

NICK VAN DER MEULEN

The Distance Dilemma

The effect of flexible working practices on performance in the digital workplace



THE DISTANCE DILEMMA;

THE EFFECT OF FLEXIBLE WORKING PRACTICES ON PERFORMANCE IN
THE DIGITAL WORKPLACE

The Distance Dilemma;

The effect of flexible working practices on performance in the digital workplace

Het afstands dilemma;

Het effect van flexibel werken op prestaties in de digitale werkomgeving

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The Erasmus University logo, featuring the word "Erasmus" in a stylized, cursive script.

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A popular saying is that “there’s no place like home.” During the course of my PhD, I have been fortunate enough to call multiple places my professional home, for which I have several people to thank.

Rotterdam

Home to some of my ancestral roots, but also to my alma mater: Erasmus University Rotterdam. While I joined this great institution back in 2004, it was not until 2008 (during the master orientation days) that a series of fortunate events started the ball rolling for the rest of my career. At that point, one enthusiastic presentation by Eric van Heck made my choice between the human resource management, innovation management, or business information management master programmes an easy one. After all: all the other specialisations would soon be nothing if not for IT! Not much later I found myself fascinated by the convergence of these three areas and wanted to investigate the effects of IT-driven innovations in the workplace. The ‘big four’ considered my views too futuristic for an internship position, but luckily Eric van Heck and Peter van Baalen had recently started a research group concerning “New Worlds of Work” where futuristic views were more than welcome. I joined the group as a student assistant and got to experience the joys of doing academic research in direct collaboration with practice. After one year I finished my master thesis research, but it still felt incomplete. Eric and Peter encouraged me to pursue a PhD to continue my research... And the rest, as they say, is history.

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... and beyond

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Chapter 1

Introduction

“In terms of actual work on knowledge worker productivity, we [are] roughly where we were in the year 1900 in terms of productivity of the manual worker” (Drucker, 1999: p.83).

For a long time, employee performance seemed a relatively straightforward affair. In the Fordist mass-production system (built on hierarchy, standardization, and routinization) employees were simply excluded from any decision-making and work was organized at distinct places with distinct time schedules, thereby providing an efficient spatial and temporal ‘fix’. Each employee had his or her own workplace (which could be an office, cube, desk or machine), and the term ‘office’ mostly referred to a place. Similarly, the clock was considered the main instrument for coordination and control as time periods became the focal unit of production (Hassard, 1989; Mumford, 2010). In this highly standardized work environment, employee productivity and organizational profits soared (Smith, 1997).

But in the contemporary corporate landscape, the Fordist approach to business falters. Organizations are faced with rising competitive pressures from global business environments, which increase the need for corporate efficiency, agility, and collaborations that span geographical boundaries and multiple time zones (Carmel and Espinosa, 2011). In order to achieve these needs, organizations need to re-evaluate their internal (functional) work design (Kalleberg, 2001). Rather than manual workers that do exactly as they are told, they require knowledge workers who are enabled to use their expertise to quickly adapt to complex and novel circumstances (Davenport, 2005). Yet simultaneously, both the demographic composition as well as the expectations of such workers have shifted. Flexibility and autonomy are not only required for corporate agility, they are also essential for employees to maintain a satisfactory work—life balance and considered ‘table stakes’ for organizations that wish to attract top talent (Economist Intelligence Unit, 2014). Work—and especially the way we work—is therefore changing: flexible working practices have been on the rise for the past decade (Eurostat, 2016; U.S. Department of Labor, 2015), with potential implications for employee and organizational performance.

Recent developments in information and communication technologies (ICTs) have served as a major enabler for these flexible working practices, most notably by changing the ease with which the majority of people can work over physical and temporal distances. One of the most prevalent practices in this regard is telework (WorldatWork, 2015), which is an ICT-enabled form of organizing work in which employees can decide for themselves *where* and typically also *when* they wish to conduct their work away from a central workplace. In the Netherlands, the percentage of organizations (with at least 10 employees) that allow telework is now at 74% (Statistics Netherlands, 2015). Yet despite this number having more than tripled since 2003, the Dutch government aimed to stimulate this uptake even further. This was done through changes in employment legislation, which provide employees with the right to formally request an adjustment of the duration, scheduling, or location of their work (Wet Flexibel Werken, 2016). Consequently, employers have a statutory duty to discuss such a request with the employee and take it under serious consideration; requests may not be declined without written argumentation.

What the actual effect of telework on employee and/or organizational performance might be, however, is still up for debate. Meta-analytic studies (e.g. Gajendran and Harrison, 2007; Martin and MacDonnell, 2012), for instance, show small effect sizes that are fraught with heterogeneity and without any indication on how often subjects telework. Moreover, the majority of investigations on this topic lack theoretical frameworks that could elucidate its underlying causal structure. These shortcomings are an important motivation behind the research presented in this dissertation, which focuses on creating a better understanding of *how the extent of telework (i.e. temporal and spatial flexibility) affects employee and organizational performance*.

1.1 A Brief Primer on Telework Practice and Research

The concept of telework (or rather: telecommuting) was introduced in the United States approximately four decades ago, as a technology—transportation trade-off in which (close to) home working with the help of ICT would help to reduce traffic congestion and pollution in densely populated areas (Nilles et al., 1976). Environmental awareness was not high on the corporate agenda, however, and organizations were mainly interested in telework as a solution to fuel shortages that resulted from the two ‘oil shocks’ of the 1970s. After this crisis settled, ideological views of the home office emerged—depicting it as “an electronic cottage that will glue the family together again” and where people would “get more done in less time, while bypassing the alienating experience of a 9-5 city job” (Toffler, 1980: p.219). Negative experiences of early adopters were also discussed, which is why in the 1980s the primary research focus changed towards drafting contractual frameworks and successful telework policies (e.g. Huws et al., 1990). As enabling employees to telework still proved quite costly, this is also the time when the first ‘telework centres’ (now referred to as coworking spaces) were introduced. These were shared locations with regular office facilities (such as data connections or laser printers) located close to employees’ homes, where organizations could rent space for employees to work among professionals from other organizations (Kurland and Bailey, 1999).

Telework experiments began in earnest in the early 1990s. These voluntary pilots were typically meant to accommodate personal and family needs, and designed to increase retention of valued (top performing) employees (e.g. Hill et al., 2006). Due to costs and the required trust from managers, telework was typically regarded as a ‘privilege’ in many organizations (e.g. Kurland and Cooper, 2002)—a rhetoric that is commonly used to this day (e.g. Peters et al.,

2010; Waber et al., 2014) and which reflects a limited focus on flexibility as an essential element to organizational success (WorldatWork, 2015). Strategic interest in telework rose during the mid-to-late 1990s, when affordable computers and broadband Internet connections became widely available (Eurofound, 2010) and made telework an interesting way to cut costs and potentially increase performance. As a result, academic interest in the practice and ‘virtual organizations’ grew as well (Siha and Monroe, 2006), with studies aimed at identifying: 1) traits of employees who could be suitable for telework, 2) factors that predict who will telework (including individual and organizational motivations), and 3) potential advantages and challenges related to telework (Bailey and Kurland, 2002). Finally, around the start of the 21st century the focus shifted towards explaining what happens when employees telework. Major conceptual themes covered thus far concern the work-family interface (e.g. Allen et al., 2013; Hill et al., 2003; Kossek et al., 2006), organizational commitment and identification (e.g. Eaton, 2003; Golden, 2006; Hunton and Norman, 2010; Thatcher and Zhu, 2006), and interpersonal processes at work (e.g. Cooper and Kurland, 2002; Dambrin, 2004; Gajendran et al., 2014).

1.2 Research Motivation

Several articles have consistently ranked increased employee and/or organizational performance among the top reasons or advantages to telework (e.g. Boell et al., 2013; James, 2004; Kurland and Bailey, 1999; Pyöriä, 2011). Empirical investigations in this area have, however, been scant (Allen et al., 2015; Gajendran and Harrison, 2007; Martin and MacDonnell, 2012) and mostly pragmatic in nature. More specifically: studies have been primarily concerned with assessing whether telework is a viable arrangement by comparing groups of teleworkers with non-teleworkers (e.g. Bélanger, 1999; Bloom et al., 2015; Collins, 2005; Dutcher, 2012) or by asking teleworkers or program managers during interviews to provide retrospective indications of pre- and post-telework job performance differences (e.g. Baruch, 2000; Frolick et al., 1993). While such exploratory investigations have provided valuable initial insights on telework as a practice, they unfortunately tell us nothing about its true performance potential as information on the various underlying causal mechanisms is absent. Not knowing whether (and how) telework actually *works* is especially problematic considering the considerable uptake of this practice in recent years, which is why it requires further investigation.

