures, team members had difficulties establishing shared understanding of tasks. Even though the team was ethnically homogeneous, organization-specific cultures and expectations acted as significant sources of misunderstandings and conflicts. Moreover, when team members' understanding of the issues differed, conflicts were difficult to resolve and the sub teams started to exhibit more competitive behavior. Conflicts and competitive behavior contributed to lower trust, and when trust was missing, team members were even more likely to question others' intentions and draw false conclusion from others' actions.

Case 10: FinBank was a permanent, long-term financial counseling team of a Finnish financing company. FinBank's task was to counsel small- and middle-sized Finnish companies, analyze, and help improve their finances. Team members, twelve financial and legal experts, were distributed in four geographical regions of Finland to serve their regional customers. The team leader and three members were located in Oulu, Northern Finland, two members in Kuopio, Eastern Finland, two members in Helsinki headquarters, Southern Finland, and four members in Tampere, Western Finland. FinBank team was ethnically homogeneous - all group members were Finns. Four members were women and eight were men. Each FinBank team member had his or her own customers and responsibility areas. Every member was highly educated, had strong expertise and knowledge on the field and long experience in the business. Interdependence between the team members was moderate. Mostly they worked independently in their own expertise areas, but in challenging customer cases, they leaned through sub team or pair collaboration. Frequent face-to-face meetings, email, and telephone were the media of team communication.

Crafting semi-structured interview protocol

Before entering the field, I designed a semi-structured interview protocol for data collection with my colleagues in Helsinki University of Technology's vmWork Research Unit. The protocol ensured that certain questions were asked of all participants but also allowed the flexibility to follow leads that emerged during data collection by adding new questions to the interviews. The interview themes included questions about the job demands of distributed work, spatial, temporal and cultural boundaries of team members, computer mediated communication (CMC), individual and social job resources, coping mechanisms, team dynamics, stress and well-being (Table 2).

Table 2. Interview protocol

Semi-structured interview protocol
<ol style="list-style-type: none">1. Describe your work and role in the team, and the roles of your distant collaborators.2. What are the goals of your team? How did you create and maintain the shared understanding of the goals?3. What communication tools do you use and prefer in different situations in this team?4. What kinds of demands and challenges do 1) geographic distribution, 2) working in different time zones, 3) the different backgrounds of team members, and 4) electronic communications create for your work, and the team collaboration?5. In what kind of situations have you felt stress, strain, frustration, or anxiety at work?6. How did you manage to cope with the demands? What happened after the coping attempts?7. What special competences are needed from a member to work well in this distributed team? What special competences are needed from a leader of this team?8. What are the most important managerial practices in your team? What is difficult in virtual leadership? Have you had any problems? How did you cope with that?9. How have you created we-spirit in your team? And how do you maintain it?10. Does trust matter in dispersed teamwork? Why? Could you share an example of how you started to trust a distant team member? What happens if people do not trust each other?11. Describe a conflict that you have experienced in this team? How did you solve the conflict?12. Are there best practices or important issues that you have learned about distributed work in this team? What would you do differently in the future in distributed teams?

Entering the field

After gaining approval from team management, three researchers¹ from the vmWork research unit contacted subjects and invited them to participate in interviews, with no obligation to participate. Seven out of 104 interviewees refused being interviewed. The abovementioned researchers interviewed 61 team members and 36 team leaders or sub team leaders individually face-to-face between March 2003 and July 2004 as a part of Helsinki University of Technology's larger program of research on virtual and mobile teamwork. The interviews were conducted in privacy, in most cases in a meeting room of the particular organization. The researchers traveled to Amsterdam, Dongguang, Espoo, Helsinki, Hong Kong, Kuopio, Oulu and Tampere to interview the participants. Seventy-four persons were interviewed in their native language, Finnish, and the rest who were not Finnish speakers were interviewed in English. Each in-depth interview lasted 1-2 hours and was taped and fully transcribed. This resulted in 2250 pages of single-spaced interview data.

¹ Niina Nurmi (64 interviews), Marko Hakonen (23 interviews), Satu Koivisto, (10 interviews)

The data-gathering combined controlled and flexible in-depth interviewing techniques: the interviewers collected the data by using the same semi-structured outline, adding clarifying questions when needed. By using semi-structured interview protocol, we did not ask every interviewee the exact same questions but allowed them the freedom to bring up all the important issues that they felt were relevant to the research.

Analyzing data

I analyzed each case in context after collecting the data from the members of the team. After the single case analysis, I performed comparative thematic analysis across the cases.

Single case studies

Each individual case study had its own “story” to tell. Analytic strategy was my guide to crafting these stories. The first step in this strategy was to describe the contextual demands of teamwork: Locations and time difference between the sites, cultural backgrounds of the members, and means of communication. After that, I described how each team collaborated across distance, what kinds of challenges they faced, and how they coped with these challenges. Interview data collected from the members of the teams were my source of information. I started analyzing the transcribed interviews by immersing myself in the data to gain an understanding of the meanings beyond individual interviews. Combining the interviews of members from different team sites allowed me to draft comprehensive descriptions of the collaboration in the teams, which were also enlightening to the teams themselves as well as for myself.

The second step in my analytic strategy was to test my interpretations by presenting the results and ideas to the informants, enabling them to review the analysis (Eisenhardt, 1989; Miles & Huberman, 1984; Ragin 1997; Mahoney & Goertz 2006). I presented PowerPoint case reports, which included descriptions about the team collaboration practices, challenges in collaboration across distance, time and culture, coping mechanisms, and best practices. The organizations also wanted me to present development ideas for their teamwork practices based on my case analysis.