That is not to say that no attempts have been made to explain the relationship between telework and performance (post-hoc) to date. It has, for instance, been argued that telework is tied to both a reduction (e.g. Bloom et al., 2015) and increase (e.g. Pyöriä, 2003) in distractions that impact focus work, at the possible cost of collective identity and relationships required for effective knowledge-intensive and collaborative work (Golden and Raghuram, 2010). Similarly, teleworkers are said to work harder and more hours (even when sick) (Bloom et al., 2015; Dimitrova, 2003) although managers typically fear that ‘detached teleworkers’ will exhibit reduced motivation and/or reduced work effort—sparking discussion over if and how teleworkers should be controlled for maximum performance (Felstead et al., 2003). Such discrepancies and interactions between benefits and drawbacks of telework point to certain ‘distance dilemmas’ for teleworkers as well as for the managers and organizations involved. Yet despite their salience, there have been no follow-up studies in which the elements of such distance dilemmas are explicitly theorised, modelled, and tested.

1.2.1 Distance Dilemmas

For teleworkers, the main distance dilemma involves a trade-off between opportunities for concentration and collaboration. This is because the temporal and physical separation from colleagues that is inherent in telework may on the one hand stimulate individual (focus) work through reduced distractions, while it may simultaneously frustrate interdependent (collaborative) work efforts through reduced presence and reduced social capital. Fortunately, telework is seldom an all-or-nothing practice: whether someone teleworks one day every other week or nearly every day is therefore likely to have an effect on performance. Yet existing studies vary greatly in who classifies as a teleworker: there is either no lower bound on the practice (e.g. Hill et al., 2003), or cut off points vary from one day (e.g. McCloskey and Igbaria, 2003; Bélanger, 1999) to three (e.g. Johanson, 2007) or four days (Bloom et al., 2015) of telework per week. Introducing mediating and moderating variables as well as additional variance by examining the actual extent (or frequency/intensity) of telework may therefore account for inconsistencies between existing studies (Allen et al., 2015).

For managers, the distance dilemma stems from no longer being able to observe the employee at any time: how can they give up control (resulting from a lack of visibility) without actually losing control? One aspect therefore involves the identification of effective alternative forms of control (behavioural, output, or clan-based) to re-regulate telework. Equally important to this dilemma is the role of a manager's trust in his/her employee, which could be considered an enabler of successful telework. This begs the question, however, of whether such a trusting relationship can be maintained in a remote context (e.g. Dambrin, 2004; Dimitrova, 2003; Sewell and Taskin, 2015), posing a potential challenge to teleworkers and managers.

For organizations, an additional distance dilemma stems from the need to balance global competitive pressures and changing employee needs. More specifically: by providing employees with the autonomy and the technological solutions that enable employees to work at any time and at any place, organizations potentially introduce additional work complexity that may limit organizational performance. Yet at the same time, such practices have become essential to attract and retain top talent (Economist Intelligence Unit, 2014), which is why decisions to cancel or severely curtail remote and autonomous work practices in favour of co-location and centralized open work environments—by organizations such as Best Buy, HP, and Yahoo—were widely challenged in recent years (e.g. Schwartz, 2013; Valcour, 2013). Which of these two approaches is best for organizational performance, however, remains to be seen.

1.2.2 Research Objectives

The main research question for this dissertation deals with *how the extent of telework (i.e. temporal and spatial flexibility) affects employee and organizational performance*. To this end, the formulated distance dilemmas can serve as a guide to better understand the relationship between telework and performance, which will be explored by focusing on three research objectives. Empirically assessing the effect of the actual extent of telework on employee job performance is the first objective. Subsequently, the second objective is to apply existing theoretical frameworks to learn more about the causal mechanisms underlying the distance dilemmas. More specifically, I will draw on theoretical frameworks from three interrelated areas that are considered major influencers of the performance of knowledge workers and knowledge-based organizations: 1) management and organization, 2) information technology, and 3) workplace design (Davenport et al., 2002). The third objective is to examine whether the findings obtained from empirical studies on the level of the employee also correspond to higher performance on the organizational level. Together, these objectives aim to advance the field of study and provide actionable insights to practitioners.

1.3 Dissertation Overview

The main body of this dissertation consists of chapters 2 to 5, which are based on four empirical studies that have been conducted with organizations. While all chapters investigate the overarching telework—performance relationship, each is developed as a self-contained paper (that deals with a specific research area) and can be read as such. Although I was the primary author for each paper, I will use first person plural pronouns (e.g. ‘we’ instead of ‘I’) to recognize the contributions of my supervisors and co-authors in collaborative work. A detailed description of these contributions is provided after the dissertation outline. Figure 1.1 summarizes how each of the chapters in the outline relate to the three aforementioned research areas.

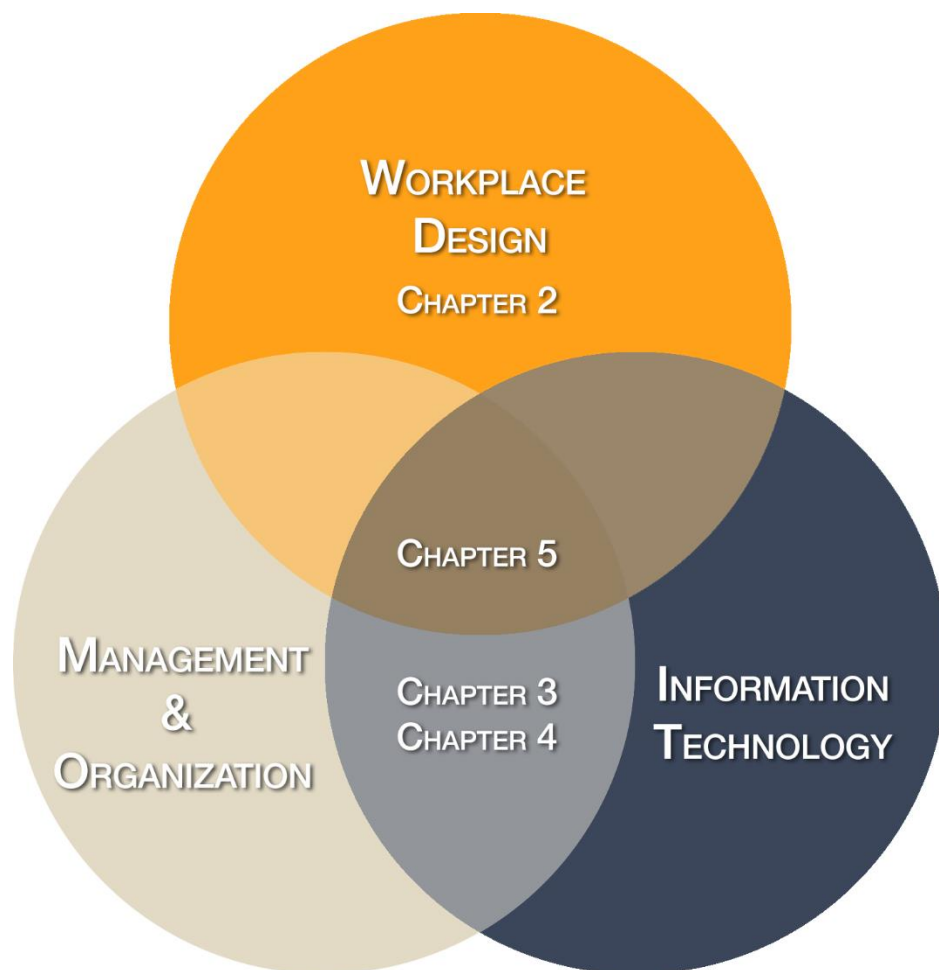


Figure 1.1. Graphical depiction of dissertation outline

1.3.1 Dissertation Outline

In chapter 2 we focus on the teleworker’s distance dilemma and the importance of workplace design for explaining the relationship between the extent of (home-based) telework and employee job performance. This is due to finding that differences in working environments in terms of distraction, satisfaction, and/or control are among the most common explanations for telework-related performance increases (e.g. Baruch, 2000; Bloom et al., 2015; Frolick et al., 1993;

Martinez-Sánchez et al., 2007). If actual differences between characteristics of working environments are considered an advantage of telework, however, then it makes sense to both conceptualize and explicitly measure them as such. We therefore introduce and test the concept of ‘telework advantages,’ which represents the potential for more favourable working conditions attributed to changing from a central office to a home work environment. We build on theories of cognitive overload (Hirst and Kalmar, 1987; Klingberg, 2009), distraction conflict (Baron, 1986), and environmental comfort (Vischer, 2005) to model the so-called distraction advantage, satisfaction advantage, and control advantage of telework as moderators in our conceptual model. This model is tested using quasi-field experiments at two organizations, where we draw on the job performance results of 325 participants (self-assessed and objectively assessed) both before and after the implementation of extensively supported telework programmes. Additionally, we test whether our outcomes are contingent on participants’ classification as knowledge workers.

Chapter 3 addresses the manager’s distance dilemma and therefore extends the focus from the single teleworker to the relationship with his/her manager by investigating the areas of management and organization as well as information technology. We argue that teleworker performance benefits can only be realized when telework is effectively controlled, which is why it is important to investigate how managers can re-regulate work in a setting characterized by reduced visibility and presence. Telework researchers and practitioners typically argue that such re-regulation—in knowledge-intensive contexts—entails a control shift from behavioural control to outcome control (e.g. Dambrin, 2004; Konradt et al., 2003; Lamond, 2000). To test this claim, we use theories of management control (Eisenhardt, 1985; Ouchi, 1979; Snell, 1992), self-regulation (Bandura, 1991), and psychological contracts (Rousseau and McLean Parks, 1993) to hypothesize which types of control are most effective in realizing teleworker job performance (both self-assessed and supervisor rated). In doing so we pay special attention to a specific type of employee self-regulation, which is based on an exchange-based psychological contract with the manager. For this reason, we also examine the importance of maintaining a trusting relationship between the employee and the manager, particularly through frequent and synchronous communication. Our hypotheses are tested by means of structural equation modelling, using a sample of 1,450 employees of four public and private organizations that have institutionalized telework arrangements in place.

In chapter 4 we return to the teleworker’s distance dilemma as we once more investigate the areas of information technology as well as management and organization, but this time from a broader viewpoint. We posit that due to the nature of knowledge work, most teleworkers are fundamentally *interdependent* and reliant on knowledge sharing and electronic communication media for their performance (Davenport, 2005). According to Nahapiet and Ghoshal’s (1998) theory of social capital, such knowledge sharing is built on the resources embedded in networks of interpersonal relationships—networks that can easily be disrupted by the use of ICTs and flexible work practices (Huysman and de Wit, 2004). This means that while teleworkers may thus on the one hand gain (short term) performance benefits from increasing the distance towards colleagues through telework (as described in chapter 2), they may ultimately experience negative mid to long-term performance effects as such distance could negatively impact their knowledge base. To test this assertion, we have further developed the extent of telework measure from previous chapters into a network measure that assesses both a teleworker’s average temporal as well as spatial separation from colleagues. We subsequently tease out the interaction effects of these two measures with communication media synchronicity and use structural, cognitive, and relational dimensions of social capital to further explicate the relationship between co-worker separation and knowledge sharing networks. This is done by means of multiple surveys and the use of whole network data from an in-depth study of 64 knowledge workers at the Medicines Evaluation Board.

For chapter 5, we focus on the organization's distance dilemma as we place telework in the broader context of the digital workplace and shift our level of analysis in order to investigate whether individual level findings from previous chapters actually translate into organizational performance. As the digital workplace is a relatively new concept without a dedicated research stream (Köffer, 2015), we decided to take an exploratory sequential mixed methods approach to investigate 1) how organizations are designing digital workplaces, and 2) which design choices contribute to organizational performance. In doing so, we assess the organizational value of telework in a veritable ecosystem of practices. Based on a series of interviews with 63 executives at 27 large global organizations (that were implementing digital workplaces), we first develop a framework that outlines the various design elements of a digital workplace. Subsequently, we test the importance of these elements using data from an online survey among senior managers and policymakers from 113 organizations.

Ultimately, I summarize the findings of the empirical studies in chapter 6 and reflect on the distance dilemmas that arise from the temporal and spatial separation inherent in telework. Here I also touch upon the difficulties inherent in knowledge worker performance research and discuss this dissertation's main contributions to theory. I conclude with several recommendations for further research and management practice.

1.3.2. Declaration of Contributions

The Medicines Evaluation Board (CBG-MEB) supported the research upon which this dissertation is based. Sipko Mulder has been my supervisor at CBG-MEB, helping me to get acquainted with the organization and its systems, get in touch with the right people, and to obtain access to data sources within the organization.

Additional support was obtained from fellow members of the Erasmus@Work research centre: Peter van Baalen, Janieke Bouwman, Frank Go, Eric van Heck, Marcel van Oosterhout, Michaela Schippers, and Christina Wessels have been partially involved in developing and testing the research instrument ('New Worlds of Work framework') that has been (in part) used in chapters 2, 3 and 4. Peter van Baalen, Eric van Heck and Marcel van Oosterhout have been pivotal in setting up collaborations with (and thereby providing data access to) the additional organizations in chapters 2 and 3. Janieke Bouwman and Christina Wessels have supported the data collection efforts for chapters 2 and 3.

I conducted most of the work for chapter 2 independently, with valuable review comments and edits from Peter van Baalen, Eric van Heck, and Sipko Mulder (i.e. my supervisory team). An earlier version of this paper has been published in the Proceedings of the 33rd International Conference on Information Systems (van der Meulen et al., 2012). The current version has been submitted for publication in an international journal.

For chapter 3, I conducted the analysis as well as writing of the current version independently. Peter van Baalen co-wrote an earlier version of the paper and helped to develop the research idea concerning trust-based self-determination, which is based on an earlier concept of the so-called 'trust-control nexus' (van Baalen, 2012). My supervisory team provided valuable review comments and edits. The current version has been submitted for publication in an international journal.

I conducted most of the work for chapter 4 independently, with valuable review comments and edits from my supervisory team. Robert Boerrigter assisted in my network data collection efforts at CBG-MEB. The current version has been submitted for publication in an international journal.

Chapter 5 is by far the most collaborative chapter, which came to fruition during my research visit at the MIT Sloan Center for Information Systems Research (CISR). This visit was supported in part by a grant from Trustfund Erasmus University Rotterdam. The initial framework upon which this paper is based has been developed by Kristine Dery, Ina Sebastian and Jeanne Ross (Dery et al., 2015), who are also responsible for nearly all of the qualitative data collection in this study. I developed the quantitative research instrument, with feedback from Marcel Bijlsma, Ruud Janssen (both formerly Novay) and the Erasmus@Work research team. I also conducted the quantitative data collection, which was supported by Novay and the Centre for People and Buildings. The analysis for this chapter is my own, with feedback from Kristine Dery, Ina Sebastian, and members from CISR. The paper was entirely written in collaboration with Kristine Dery and Ina Sebastian. My supervisory team as well as members from CISR have provided valuable review comments and edits. The current version has been submitted to the 37th International Conference on Information Systems.