From a methodological standpoint, this review process enhanced the accuracy of the case studies, hence increasing the construct validity of the studies. The likelihood of falsely reported events should be reduced. In addition, where no objective truth may exist—as when different interviewees had described their experiences of the same events from their own points of view—the procedure helped to identify the various perspectives, which could then be represented in the case reports and analyzed in the cross-case analysis. For example, comparing the answers of experts to novices across ten teams in the study 5, the cross-case analysis revealed different coping strategies between these different groups of interviewees.

The final step in my analytic strategy was to perform comparative thematic analyses across the cases.

Multi-case studies

I labeled the multiple cases of each individual study based on my single-case analysis. Some cases represented the phenomenon I intended to study better than others. For example, the Finnish cases were not viable when studying the cross-cultural collaboration in Study 4. After selecting cases for each thematic analysis, I read and reread the interview transcripts and wrote memos, which summarized my readings and captured my ideas and insights of the data. I used the memos for directing and focusing the data analysis further. Following up on ideas and questions that came up while I wrote them pushed my work forward. The memos provided a record of my thoughts, research ideas, and analytic process. On returning to them, I identified the next steps and, moreover, took my ideas to more abstract levels in the thematic analyses. The memos helped me to identify five different analysis paths or themes, which are presented in the reports of the Studies 1 - 5.

The single cases had shown that geographic distribution of team members caused several sources of psychological strain to the interviewees, e.g., distance from team members, electronic dependence, coordination and power problems, and cultural miscommunication. These became the themes of my further analysis in the comparative multi-case studies of this dissertation. I started analyzing the stressors in three case studies in Study 1 and expanded the analysis in Studies 2 and 4 with seven cases, and eventually in Study 5 with three more cases. Study 3 deepened my analysis

of one particular stressor, power and coordination problems in distributed teams. Finally, in Study 5, I focused my analysis on how the teams and their members coped with the stressors of distance, time zones, and culture.

I used the same inductive analysis method in all the five studies of this dissertation. The next paragraphs explain how I coded and analyzed the data using Atlas.ti content analysis software. This hermeneutic method allowed flexible non-hierarchical coding and was a useful tool for organizing large amounts of data and discerning relationships within the data. The analysis included three linked sub processes: *data reduction* (coding, teasing out themes), *data display* (making lists and tables of the emerging themes), and *drawing conclusions* (noting regularities and patterns) (Miles & Huberman, 1984).

Data reduction

In the data reduction phase, I coded the texts and extracted the passages incorporating expressions of stress or stress-related negative emotions (such as overload, anxiety, nervousness, frustration), and the passages related to job demands and coping for further analysis. Coding was an iterative process: new codes were added throughout the process, and then earlier transcripts were recoded to include these new codes. Consistent with the grounded theory coding technique (Charmatz, 2006), I coded the data in two main phases: *initial* and *focused coding*.

Initial coding. I coded “context units” (Krippendorff, 2004) of each transcription to identify common themes. Unitization was flexible in an attempt to capture naturally-occurring and meaningful thought units within the data, rather than imposing units of equal length (such as a word, line, or paragraph). Many of the thought units were the length of a paragraph as they coincided with a response, but they ranged from a line to several paragraphs. During initial coding, my goal was to immerse myself to the data and remain open to all possible theoretical directions indicated by the data (Charmatz, 2006). I created the initial codes by defining what I saw in the data (see a short list of the used codes in Table 3). I tried to use the most descriptive wording possible for my initial codes. Later, the initial codes that related to each other were grouped together with focused codes.

I started each study of this dissertation by going through the interviews again and evaluating my earlier interpretations. I created new initial codes focusing the themes of each study separately. For example, in Study 2, I concentrated mainly on those parts of the data where the interviewees were talking about the geographic distance and the dependence on electronic communication tools. My interviewees talked about situations in which their ability to access the needed information in time was limited due to distance and time differences. I coded these passages as “Difficulties in accessing distant collaborators” or “Difficulties in accessing the right contact person” depending on the situation. I also added codes “Geographical distance” or “Time differences” to describe the reason for the low access to information. When the interviewees reported feelings of strain when they were not able to reach other team members and ask for informational support in urgent situations, I used the codes “Feelings of strain” and “Waiting for an urgent response” or “Waiting for the answers till the next day” or “Unsure if the message is received (when waiting for reply).” Later, these codes among others were categorized under the focused code named “Access to information.”

In the coding process, the role of the researcher becomes important. The codes do not and cannot capture the empirical reality. Yet they are my view of the reality. The empirical world does not appear to everybody in some neutral state apart from human experience. Rather, each individual’s view of the world is biased. In this sense, no researcher is neutral or objective, but his or her earlier experiences affect the perceptions and interpretation of the events. Thus, I defined what I saw as significant in the data and presented pieces of the data to the readers in the study reports (Appendices 1 - 5) so that they could assess whether the data matched my interpretation or not. My challenge as a researcher was to be aware of my prior perspectives and how they affect the interpretation. Without this awareness, the coding process could have led me to prejudge what was happening. Instead, it was important to try to understand the informants’ situations before judging their expressions through my own assumptions (Charmatz, 2006).