Chapter 2

What a Difference a Place Makesⁱ

2.1 Introduction

The ubiquitous presence of powerful portable computers, a high penetration rate of cheap and reliable broadband communications, unified communication and collaboration software, as well as cloud computing and software as a service solutions have changed the way we work and live. One of these changes is that in the past two decades, full-time teleworking has become a viable alternative to regular office-based work for most job types and functions, especially knowledge work. Practitioner reports indicate that telework has become one of the most prevalent flexibility programs (WorldatWork, 2015), expecting the practice to become even more commonplace in the near future (Wessels et al., 2014), and census data from the United States and European Union show that 23 and 15 percent of employees telework at least ‘some of the time,’ respectively (Eurostat, 2016; U.S. Department of Labor, 2015). Home-based telework (HBT), which we define as a work practice that enables employees to work at home with the help of IT, offers many potential benefits for individuals, organizations, and society at large. Of these benefits, one the most alluring to organizations is the potential for higher employee performance (Boell et al., 2013). In principle, organizations will only consider HBT a viable work practice if teleworkers perform at least as well as their ‘traditional office’ colleagues. Ideally, HBT should even lead to higher performance. Yet while meta analytic studies (Gajendran and Harrison, 2007; Martin and MacDonnell, 2012) seem to substantiate the positive performance outcomes of practitioner surveys (e.g. James, 2004; Wessels et al., 2014), the reported effect sizes are small and fraught with heterogeneity. We believe that these findings reflect not only “the likely operation of moderators” (Gajendran and Harrison, 2007: p.1533), but also the incorrect classification of telework as a dichotomous factor in cross-sectional studies. Relatively recently, several studies have shown that the extent or frequency (intensity) of telework needs to be considered in order to obtain a deeper understanding of how telework is related to work outcomes (Allen et al., 2015). Our research objective is therefore to investigate how changes (over time) in the extent of HBT affect job performance, while taking into account potential moderating factors.

ⁱ This chapter is based on a working paper by van der Meulen, N., van Baalen, P., van Heck, E., and Mülder, S. 2016. “What a Difference a Place Makes: The Influence of Workplace Distraction, Satisfaction and Control on Teleworkers' Job Performance.” An earlier version is published in *Proceedings of the 33rd International Conference on Information Systems* (van der Meulen et al., 2012).

This paper is structured as follows. First, we provide an overview of existing research on the telework–performance relationship and discuss various potential mediating and moderating factors. Subsequently, we identify those factors that are not only important but also largely under-theorized and under-investigated, namely situational factors that refer to the differences in working conditions (in terms of distraction, satisfaction, and control) between the office and home work environment. To conceptualize these differences we develop the concept of ‘telework advantages,’ which we subsequently combine with theories of cognitive overload (Hirst and Kalmar, 1987; Klingberg, 2009), distraction conflict (Baron, 1986), and environmental comfort (Vischer, 2005) to hypothesize which (types of) telework advantages are most important for realizing teleworker job performance. We then proceed to test our hypotheses by means of a quasi-field experiment that draws on the individual job performance results of 325 participants (self-assessed and objectively assessed) before and after the implementation of an extensively supported telework program at two organizations. In doing so, we do not only provide much-needed longitudinal insight into how the extent of telework is related to job performance (Allen et al., 2015), but also on the environmental conditions under which this relationship might occur.

2.2 Theory and Hypotheses

Contrary to typical telework research, which is characterized by “a hodgepodge of theoretical frameworks” (Martin and McDonnell, 2012), research on its relationship with job performance has traditionally been plagued by a lack of theory (Bailey and Kurland, 2002). With the exception of some recent studies that do include theoretical frameworks (Gajendran et al., 2014; Golden and Veiga, 2008; Kossek et al., 2006), the vast majority of empirical research merely focused on establishing a performance effect of the telework arrangement as a whole (often in conjunction with other outcomes) by comparing groups of teleworkers with non-teleworkers (e.g. Bélanger, 1999; Bloom et al., 2015; Collins, 2005; Dutcher, 2012) or by directly asking teleworkers or program managers to give retrospective indications of pre- and post-telework differences during interviews (e.g. Baruch, 2000; Frolick et al., 1993). Though such investigations gave valuable primary insights, a continuation of such line of inquiry will not advance the field; what is required is a better understanding of 1) the causal mechanisms underlying the telework—performance relationship and 2) the role of the actual *extent* of telework.

To illustrate the latter point: existing studies on telework either completely lack a clear lower bound on the practice (e.g. Hill et al., 2003), or they use cut off points varying from one day (e.g. McCloskey and Igbaria, 2003; Bélanger, 1999) to three (e.g. Johanson, 2007) or four days (Bloom et al., 2015) of telework (per week) in order to classify employees as teleworkers. This disparity indicates that telework is seldom an all-or-nothing practice, and by not examining the variation in this extent of telework we will be unable to distinguish the vastly different work experiences such an extent could produce. Analysis of the role of the extent of telework, typically operationalized as the time spent away from the central office (either in number of hours per week or the proportion of work time), has already led to a number of novel findings in studies on job satisfaction (Virick et al., 2010), turnover intentions (Golden, 2006) and work—family conflict (Golden et al., 2006), but has received little attention in studies on job performance.

2.2.1 Telework and Job Performance

In the past ten years, there have been four studies that have incorporated the extent of telework in performance-related research, all of which show that the extent of telework is not directly related with job performance (Gajendran et al., 2014;

Golden and Veiga, 2008; Golden et al., 2008; Kossek et al., 2006). Two of these studies support previous findings, however, inasmuch they show that their dichotomous operationalisations of telework *are* positively (and directly) related to job performance (Gajendran et al., 2014; Kossek et al., 2006). While this could lead one to believe that the extent of telework is of no consequence, the exact opposite seems to be the case: there are indications that the extent of telework indirectly affects job performance through job autonomy (Gajendran et al., 2014) and that it could interact with variables such as leader-member exchange quality (Gajendran et al., 2014; Golden and Veiga, 2008), professional isolation (Golden et al., 2008) and telework normativeness (Gajendran et al., 2014). These findings illustrate the multivariate complexity of telework as a practice, with various positive and negative effects simultaneously resulting in the absence of a (net) direct effect of its intensity. This notion is reflected in the following hypothesis:

Hypothesis 1. The extent of telework has no direct effect on job performance.

In order to better understand the effect of the extent of telework, we thus need to investigate additional moderating and mediating factors. Prior qualitative and exploratory studies in this area have provided a multitude of candidates for such investigations, which can be summarized into three categories: 1) individual factors, 2) social factors, and 3) situational factors (Neufeld and Fang, 2005). What follows is a brief summary and outline of recent findings for each of these categories, with suggestions on possible extensions. Subsequently, we shall further theorize on the category we feel is largely under-explored.

Individual factors influencing teleworker job performance.

Studies that focus on individual factors in relation to teleworker performance typically do so in terms of family status and gender (Neufeld and Fang, 2005). These factors stem from the origins of the telework practice, which was typically seen as a means to accommodate working mothers (Hill et al., 2006). The relevance of this archaic notion has, however, since been disproven: women with children were found no different from other demographic groups in terms of the extent of telework—job performance relationship (Kossek et al., 2006). Individual job characteristics (involving the complexity, novelty, or interdependence of work) on the other hand provide new grounds for differences. For instance: students involved in a telework experiment performed better on creative tasks when teleworking, but worse on dull tasks (Dutcher, 2012). Similarly, the level of job autonomy and the idiosyncrasy of an individual's telework practice have been shown to play important mediating and moderating roles as well. Teleworkers who consider the arrangement a special treatment are for instance likely to reciprocate by exhibiting greater job performance (Gajendran et al., 2014), which is in line with social exchange theory (Blau, 1964). There is a substantial risk, however, that such reciprocation takes the form of an increase in the number of hours worked (Baruch, 2000), which is why studies on the telework—job performance relationship should control for such a potential change.

Social factors influencing teleworker job performance

The importance of social factors stems from the argument that social interaction is generally positively related to job performance (Neufeld and Fang, 2005) and that telework endangers interpersonal relations due to reduced physical proximity to clients, colleagues and managers. There have been a fair number of studies that fall under this category, based on leader-member exchange theory (Gajendran et al., 2014; Golden and Veiga, 2008) and literature on professional isolation (Golden et al., 2008; Johanson, 2007). As such, we deem this category (at this stage) not a prime candidate for further investigation of potential moderating and mediating factors.