Focused coding. When coding the text, I started to note reoccurring patterns and themes, which pulled together separate initial codes. By identifying a theme or pattern, I isolated something that was expressed a number of times, consistently in a

Table 3. A short list of the used codes, (CMC = computer mediated communication)

JOB DEMANDS	
Focused codes	Initial codes
Access to information	<ul style="list-style-type: none"> - Lack of coffee corner -discussions - Sharing tacit knowledge - Virtual communication is less rich than face-to-face communication - Hard to share and develop creative ideas - Hard to share pictures, ppt-slides in video conference - Leaving questions unanswered - Wondering why one is not answering - Difficulties in accessing distant collaborators - No access if needed (to shared calendar, collaboration tool, SMS) - Uncertainty of what is expected from you - Difficulties in finding right information - Difficulties in accessing right contact person - Information flow between the sites - Waiting for the answers till the next day - Waiting for an urgent response - Unsure if the message is received (when waiting for reply)
Lack of clarity in communication	<ul style="list-style-type: none"> - No nonverbal cues in CMC - Misunderstanding - Not knowing who is talking in teleconference - Contradicting email-conversations - Unclear emails - Different mindset of collaborators - Different communication styles of collaborators
Language barriers	<ul style="list-style-type: none"> - Difficulty in understanding foreign language in CMC - Difficulties in understanding different accents - Language barriers - English words have different meanings for diverse people
Frequent traveling is exhausting	<ul style="list-style-type: none"> - Traveling requires lots of time - Long working days (due to traveling) - Fully booked days (meetings etc.) - Work days start very early in the mornings - Work days end very late in the evenings - Driving long ways - No time for recovery - Traveling is a loss of time (prevents you doing "real tasks")
Business traveling interrupting life routines	<ul style="list-style-type: none"> - Work-family conflict - Nights away from home - Being away from home - Less leisure time - Cannot have regular hobbies - Traveling hinders social life - Office work pile up - Jet-lag - Being tired - Catching colds (because of tiredness)
Asynchronous working time with co-workers	<ul style="list-style-type: none"> - Communication requirements out of hours - Long working days (due to time differences) - Working later evenings or earlier mornings due to time difference - Working double shift - Has to be available 24/7 - Urgent phone calls in the night - Staying later at work if phone call is not expected/agreed beforehand - Flexibility in working hours - Virtual meetings after hours - Virtual meetings from home
JOB DEMANDS	
Focused codes	Initial codes
Email Overload	<ul style="list-style-type: none"> - Information overload - email-overload - e-mail communication is time consuming - Increased workload due to email communication - Piles of e-mail questions waiting in the morning in inbox - Reading e-mails takes a long time - Reading emails is exhausting - Writing formal e-mails takes a long time - email communication is cumbersome - Difficulties in prioritizing email traffic - emails after hours (spill over of work)

Table 3. A short list of the used codes (continued)

COPING RESOURCES AND STRATEGIES	
Focused codes	Initial codes
Self-management	<ul style="list-style-type: none"> - Structured way of managing information - Organized working style - Planning ahead - Scheduling work in advance - Using complementary CMC tools - If don't get answered, call! - First call then specify with email - Keeping oneself updated - Staying on top of things - Making independent decisions
Managing one's own well-being	<ul style="list-style-type: none"> - Managing workloads - Managing multiple project work - Preparing before virtual meetings - Limiting travel days per year - Limiting email communication - Reading only the most important messages - Limiting late night phone calls - Limiting weekend phone calls - Limiting work-related communication during holiday
Expertise	<ul style="list-style-type: none"> - Work experience - Expertise - Understanding the bigger picture - Finding the information - Knowing the right contact person

specific way, in the data. These themes established directions for further analysis. I started to synthesize and explain larger segments of the data by focused coding. I used the most significant and frequent initial codes to categorize the data. Through focused coding, I moved across interviews and compared people's experiences and interpretations. I conducted a separate focused coding in each individual study of this dissertation. Focused coding tested my preconceptions about the topics of the studies.

Data display

In the data display phase, I placed the coded passages in tables and monitored the internal cohesion of the codes. I drew within-case analysis of each case on its own terms in context and presented the results to the focal teams in face-to-face meetings as PowerPoint presentations. In these meetings, the informants reviewed and confirmed the analysis. The single case reports were written for two different purposes: The teams used them to identify the development areas of their distant collaboration, and I used them for research purposes. Both the teams and I came up with new ideas in the feedback workshops when the teams discussed about their results. I wrote those ideas into my memos after the meetings.

I used the similar format of displays in the within-case presentations to make the cross-case analysis easier. To compare the cases, I placed the contextual characteristics, job stressors, and job resources of all the focal teams into different

descriptive and explanatory matrixes (see examples of three different analysis matrixes in Tables 4, 5, and 6). I created different matrixes for the each individual study of this dissertation. The formats of the matrixes were driven by the research questions involved and by my developing concepts. Using the matrix displays, analysis occurred during the data entry, which was done by moving across each row or column. By the time the matrixes were filled in, I had the first sense of what the dynamics would be in the cases by noting the patterns and themes in the coded passages.