Situational factors influencing teleworker job performance

Largely under-theorized and under-investigated, however, is the situational factors category, which comprises factors that represent a “combination of the person and the situation in which the person operates” (Neufeld and Fang, 2005: p.1040). It is closely tied to a teleworker’s physical working environment, and describes several advantages and/or drawbacks related to changes in that environment. Traditionally, this category has been described in terms of both a ‘distraction free environment’ and ‘resource availability,’ though studies frequently mention ‘control over the work environment’ as an important factor as well (Gajendran and Harrison, 2007). While these three factors have never been explicitly tested, there have been several studies that refer to their importance when discussing changes in performance due to HBT (e.g. Baruch, 2000; Bloom et al., 2015; Frolick et al., 1993; Martínez-Sánchez et al., 2007). To illustrate: in their field experiment on the effectiveness of HBT for call centre employees, Bloom and colleagues (2015) attributed a 4% job performance increase (post hoc) to “a quieter and more convenient working environment” (p.165). Notwithstanding the fact that these explanations may make intuitive sense, they hardly bring us closer to understanding how actual differences in distraction, satisfaction and/or control over the work environment interact with the extent of telework, or how big the potential effect of each factor is. This is why we deem it important to investigate these three factors in depth. Specifically, our premise is that if actual differences between working environments are considered among the most popular advantages of HBT, then it makes sense to conceptualize as well as explicitly measure these differences and take them into account when studying the extent of telework—job performance relationship. We will do so by developing a new concept, named ‘telework advantages.’

2.2.2 Telework Advantages

We conceptualize a telework advantage as the positive difference between a dimension of the physical work environment at home versus the office. In terms of the three situational factors discussed earlier, this would constitute less distraction at home (a distraction advantage), a higher level of satisfaction with the work environment at home (a satisfaction advantage), and a higher level of control over the work environment at home (a control advantage). Inversely, in the case of negative differences we could speak of telework *disadvantages*. In the following sections, we will further theorize on each of these three telework advantages and how they moderate the extent of telework—job performance relationship.

The distraction advantage

Teleworkers often indicate that one of the primary reasons they prefer to work at home is to escape distractions at the office (Peters et al., 2004). Workplace trends towards ever more open and collaborative work environments—causing a loss of privacy, unwanted noise, and interruptions (Ashkanasy et al., 2014; Lee and Brand, 2005)—have likely only increased this drive. If the work environment or organizational policies are the cause of a distraction (as opposed to an employee’s internal dispositions or mental state), then this distraction can be classified as an externally generated involuntary distraction (EGID) (Roper and Juneja, 2008). EGIDs are psychological reactions triggered by competing activities or environmental stimuli that do not pertain to one’s primary task and frustrate focused attention that would otherwise have been directed at that task (Jett and George, 2003). More specifically: when new information cues (such as background noise or visual stimuli) draw on the same type of sensory channel being used for the primary task, cognitive (working memory) overload occurs (Hirst and Kalmar, 1987; Klingberg, 2009). For instance, nearby conversations from

colleagues are likely to lead to cognitive overload when doing a task that involves writing a report, as both are phonological (i.e. deal with the storage of linguistic information).

Distraction conflict theory (Baron, 1986) states that such an overload causes stress, which results in narrowed attention to information cues and the application of cognitive shortcuts (e.g. by using heuristics) to save already limited cognitive capacity. While this phenomenon (known as cognitive economy) works well when performing well-learned or simple tasks, it severely limits the cognitive exploration needed when performing complex or novel tasks that involve the processing of many combined information cues, thereby reducing performance on these tasks (Speier et al. 1999). In addition to the drawbacks of cognitive economy, EGIDs also frustrate opportunities for extended periods of concentration and reflection (Jett and George, 2003), especially when an EGID requires one's immediate attention (i.e. when interrupted) (Speier et al., 2003). As such, EGIDs may also prevent individuals from reaching a state of 'flow:' a condition linked to high performance (Demerouti, 2006) "in which people are so involved in an activity that nothing else seems to matter at the time" (Csikszentmihalyi, 1990: p.4). In an era where work is increasingly characterized as complex, novel, and non-routine (Davenport, 2005), a reduction of distractions by means of HBT (i.e. a distraction advantage) should thus have a positive impact on job performance. Naturally, this is only the case if the home work environment provides less sources of distraction than the office work environment. A distraction disadvantage will occur if the home work environment turns out to be *more* distracting than the office work environment (e.g. due to location, the presence of co-residents, or perhaps neighbours doing reconstruction work). In that case, the distraction disadvantage will have a negative influence on job performance. All in all, this leads to the following hypothesis:

Hypothesis 2. A teleworker's level of distraction advantage interacts with the extent of telework such that (a) the extent of telework positively affects job performance in case of a distraction advantage, and (b) the extent of telework negatively affects job performance in case of a distraction disadvantage.

The satisfaction advantage

Yet even if one can potentially obtain a distraction advantage by teleworking, it might still not be desirable to do so simply because the home work environment may not have the resources (i.e. facilities or the required environmental characteristics) in place to adequately support the one's work activities. According to Vischer's (2005) Environmental Comfort model, such a low level of perceived fit between one's work requirements and the related work environment will cause stress (reduced functional comfort) and require energy to cope with adverse environmental conditions. This coping mechanism thus expends energy that would otherwise have been directed at work, thereby reducing job performance. Conversely, a high level of fit allows employees to more easily meet work demands and directs one's full attention to work, resulting in higher performance. The notion of *perceived fit* (i.e. environmental satisfaction) is important here, as it reflects an employee's self-assessed level of efficacy in that environment as opposed to a generalized objective quality of the environment itself. As such, it has been shown to affect various affective states that have been linked to job performance, such as engagement (Olson, 2015), job satisfaction (Veitch et al., 2007), and organizational commitment (Carlopio, 1996).

As much attention as organizations pay to their office work environment, however, so little attention is paid to teleworkers' home work environments. An assessment of fit between work requirements and the home work environment is left to the employee, but generally little support is offered should that perceived level of fit prove insufficient (Jaakson

and Kallaste, 2010). Although mobile technologies and Internet connectivity are generally arranged or reimbursed (e.g. Karnowski and White, 2002; Montreuil and Lippel, 2003), the opposite is typically true for office equipment and furniture (Karnowski and White, 2002; Jaakson and Kallaste, 2010). This means that while many teleworkers might like to achieve a better fit by replicating aspects of the office in their home work environment, this may not be for everyone as the required investment may be too high—especially for part-time teleworkers (Ng, 2010; Wapshott and Mallett, 2011). In summary: teleworkers either invest in a home working environment with a good level of fit (potentially resulting in a satisfaction advantage), or they bear the burden of insufficient fit (i.e. a satisfaction disadvantage)—it seems that both employers and employees consider either the ‘price of telework’ (Jaakson and Kallaste, 2010).

Hypothesis 3. A teleworker’s level of satisfaction advantage interacts with the extent of telework such that (a) the extent of telework positively affects job performance in case of a satisfaction advantage, and (b) the extent of telework negatively affects job performance in case of a satisfaction disadvantage.

The control advantage

Whereas the work environment at home might lack certain facilities or environmental characteristics, it might make up for these shortcomings by providing greater control over the environmental resources that *are* present. Such environmental control implies a certain ownership of environmental resources and consists of two components: 1) instrumental control and 2) empowerment (Vischer, 2005). Instrumental control deals with functional modification of the work environment to support work activities (for instance by changing the height of work surfaces or by changing the temperature), which according to the Job Demands-Control model (Karasek, 1979) prevents stress build-up from challenging work requirements (job demands). Additionally, the empowerment component deals with the psychology of control. Most notably, environmental control is expected to result in increased levels of motivation (due to a reduction in unpredictability) and psychological comfort (a result of increased privacy and an ability to personalize one’s work environment) (Vischer, 2007). As such, environmental control results both directly and indirectly (through affective states) in increased job performance (Lee and Brand, 2005; 2010; O’Neill, 1994; Wells, 2000).

The potential for a control advantage is currently growing: as more and more employees embrace telework, organizations discover that office space has to be used more efficiently (and more cost effective), resulting in an uptake of flexible and/or open plan office concepts (Bosch-Sijtsema et al., 2010). These concepts substantially change how employees go about their work (Davis et al., 2011) and lower perceived levels of environmental control at the office (Ashkanasy et al., 2014; Danielsson and Bodin, 2008), which in turn increases the control advantage level. Considering the potential benefits for job performance brings us to the following hypothesis:

Hypothesis 4. A teleworker’s level of control advantage interacts with the extent of telework such that (a) the extent of telework positively affects job performance in case of a control advantage, and (b) the extent of telework negatively affects job performance in case of a control disadvantage.