Table 4. Contextual characteristics and occurrence of job demands and job resources in the studied teams

	Distance		Moderate				Short			
	Long		GlobSoft	GlobTele	GlobTech	GlobGate	ScanSoft	EuroOff	FinPaper	FinBank
Contextual Characteristics of the teams										
N:o sites	3	4	4	2	5	6	4	2	4	4
Time difference between sites (hrs)	14	9	7	7	7	5	1	1	0	0
N:o cultural backgrounds	5	2	4	3	3	4	3	2	1	1
Job Stressors										
<i>Individual Level</i>										
email overload	X	X	X	X	X	X	X	X	X	X
Heavy workload	X	?	X	X	?	NO	NO	?	X	X
Working outside business hours	X	X	X	X	X	NO	NO	?	X	X
Low accessibility to information	X	X	X	X	X	X	X	X	X	X
Unattainable remote co-workers (waiting for answers)	X	?	X	X	X	?	?	?	?	X
Traveling to face-to-face meetings	X	?	NO	X	X	?	X	X	X	X
<i>Team Level</i>										
No overlapping working time	X	X	X	X	X	NO	NO	NO	NO	NO
Lean asynchronous CMC	X	X	X	X	X	NO	NO	NO	NO	NO
Inadequate information flow between the sites	X	X	X	X	X	X	X	NO	X	NO
Task coordination problems (power problems)	X	X	X	X	X	X	X	NO	NO	NO
Slow collaboration	X	X	X	X	NO	X	NO	NO	NO	NO
Delays in process deployment	X	X	X	NO	NO	X	NO	X	NO	NO
Job Resources										
<i>Individual Resources:</i>										
Flexibility	X	?	X	X	X	NO	NO	?	X	X
Motivation	X	X	X	X	X	NO	NO	?	X	X
Self-management skills	X	X	X	X	X	X	X	X	X	X
Expertise	X	X	X	X	X	?	X	X	X	X
CMC usage skills	X	X	X	X	X	?	X	?	NO	NO
<i>Team Resources:</i>										
Applying Following the sun -method	X	?	X	X	X	NO	NO	NO	NO	NO
Regular meeting practices	X	X	X	X	X	?	X	?	X	X
Advanced CMC tools (video / web conferencing)	X	X	X	X	X	NO	X	?	NO	NO

Table 5. Psychological job stressors caused by dispersed locations of teamwork and the relevant coping mechanisms

DISPERSED LOCATIONS	
Psychological job stressors	Coping mechanisms
Isolation	Tolerance of social isolation, self-management of work, location of workers, social support from the local organization, close group spirit
Need for independent work	Working experience, self-management of work and competence, decision-making ability and problem-solving skills
Amount of control by management	Tendency of leader to trust, reliability of members
Clarity of goals and roles	Frequency and quality of information and communication
Clarity of career development opportunities	Regular monitoring of results, supply of information, systems of personal development
Position in group	Meetings, social support from group and leader

Table 6. Costs and benefits of the coping strategies used to manage job demands in distributed work

Job Demands	Coping Efforts	Benefits (+) and costs (-)
Low visibility and awareness of local conditions	Traveling to face-to-face meetings	+ learning about local conditions of other team sites + sharing work-related information
Low accessibility to information		+ sharing personal information with team mates + establishing mutual knowledge
Lack of clarity in communication		+ creating trust - travel fatigue - overload and exhaustion
Low accessibility to information	Synchronous CMC	+ sharing work related information + sharing personal information with team mates + establishing mutual knowledge
Lack of clarity in communication		+ creating and maintaining trust - extending work hours - work overload
Low accessibility to information	Asynchronous CMC	+ sharing work related information + creating trust with quick responses - unclear and ambiguous communication - email overload

Drawing conclusions

In the phase where conclusions were drawn, the coded passages were re-contextualized and interpreted. I looked for patterns of within-case similarities and cross-case differences by comparing the categories of the context-specific job

demands and different coping resources used to manage them (Eisenhardt, 1989). I verified the conclusions by going back to the raw data and by gathering feedback from the informants.

I detected the relationships between context-specific job demands, job resources, and expressions of strain by scanning the matrix displays and the raw data. Glaser and Strauss (1967) and more recently Corbin and Strauss (2007) emphasize the continuous comparison of data and theory throughout the theory-building process. Unlike Yin (2009) recommends, I did not follow *a priori* set theoretical propositions, but let the theoretical categories of my analysis emerge solely from evidence. Hence, my analysis was not a linear process. Unexpected ideas emerged during the dissertation process. Parts of my analysis shifted when I looked at the codes from different perspectives. For example, some of the actions (frequent computer mediated communication and traveling to face-to-face meetings), which I had coded as job stressors in Studies 1 - 4, appeared as coping strategies in Study 5 when I switched my focus to study how people coped with the job demands. I noticed that when continuously used, these coping strategies created work overload and distress to the interviewees—which was the reason I had coded them as job stressors in the first place. The strength of grounded theory coding derived from this emergent coding process, in which events, interactions, and perspectives came into analytic purview that I had not thought of before.

5. Overview of the Results

In this section, I will describe and summarize the logic and key results of each of the five studies.

Study 1: Job stressors of distributed work

Comparative cross-case analysis of three teams aimed to investigate how distributed team members experience the challenges set by geographically dispersed collaboration, what stressors distributed working practices create, and what kind of coping methods are used (Research questions 1 and 2). Study 1 contributed to the research on Job Demands—Resources Model by revealing new virtual-specific job demands and coping resources related to six complexity factors of distributed work:

(1) location, (2) mobility, (3) time, (4) temporariness, (5) diversity, (6) electronic mode of interaction.

Several new work stressors were identified in all the six categories. Some of these six complexity factors contributed to strain by creating collaboration problems to the studied teams. For example, *dispersed locations*, *mobility*, *time zones*, and *electronic communication* lowered access to information and created problems in task coordination. Interviewed team members felt strain when they faced difficulties in reaching collaborators and accessing information due to travel, insufficient communication media, or time differences. Electronic communication without functioning rules also caused information overload. Coping with the strain was achieved by individual flexibility and willingness to work outside normal working hours.

Dispersed locations created social distance between the studied team members. Separation from colleagues and management created feelings of isolation and loneliness. Team members working far from immediate supervisors also experienced difficulties in prioritization of tasks and time management. Interviewees used their work experiences and job management skills to cope with the stress of isolation and independent work.