2.3 Methodology and Data Analysis

2.3.1 Sample and Procedures

We conducted quasi-field experiments—consisting of a pre-measurement, intervention, and post-measurement—to test our hypotheses at two organizations: a utilities company (Company A) and a semi-governmental organization (the Medicines Evaluation Board, or MEB). Both organizations met the following criteria:

- The organizations were about to implement an official teleworking program (for us to use as an intervention in the experimental research setup);
- The teleworking programs had to be active and comprehensive with regards to organizational and technological support (in order to exclude factors that might limit teleworker job performance);
- The decision to telework rested with the employees (in order to avoid selection bias);
- There were no restrictions on the extent of telework (in order to ensure variability in our dataset).

At the time of measurement, the utilities company employed over 10,000 FTE and had an annual turnover of approximately 9 billion Euros. Before launching an organization-wide teleworking program, management first wanted to conduct a pilot project with 206 participants. To examine the potential impact of telework on various types of job functions, departments participating in the pilot were pre-selected based on the functional profile of employees. Overall, this led to two distinct groups in the study. The first group had high levels of autonomy (scoring a 3.8 out of a 5-point scale, on average) and high job complexity (scoring a 4.0 out of a 5-point scale), and comprised typical knowledge work jobs in operations, sales, HR, and IT. The second group had significantly lower levels of autonomy (3.1) and lower job complexity (3.4), and consisted only of call centre employees. As our literature review has shown that these two individual factors might have an effect on the outcomes of this study, we decided to split up the sample of Company A into two distinct subsamples that will be used for subsequent analyses: knowledge workers and call centre employees. Seventy-four percent of the participants in the call centre group were female; 37% had an associate degree, 53% had a community college degree, and 10% had a high school diploma. The mean age for this group was 31 years, with a mean organizational tenure of 4 years. Of the knowledge worker group, forty-eight percent of the participants were female; 24% had a graduate degree, 47% had an associate degree, 24% had a community college degree, and 5% had a high school diploma. The mean age for this group was 42 years, with a mean organizational tenure of 5 years. All pilot participants at Company A were given a support package, which included a mobile phone, laptop, router, printer, company token, and a monthly fee for a high speed Internet connection. In addition, several software and cloud-based solutions for unified communication and collaboration as well as desktop virtualization supported the pilot. Participants also received training on how to best work at home with the provided tools and software, and a lot of attention was paid to (self) management and coordination issues that might occur during the pilot.

The semi-governmental organization (MEB) is project-based, highly knowledge intensive, and involved in a research and advisory function to the Dutch government and the European Union. The MEB employed 302 employees at the time of measurement, and management had already decided to implement an organization-wide teleworking program before the start of the study. Fifty-eight percent of the employees were female; 21% had a doctorate degree, 50% had a graduate degree, 18% had an associate degree, and 11% had a community college degree. The mean age for this group was

42 years, with a mean organizational tenure of 7 years. All employees were given the same rights and benefits, with support packages including a smartphone, laptop, company token, and a monthly fee for a high speed Internet connection. The MEB used (cloud-based) unified communication and collaboration as well as desktop virtualization solutions that were almost identical to those of Company A. An extensive training program prepared employees for the intervention, both from a technological and an organizational standpoint.

2.3.2 Data Collection

An online survey was employed as the primary data collection method. The research instrument was pre-tested in the final stage of development in order to test the user friendliness of the survey and to check if acceptable levels of measurement reliability could be achieved. An independent agency provided a panel consisting of 100 unique respondents, whose responses and feedback led to minor changes in question wording, the addition of fill-in instructions, and the inclusion of definitions when deemed necessary. The online survey environment allowed for randomization of questions (when appropriate), which minimized the risk of anchored and adjusted responses. In addition, the tool allowed for automatic coding and provided the opportunity to export the answers directly to a format that was ready for statistical analysis, eliminating the risk of data entry errors.

At both organizations, two surveys were administered: one pre-measurement between three and six months before the implementation, and one post-measurement six months after the implementation of the telework program (i.e. the intervention). Due to the use of personalized invitation links (necessary to match responses), data confidentiality was assured in the introduction text of the survey, and participants were told that no individual results would be communicated to any of the parties involved. Hosting the survey on the researchers' university servers meant that the latter could be ensured, as the participating organizations did not have any access to survey information. This allowed us to match the responses across both measurements and yet maintain the necessary research protocol. Table 2.1 provides an overview of the various survey measurement moments and corresponding response rates. Ultimately, two paired sample sets of 141 respondents (Company A) and 184 respondents (MEB) remained, representing approximately 57 percent of all study participants.

Additional data collection took place through the information management system of the MEB. This system was used for the performance dashboards of the executive team, and provided full records of (1) projects completed at the organization, (2) specific project tasks completed by individual employees, (3) start and stop dates for each project and task, and (4) the subject matter area for each project/task. The data cover the entire 2011-2012 time period and provide excellent measures of job performance of employees. Direct extraction of this data from the organization's system ensured high data accuracy.

	Measurement Period	Sample Size	Response Rate
Company A pre-measurement	Q3 2009	206	86%
Company A post-measurement	Q1 2010	206	80%
MEB pre-measurement	Q2 2011	302	73%
MEB post-measurement	Q3 2012	302	71%

Table 2.1. Overview of Survey Measurement Moments and Response Rates

2.3.2 Measures

In our survey, we relied on existing work to create measures that fit our research context. What follows is an outline of the questions, scales, and calculations for each of these measures. Please refer to table 2.2 for an overview of all items for each of the five composite measures, which were measured with Likert scales ranging from 1='completely disagree' to 5='completely agree.'

Measure	Items
Attitude towards telework	<ol style="list-style-type: none"> 1. Teleworking makes it easier to do my work 2. Teleworking improves my work performance 3. Teleworking allows me to accomplish specific tasks more quickly 4. Teleworking is compatible with most aspects of my work 5. Considering my work activities, I find teleworking useful
Environmental distraction	<ol style="list-style-type: none"> 1. I find it difficult to concentrate at this location 2. I experience auditory distractions at this location 3. I experience visual distractions at this location 4. I experience interruptions at this location 5. My work environment is too noisy at this location
Environmental satisfaction	<ol style="list-style-type: none"> 1. I am content with the working conditions at this location 2. I am satisfied with the facilities I have available at this location 3. This location has everything I need to do my job well 4. My work environment at this location is appropriate for the work activities I have to conduct
Environmental control	<ol style="list-style-type: none"> 1. I am in control of the working conditions at this location 2. I can change or adjust the furniture at this location 3. I can personalize my work environment at this location 4. At this location, I am able to work comfortably for sustained periods of time
Job performance	<ol style="list-style-type: none"> 1. I am an effective employee 2. I am an efficient employee 3. I am a productive employee 4. I am satisfied with the quality of my work results 5. I meet set deadlines 6. My performance is among the top 25% of my department

Table 2.2. Summary of Composite Measures and Items

Extent of telework. To assess the extent of HBT, we asked respondents to indicate the proportion of an average workweek they typically spend working at home. Past studies have shown that this measure is comparable to a measure based on the average number of hours spent teleworking per week (Golden and Veiga, 2008).

Distraction/Satisfaction/Control advantage. Levels of environmental distraction, satisfaction, and control for both the office and home workplace were assessed through modified measures based on a framework by Lee and Brand (2005). Each measure contains multiple items, which were averaged for each environment to create two scores. Cronbach alpha scores for both the office and home location across pre and post measurements ranged from .86 to .88 for environmental distraction, from .79 to .91 for environmental satisfaction, and from .70 to .83 for environmental control. The distraction advantage level was subsequently calculated by subtracting the mean score for 'environmental distraction at home' from the mean score for 'environmental distraction at the office.' The satisfaction advantage and control advantage levels were calculated by subtracting the corresponding mean scores at the office from those at home.

Job performance. Self-rated performance levels were assessed using six items based on a measure developed by Staples and colleagues (1999). The items were averaged to create an overall job performance score. Cronbach alpha scores ranged from .81 to .84 for both the pre- and post-measurement. At the MEB, we also objectively assessed intra-personal growth in job performance through company records. For project managers, we divided their aggregated number of completed projects in 2012 by their aggregated number of completed projects in 2011; for other employees (i.e. subject matter experts) we calculated the same index for their number of completed tasks. As the demand for these projects (and thereby also tasks) originates outside of the company and is subject to demand fluctuations based on subject matter area, we corrected each objective performance index value for these total demand fluctuations. We ruled out the need for nonuniform distributions of completions from year to year, as there was no evidence of front or back loading of project completions.

Control variables. To ensure that changes in the level of self-rated job performance were not conflated with changes in the level of production, we asked respondents to indicate the average number of hours per week that they are generally busy with work (including overtime, but excluding commutes). We also included a measure that asks for one's attitude towards telework to check if changes in self-rated job performance are not the result of an extremely positive or negative stance towards telework. This measure is based on Iivari's (2005) 'individual impact [of an information system]' measure and consisted of five items that were averaged to create a single attitude score. Cronbach alpha scores ranged from .78 to .92 for the pre- and post-measurement.

2.3.3 Residual Change Scores

Our longitudinal research setup allows for the testing of both between and within-subjects effects. More specifically, it allows us to test whether the amount of change in the extent of telework is related to the amount of change in the level of job performance, depending on distraction, satisfaction, and control advantage levels. To do so, we conducted hierarchical regression analyses with residual change scores to remove any structural elements of change between measurement moments and to correct for any regression towards the mean. Other methods (e.g. response surface analysis, time-lagged autoregressive path modelling, or latent growth curve modelling) were ruled out due to either the temporal variance in both our dependent and independent variables or the two-wave nature of our data. The residual change scores were calculated for attitude towards telework, extent of telework, hours worked, and self-rated job performance. This was done in two consecutive steps, as per Blomqvist (1977). First, the post-test score of variable Y was used as a criterion variable in a linear regression analysis, with the pre-test score of Y as the predictor variable, such that $Y_{it2} = \beta_0 + \beta_1 Y_{it1} + \epsilon_{it}$. Then the difference (ΔY) between the observed value of Y_{it2} and the predicted value of Y_{it2} (based upon the aforementioned equation) was calculated and ultimately used as a measure of unpredicted change (in Y) in subsequent analyses.

The reliability of these residual change scores (much like simple change scores) is, however, contingent on the reliability and correlation of their component parts: for residual change scores to be reliable and able to distinguish among individuals, pre and post-test scores must have low to medium correlations (Kisbu-Sakarya et al., 2013). Tables 2.3 and 2.4 show medium Pearson correlation coefficients for the components of our residual change scores; factoring in reliability scores for pre and post-test components (as per Linn and Slinde, 1977) leads to adequate reliability scores for our residual change measures (either at or above the recommended cut off point of .70) (Hair et al, 2009).

2.4 Results

We decided to run separate analyses for the knowledge work and call centre subsamples of Company A, as we expected (a priori) differences in results for these groups. These two groups were split almost evenly across the sample, with 71 knowledge work respondents and 70 call centre respondents. In addition, we conducted separate analyses for the MEB in order to 1) accommodate for the individual and organizational-level differences between Company A and the MEB, and 2) better compare self-assessed and objectively-assessed outcomes for the MEB. Table 2.5 presents for all three groups the means and standard deviations of the variables upon which the analyses are based. Of special interest is that the two subsamples of Company A do not differ significantly on most variables, with three exceptions: 1) the extent of telework for both the pre ($F = 5.07, p < .05$) and post ($F = 8.25, p < .01$) measurements, 2) the level of environmental satisfaction during the pre-measurement ($F = 4.43, p < .05$), and 3) the number of hours worked during the post measurement ($F = 4.81, p < .05$).

2.4.1. Self-rated Job Performance Results

Hypothesis 1 states that the extent of telework has no direct effect on job performance. Our analysis shows, however, that this hypothesis does not hold for knowledge intensive samples characterized by high levels of autonomy and job complexity. As shown in table 2.6 and 2.7 (model 2), a positive linear effect for Δ extent of telework on Δ self-rated job performance exists for the knowledge workers of Company A ($\beta=.25, p<.05$) and for the MEB ($\beta=.22, p<.01$). However, no significant results were found for the call center subsample of Company A ($\beta=-.10, n.s.$). These effects were corrected for residual changes in the number of hours worked and the attitude towards telework, of which the latter showed a significant positive relationship with Δ self-rated job performance ($\beta=.27, p<.01$) for the knowledge workers of Company A.

According to hypothesis 2, distraction advantages interact with the extent of telework such that (a) the extent of telework positively affects job performance in case of a distraction advantage, and (b) the extent of telework negatively affects job performance in case of a distraction disadvantage. Table 2.6 (model 4) shows a significant interaction term of standardized Δ extent of telework and standardized distraction advantage on Δ self-rated job performance ($\beta=.39, p<.05$), combined with a significant increase in model fit ($\Delta R^2=.15, p<.01$) with medium effect size ($f^2=.23$) for the knowledge work subsample of Company A. Table 2.7 (model 4) shows similar results for the MEB ($\beta=.25, p<.05$; $\Delta R^2=.05, p<.05$; $f^2=.06$). To aid in the assessment of the nature of these interaction effects, we plotted simple slopes for high and low levels of the independent (+20% and -20%) and moderating (+1 and -1) variables: see Figures 2.1 and 2.2. Consistent with

	1	2	3	4	5	6	7	8	9	10	11
1. Extent of telework (pre)	1										
2. Extent of telework (post)	0.08	1									
3. Hours worked (pre)	0.01	-0.21*	1								
4. Hours worked (post)	0.02	-0.21*	0.91**	1							
5. Attitude towards telework (pre)	0.22**	0.12	0.05	0.05	1						
6. Attitude towards telework (post)	0.20*	0.25	-0.05	-0.04	0.41**	1					
7 Self-rated job performance (pre)	0.06	-0.08	-0.01	0.01	0.03	-0.07	1				
8. Self-rated job performance (post)	0.13	0.04	0.05	0.11	0.05	0.00	0.54**	1			
9. Distraction advantage	-0.06	0.23**	-0.22*	-0.20*	0.19*	0.16	-0.11	-0.03	1		
10. Satisfaction advantage	0.04	0.12	-0.10	-0.10	0.13	0.09	0.07	0.12	0.47**	1	
11 Control advantage	0.08	0.24**	-0.10	-0.07	0.24**	0.14	-0.01	0.21*	0.52**	0.46**	1

*Significance at 5%, **Significance at 1%

Table 2.3. Pearson Correlation Matrix for Knowledge Workers, Company A

	1	2	3	4	5	6	7	8	9	10	11	12
1. Extent of telework (pre)	1											
2. Extent of telework (post)	0.30**	1										
3. Hours worked (pre)	0.09	-0.17*	1									
4. Hours worked (post)	0.01	-0.12	0.66**	1								
5. Attitude towards telework (pre)	0.19*	0.07	-0.04	0.04	1							
6. Attitude towards telework (post)	0.12	0.18*	0.05	0.04	0.48**	1						
7 Self-rated job performance (pre)	-0.06	0.02	0.18*	0.08	0.05	0.07	1					
8. Self-rated job performance (post)	0.04	-0.08	0.22**	0.21**	0.07	0.11	0.47**	1				
9. Objective job performance index	-0.05	0.16	-0.27**	-0.10	0.06	0.04	0.10	-0.13	1			
10. Distraction advantage	0.19*	0.24**	0.11	0.12	0.26**	-0.07	0.06	0.02	0.02	1		
11. Satisfaction advantage	0.13	0.30**	0.05	0.01	0.14	0.12	0.11	0.09	-0.01	0.55**	1	
12. Control advantage	0.14	0.16*	0.00	0.00	0.24*	0.01	0.13	0.09	-0.08	0.54**	0.61**	1