Cultural diversity was also a source of strain in the studied global teams. Differences in working styles, ways of thinking, and in attitudes toward work among culturally diverse team members were emphasized as job stressors. Broadmindedness, approval of diversity, and knowledge of different cultures helped cope with the demands of cross-cultural collaboration.

Some of the job stressors that emerged in the analysis were the same as those found in prior studies of collocated teams, such as clarity of goals and roles, clarity of career development opportunities, length of working days, work-life balance, workload, job permanence, information overload, number of urgent tasks, and social conflicts. However, these conventional job stressors were evident in distributed work environments in a manner that departed from the findings of previous research. For example, longer working days were not the result of the volume of work but instead

of travel and time differences between group members. A lack of clarity regarding roles and objectives was an already familiar job stressor (Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964; Rizzo, House & Lirtzman, 1970); the challenges entailed in coordination of distributed collaboration emphasized it further.

The small number of cases and interviews (N=23) limited the reliability of the reasoning and the validity of conclusions. Thus, more data was needed to deepen and broaden the findings through Studies 2 - 5.

Study 2: Job stressors related to geographic distance and electronic dependence

Study 2 deepens the analysis of Study 1 by adding more data (seven cases all together) to the cross-case analysis, and by focusing on the job stressors related to geographic distance and electronic communication in distributed teams (Research question 1).

Main stressors in the studied seven teams were *work overload*, *low accessibility to information*, and *task coordination problems*. Most often, spatial, and temporal distances were considered the sources of these stressors.

Work overload: Globally and domestically distributed teams faced somewhat different challenges in distributed work. All teams suffered from overload due to long working hours, but the work times extended for different reasons in global and national teams. While time differences were the main cause of prolonged work time in global teams, frequent traveling to face-to-face meetings added overload and weekly work hours in domestic teams.

Low accessibility to information added strain when the interviewees were not able to reach colleagues and ask for informational support. Without the needed information, team members were sometimes unable to continue working. People became frustrated when their e-mails were not replied to as quickly as anticipated, or if they did not reach distant collaborators about an urgent matter. Informational and instrumental social support was mainly accessible through communication technology. Time differences hindered this access, which interviewees described as stressful.

Coordinating across time zones added job demands in the global teams. Temporal distance between the team members created work delays and coordination problems. In order to gain some overlapping working hours, global team members had to prolong their daily working time. Usually, they ended up working long hours and compromising their personal time off work. This resulted in overload, work-leisure imbalance, and strain from which the team members did not adequately recover between work days.

Study 3: Coordination and power problems in distributed teams

Study 3 deepens the analysis of the Studies 1 and 2 regarding coordination and leadership problems, which had been found to add strain to remote leaders. Cross-case analysis of four teams revealed that geographic distance hindered remote leaders' power and achievement of task compliance by creating competing lines of authority and diminishing visibility and awareness of team conditions. Earlier studies demonstrate substantial evidence that lack of power in work (also constructed as lack of autonomy) is associated with job dissatisfaction and with psychosomatic symptoms (for a review, see Newton, 1989). Study 3 shows that distance diminishes leadership power in global teams, resulting in reduced ability to control task compliance and timing of activities. All the studied team leaders experienced difficulties in achieving task compliance from their distant team members, who were simultaneously attending local projects and influenced by local management. Consequently, there was a tension in competing lines of authority. Most distant leaders in the data complained about stressful power problems, "the battle" of proximate and distant management sharing the same human resources. They found themselves competing with the local team leaders who had the home ground advantage in emphasizing the importance of their project tasks at the expense of the virtual project duties.

Cultural distance between leaders and team members also challenged the studied leaders in adapting leadership behavior according to cultural differences. The differences in norms and values about working behavior and leadership expectations caused contradictions in all of the studied teams. They had difficulties in making each other aware of these leadership, work practices, and communication differences in an explicit way, which affected leaders' abilities to exercise power. Cultural awareness

and language skills increased the power of remote leaders. Leaders who did not master proper language skills had difficulties in both achieving their goals and in informal interactions among team members and other leaders.

Study 4: Job stressors in cross-cultural collaboration

Study 4 deepens the analysis of Studies 1 and 3 on stressors related cross-cultural collaboration in distributed teams. An overarching analysis across seven case studies revealed that members of cross-cultural teams experienced job stressors such as *language challenges in English, misunderstandings and conflicts* due to different mindsets, communication and behavior styles, and work-leisure orientations. Without adequate skills in English or proper cultural and local awareness of distant team sites, coping was not successful, thereby stressors led to strain.

Language challenges in English. Less fluent English speakers felt inability and incompetence in expressing themselves and getting their point across in team communication. In some cases, written communication was used as a coping mechanism in bridging the language barriers between native and non-native English speakers. However, some non-native English speakers experienced email as an especially stressful medium. E-mail communication in English was time-consuming and added to the sense of overload in busy work situations.

Misunderstandings and conflicts. Not only non-native speakers felt strain but also native English speakers found the language challenges and miscommunication stressful. ICT-mediated communication, in which non-verbal cues were minimized, caused the majority of miscommunication. Many interviewees said that e-mail messages were easily misunderstood and sometimes these misunderstandings escalated to conflicts in cross-cultural teams. Different mindsets and work and leisure orientations between cross-cultural team members created misunderstandings and stressful surprises for those who were not culturally aware. Major misunderstandings and conflicts were encouraged to be solved face-to-face during site visits in the studied teams. After a face-to-face encounter, team members understood each other better in ICT-mediated communication, which made cross-cultural collaboration less stressful.

Study 5: Coping with the stress of distance, time zones and culture

In Study 5, I aimed at answering research questions 2 and 3: How do distributed team members cope with virtual-specific job stressors? and, How does this coping process affect psychological strain? Cross-case analysis of ten geographically distributed teams demonstrated the complex and dynamic nature of the stress-coping process, and how coping strategies, adapted to manage stress-evoking uncertainty and ambiguity in distributed work, created secondary sources of psychological strain to individuals. The main strategies for managing the uncertainty and ambiguity in the studied teams were extensive emailing, traveling to face-to-face meetings, and extending workdays to collaborate simultaneously across time zones.

The most striking result of my analysis in Study 5 was how these team-level coping strategies ended up acting as new sources of overload and strain to individuals. To cope with the team-level coping strategies, team members relied heavily on individual coping resources, because spatial and temporal distance hindered the mobilization of social resources related to emotional, instrumental, and informational social support. Experienced workers, who had good self-management skills, succeeded in coping with these secondary sources of strain by prioritizing and setting clear limits for workload. Less-experienced workers were overloaded and needed more social support from their leaders and teammates.

6. Discussion

This dissertation contributes to the occupational stress literature by revealing the unique stressors and coping mechanisms of distributed work, and modeling their relations to psychological strain. Geographic distance, electronic dependence, and cultural diversity hinder the information flow and task coordination in distributed teams, creating stress-evoking ambiguity and uncertainty for team members. Not only these job stressors but also some of the strategies used to cope with them contribute to overload and strain. In particular, frequent traveling to face-to-face meetings, prolonged work hours due to synchronous CMC (computer mediated communication), and email overload create secondary sources of work overload when people use them continuously to manage uncertainty and ambiguity in distributed collaboration. This dissertation suggests that the coping strategies that are effective in managing certain job demands may, however, create other stressors and overload. The

model shown in Figure 1 illustrates and summarizes all the results presented in the five studies.

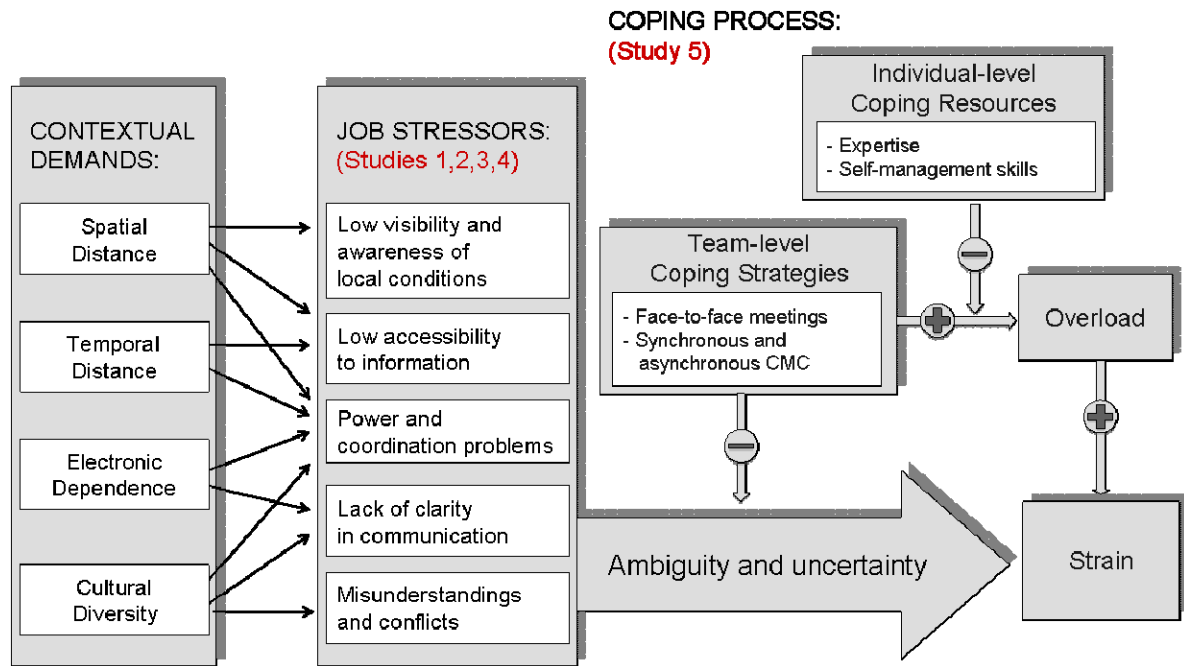


Figure 1. The stress-coping process in distributed work.

To answer the first research question, “*What are the context-specific job stressors related to distance, cultural diversity, and electronic dependence in geographically distributed teams?*” Figure 1 shows that spatial and temporal distance lowered visibility and awareness of collaborators’ local conditions, creating power and coordination problems in the studied teams. Information flow and accessibility of the people and information was diminished by distance and the incongruent temporal rhythms of collaborators. Electronic dependence and cultural diversity hindered coordination and clarity of communication, resulting with misunderstandings and conflicts. Low accessibility and awareness, power and coordination problems, and miscommunication hindered task completion and created ambiguity and uncertainty in workflow that resulted in psychological strain.

How did the distributed team members cope with these job stressors? (RQ2) and, How did this coping process affect their psychological strain? (RQ3) The main strategies to manage the uncertainty and ambiguity in the studied teams were extensive emailing, traveling to face-to-face meetings, and extending workdays to collaborate

simultaneously across different time zones. Continuously used, these team-level coping strategies themselves created work overload and strain. Experienced workers, who had good self-management skills, succeeded in coping with these secondary sources of strain by prioritizing and setting clear limits for workload. Thus, they did not feel strain. Less experienced workers were overloaded and needed more social support from their leaders and teammates.

The qualitative multiple case study method used in this study enabled inductive exploration of teams' and individuals' stress-coping behaviors in context, revealing that team-level coping strategies, which may be effective in managing team-level stressors, can create new stressors to individuals. In the context of distributed teams, the individuals mainly coped with these new stressors by using individual resources, since distance hindered the mobilization of social resources. The major advantage of the qualitative, inductive research approach was that it revealed unanticipated findings, as it did not prescribe the range or type of responses that people gave to the interview questions about demanding work situations and coping mechanisms. Instead, it allowed the informants to describe with their own words what they did and felt in these situations.

Theoretical contribution and practical implications

This dissertation has clear academic novelty in modeling the relations of unique stressors and coping mechanisms to psychological strain in distributed work (Figure 1). The model presented in Figure 1 is emergent in the sense that it is situated in, and developed by, recognizing patterns or relationships among constructs and their underlying logical arguments within and across the ten cases. My findings support Demerouti et al.'s (2001) suggestion that job demands are context- and profession-specific and not universal as the traditional stress models assume. Spatial and temporal distance, electronic dependence, and cultural diversity had particular implications for stress in the studied distributed teams.

As Lazarus and Folkman (1984, p. 142) state, "Coping thoughts and actions are always directed toward particular conditions." To understand the strategies and resources used for coping, researchers need to know what people are coping with and what the outcomes of coping are. Cooper and colleagues (2001) argue that the

complexity of a stress-coping process cannot be understood by using quantitative self-rating measures constructed *a priori* through the literature, because these are too simplified to capture the richness of the coping process. For this reason, I used the case study method, which produced rich, empirical descriptions of particular instances of the stress-coping process in the context where they happened.

This dissertation extends Lazarus' and Folkman's (1984) transactional theory of stress by demonstrating that coping can create secondary sources of strain, which require adopting new coping strategies to alleviate that strain. Prior literature on the transactional model has limited coping to constantly-changing cognitive or behavioral efforts to manage stressful encounters, but it has not acknowledged that coping itself can be an overloading activity. Study 5 revealed that team-level coping strategies, which may be effective in managing team-level stressors, can create new stressors to individuals. The studied individuals mainly coped with these stressors by using individual resources (expertise and self-management skills), because distance diminished their opportunities to give and receive social support. The shortage of social support in distributed work is a notable observation, because social support is probably the best-known situational variable suggested to buffer strain at work (e.g. Haines, Hurlbert & Zimmer, 1991; Johnson & Hall, 1988).

The Job Demands-Resources (JD-R) model suggests that job resources like social support buffer the relationship between job demands and strain (Bakker & Demerouti, 2007; Bakker et al. 2005). This dissertation showed that geographic distance and electronic dependence hinder or even preclude the use of social support in distributed work. Lack of these social resources caused strain to the studied individuals. Hence, this dissertation makes a contribution to the research on JD-R model, proposing that lack of resources is *directly* and negatively related to strain.

In addition to the negative elements of the work process, the JD-R model encompasses the motivation process. It has been applied to study positive psychological well-being outcomes (e.g. Schaufeli, Salanova, González-Romá & Bakker, 2002; Bakker, 2008; Geurts & Bakker, 2004). While this dissertation showed that some workers consider the demands as stressors, other might perceive them as

challenges and opportunities to grow, learning and flow. Thus, the future research should focus on the positive effects of job demands and resources of distributed work.

As the study 5 revealed, stress experiences vary considerably between expert team members and novices. These differences point to the fact that personal resources and characteristics are important factors to understand stress. Attention to these resources at the team level (e.g. the composition and diversity of the team members) might be critical for understanding stress differences across teams. Moreover, the future research could also test if the personal resources of the team leader, his or her competences and experience to lead this type of teams (as identified in the study 3) and probably other personal characteristics would help understanding stress and well-being at the team level.

According to JD-R model, absence of job resources undermines motivation and evokes a withdrawal process from work (Demerouti et al., 2001: 502). This kind of avoidance coping (Pearsall et al., 2009) along with continuous internal monitoring (e.g., Kozlowski et al., 1999) has been recognized as a typical coping mechanism in traditional, physically collocated teams. Once a team member appraises a situation as harmful, he or she begins to retreat from his or her task and teammates. In collocated settings, other members will become increasingly aware of the team member's behaviors and the breakdown of team interaction (e.g., Kozlowski & Klein, 2000), reinforcing their own response and leading to a shared reliance on avoidant coping. In distributed teams, awareness of other team members is reduced (Montoya-Weiss et al., 2001), which was shown to have an affect on the team-level coping in the studies of this dissertation. To reduce stressful uncertainty of workflow and to increase trust between team members, the studied teams organized regular face-to-face meetings. Even though these meetings reduced the stressful uncertainty in teamwork, frequent traveling to them created new stressors to individuals. Traveling increased workload, created work/family conflicts, and hindered other social life outside work, thus reducing opportunities for relaxation and tapping into support systems. Overall, distributed teamwork hindered the use of social support both at work and at home, creating strain to individuals.

As a practical implication, this dissertation suggests that since distributed team members rely heavily on self-management skills in coping, their efforts in setting clear limits and prioritizing tasks should be better supported by the organizations. Management should assure the appropriate organizational resources (i.e. tools and work practices) for distributed work that will reduce overload and promote better mental health (or less stress) and better productivity in distributed teams. Experts were found to cope better with strain than novices, who needed more social support from their leaders and teammates. Because spatial and temporal distance hinders the mobilization of social resources in distributed teams, mentoring programs or buddy systems, in which two or more collocated people operate together as a single unit so that they are able to support each other, could help team members cope better with the unique demands of distributed work.

Another practical implication emphasizes the importance of team design and training in global organizations. Distributed teams should be designed with a consideration for psychological safety, creating an environment where individuals will be more likely to provide social and informative support to each other. This can be achieved through encouraging support, trust, openness, and respect within the team (Gibson & Gibbs, 2006). Values such as the above can be instilled in training as recommended by Powell and colleagues (2004), and by designing teams of a size that maintains goodwill and intimacy (Martins et al, 2004).

Limitations and discussion of credibility

When judging the quality and credibility of a research study, most social science methods use the following four tests: construct validity, internal validity, external validity and reliability (Kidder & Judd, 1986). Although these tests are primarily designed to test the quality of a deductive study, I applied several tactics to deal with these tests in my qualitative case studies.

Construct validity. This first test deals with identifying correct operational measures for the concepts to be studied. Critical readers of this dissertation may point out the fact that “subjective” judgments were used to collect the interview data. For example, a reader cannot tell whether the claimed job stressors and coping mechanisms genuinely reflect the objective reality of distributed teams or whether they document

the subjective experiences of my interviewees and/or my impressions of them. It is true that the interview data reflect my view of the reality as seen through the eyes (and heard through the voices) of the informants. When studying feelings, such as strain, the strength of the used semi-structured interview method is in its ability to catch the genuine experiences of individuals. Thus, I defined what I saw as significant in the data and presented pieces of the data to the readers in the study reports (Appendices 1-5) so that they can assess whether the data matches my interpretation or not. I also created displays and analysis matrixes to help myself and the reader to follow the line of interpretation. I did this to contribute to the transparency of reasoning. Before drawing conclusions from the case studies, I had key informants review drafts of the case study reports.

Internal validity. This test is usually used when an investigator is trying to explain how and why event X lead to event Y – in this study, for example, how coping strategies such as traveling to face-to-face meetings and extensive use of CMC lead to feelings of overload instead of well-being. The gradual building of an explanation to this specific question required collecting multiple case study data and eventually developing two rival theoretical propositions. In Study 1, which involved only three teams, traveling and frequent emailing emerged as sources of overload for the individuals. At this point, my analysis had not yet revealed that the teams actually used traveling and CMC as team-level methods to cope with uncertainty and ambiguity, and when used continuously, these coping strategies created work overload and strain. When I analyzed the ten cases in Study 5, I noticed this pattern while making the cross-case comparison. The finding was surprising, and I had to test it case by case by reanalyzing the data to see whether traveling and CMC were used as team-level coping mechanisms or just as means of collaboration in all the ten teams.

External validity. This test deals with the problem of knowing whether the study findings can be generalized beyond the immediate case study. Rather than statistical generalization, case studies rely on analytic generalization to create a theory (Yin, 2009, 43). The mix of different industries and wide range of distances between the studied teams increase the external validity of this dissertation. However, the cross-cultural data is too small for presenting the findings and the recommendations for

improvement as universally adequate for every culture considered. I and the majority of my interviewees are Finnish (76 %); hence may the findings and the practical recommendations be Finnish-biased. The findings, as mentioned earlier, reflect the subjective experiences of my interviewees. The model in Figure 1 was tested by replicating the findings in all the ten cases. These direct replications justify the acceptance of the results as providing strong support for the model. It is true that the model only describes the stress-coping process in geographically distributed teams and needs to be tested in collocated settings. However, this study established groundwork for understanding the complexity of the coping process and how coping can contribute to more strain.

Reliability. The objective of the reliability test is to be sure that if a later investigator followed the same procedures as described in the Methods section and conducted the same case studies all over again, the later investigator should arrive at the same findings and conclusions as I did. For allowing this other investigator to repeat my work, I documented the procedures I followed in the case studies. I also used this documentation myself while repeating the ten case studies, which is another way of dealing with reliability.

One of the limitations of this study is that my data came from a relatively small number of individuals and teams. A larger sample drawing on more settings might reveal more job demands and coping behaviors. In addition, combining a variety of data sources, for example observational and interview data, might provide a more rich and detailed understanding of coping in specific situations. Methodological triangulation, mixing quantitative and qualitative data, would facilitate more comprehensive interpretations and strengthen the argumentation. Measuring the level of stress, work effectiveness and performance with survey and other objective methods would complement the qualitative analysis and perhaps generate enriching viewpoints.

Conclusions

Despite the limitations, this study makes an important contribution to the literature on stress and distributed teams, suggesting that distributed team members experience unique job stressors, and that coping with these stressors can create secondary sources

of strain, which require adopting new coping strategies to alleviate that strain. The present research provides a substantial base for constructing new stress and coping measures based on the experiences reported by the members of distributed teams. The future challenge of research is to develop a new instrument for measuring the context-specific job demands and coping mechanisms in distributed work. There is also a clear practical need for such an instrument. The central challenges of management and HR professionals in organizations today are ongoing monitoring of distributed workers' perception of their health and well-being, and training of leaders to develop proper team practices that help coping with the demands of distance, time zones and culture. Preparing employees for the transition to distributed work is important since virtual collaboration is a new way of working, with which people are still learning to cope.

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