*Significance at 5%, **Significance at 1%

Table 2.4. Pearson Correlation Matrix for the MEB

	Company A (Call Centre)		Company A (Knowledge Work)		MEB (Full Sample)	
	Pre Mean (SD)	Post Mean (SD)	Pre Mean (SD)	Post Mean (SD)	Pre Mean (SD)	Post Mean (SD)
Extent of telework	6.67 (17.43)	42.87 (26.68)	13.28 (17.43)	31.28 (20.94)	15.38 (15.85)	34.08 (18.20)
Hours worked	35.1 (6.5)	35.3 (6.5)	37.2 (4.1)	36.9 (4.2)	36.0 (8.41)	36.1 (7.29)
Attitude towards telework	3.96 (0.84)	4.06 (0.85)	4.07 (0.78)	4.25 (0.76)	3.83 (0.64)	3.74 (0.66)
Environmental distraction (EGID) (at the office)	2.79 (0.63)	2.91 (0.82)	2.89 (0.78)	2.89 (0.91)	2.64 (0.87)	2.80 (0.98)
Environmental distraction (EGID) (at home)	1.94 (0.31)	1.80 (0.59)	1.66 (0.68)	1.65 (0.67)	1.87 (0.74)	1.82 (0.69)
Environmental satisfaction (at the office)	3.80 (0.61)	3.90 (0.53)	4.01 (0.57)	3.96 (0.68)	3.92 (0.60)	3.94 (0.71)
Environmental satisfaction (at home)	4.37 (0.51)	4.21 (0.73)	4.04 (0.75)	4.27 (0.65)	3.58 (0.73)	3.92 (0.68)
Environmental control (at the office)	3.19 (0.59)	3.05 (0.76)	3.19 (0.74)	3.09 (0.72)	3.69 (0.61)	3.73 (0.69)
Environmental control (at home)	4.13 (0.49)	4.39 (0.71)	3.97 (0.70)	4.09 (0.63)	3.55 (0.75)	3.86 (0.67)
Self-rated Job Performance	3.89 (0.52)	3.95 (0.52)	3.93 (0.46)	4.02 (0.45)	3.84 (0.44)	3.87 (0.48)
Objective Job Performance Index	n/a	n/a	n/a	n/a	100 (0)	100.62 (33.68)

Table 2.5. Descriptive Statistics

hypothesis 2, we found that Δ extent of telework was positive in case of a distraction advantage, and negative in case of a distraction disadvantage. To further support this finding, we used simple slopes tests to find the minimal distraction advantage values for which these slopes are significant. For the knowledge work subsample of Company A, the distraction advantage had to be greater than 1.46 ($\beta=.11, p<.05$) whereas the distraction disadvantage for this organization had no values resulting in significant slopes. For the MEB, the distraction advantage had to be greater than 0.79 ($\beta=.16, p<.05$) and the distraction disadvantage had to be smaller than -1.68 ($\beta=-.50, p<.05$). Again, no significant result was found for the call center subsample of Company A ($\beta=-.24, n.s.$). This means that hypothesis 2 is supported for our knowledge intensive samples only.

Hypothesis 3 posits that a satisfaction advantage interacts with the extent of telework such that (a) the extent of telework positively affects job performance in case of a satisfaction advantage, and (b) the extent of telework negatively affects job performance in case of a satisfaction disadvantage. Table 2.6 (model 4) shows no significant interaction effect ($\beta=-.02, n.s.$) for the knowledge workers of Company A, and neither does table 2.7 (model 4) for the knowledge workers of the MEB ($\beta=-.13, n.s.$). In addition, no significant effect was found for the call center employees of Company A ($\beta=.12, n.s.$), meaning that there is no substantive support for hypothesis 3.

In hypothesis 4 it is stated that a control advantage interacts with the extent of telework such that (a) the extent of telework positively affects job performance in case of a control advantage, and (b) the extent of telework negatively affects

job performance in case of a control disadvantage. Our results do not support this hypothesis. As can be derived from table 2.6 (model 4), the interaction term of the residual change in the extent of telework and control gain on the residual change in self-rated productivity is not significant ($\beta=.05$, *n.s.*) for the knowledge workers of Company A. Similar findings hold for the call center employees of Company A ($\beta=.04$, *n.s.*) and the knowledge workers of the MEB ($\beta=.05$, *n.s.*); the latter result can be found in table 2.7 (model 4).

	Model 1	Model 2	Model 3	Model 4
Step 1: Control variables				
ΔHours Worked	.15	.14	.14	.11
ΔAttitude towards telework	.35**	.27**	.25*	.15
Step 2: Hypothesis 1				
ΔExtent of Telework		.25*	.23	.18
Step 3				
Distraction Advantage			-.09	-.03
Satisfaction Advantage			.10	.19
Control Advantage			.07	-.04
Step 4: Hypotheses 2, 3 and 4				
ΔExtent of Telework * Distraction Advantage				.39*
ΔExtent of Telework * Satisfaction Advantage				-.02
ΔExtent of Telework * Control Advantage				.05
Change in R ²	.15**	.06*	.00	.15**
R ² (Adjusted)	.15 (.12)	.21 (.17)	.21 (.14)	.36 (.26)
F	5.52**	5.33**	2.69**	3.55**

Note. Results based on 71 respondents. *Significance at 5%, **Significance at 1%

Table 2.6. Regression Analysis (ΔSelf-rated Job Performance) for Knowledge Workers, Company A

	Model 1	Model 2	Model 3	Model 4
Step 1: Control variables				
ΔHours Worked	.12	.10	.11	.10
ΔAttitude towards telework	.08	.05	.03	.02
Step 2: Hypothesis 1				
ΔExtent of Telework		.22**	.23*	.18*
Step 3				
Distraction Advantage			-.10	-.10
Satisfaction Advantage			.15	.17
Control Advantage			-.08	-.09
Step 4: Hypotheses 2, 3 and 4				
ΔExtent of Telework * Distraction Advantage				.25**
ΔExtent of Telework * Satisfaction Advantage				-.13
ΔExtent of Telework * Control Advantage				-.05
Change in R ²	.02	.05**	.01	.05*
R ² (Adjusted)	.02 (.01)	.07 (.05)	.08 (.05)	.13 (.09)
F	1.76	4.30**	2.65*	3.00**

Note. Results based on 184 respondents. *Significance at 5%, **Significance at 1%

Table 2.7 Regression Analysis (ΔSelf-rated Job Performance) for the MEB

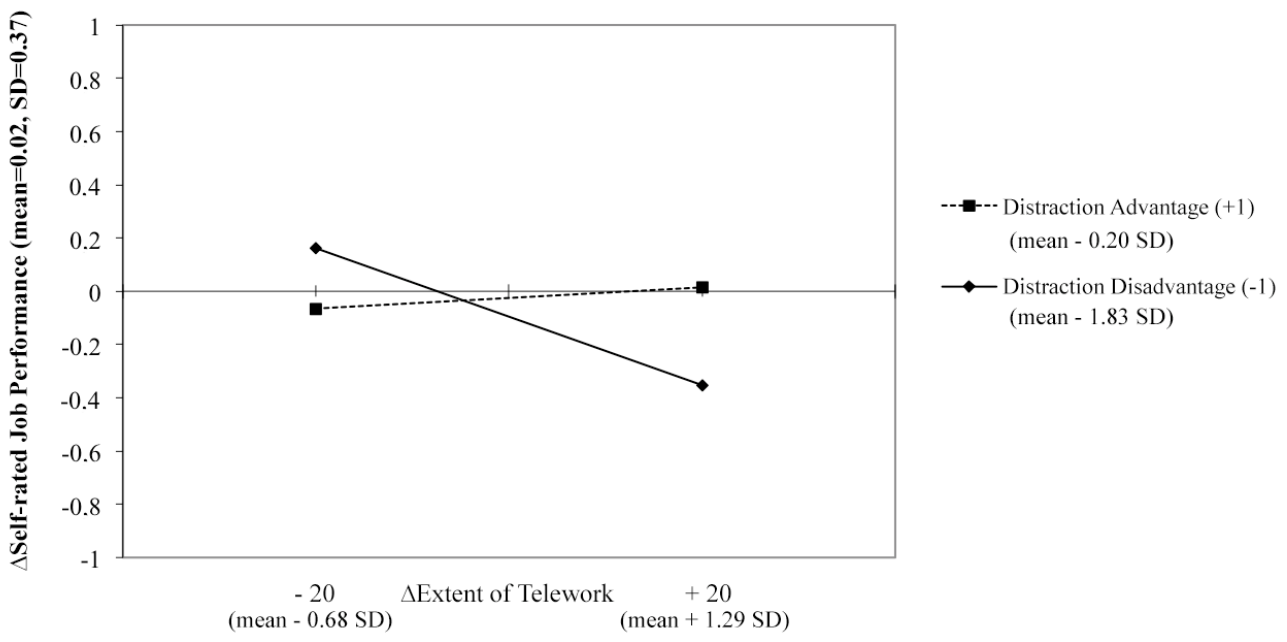


Figure 2.1. Distraction Advantage Interaction Effect at Knowledge Work Group, Company A

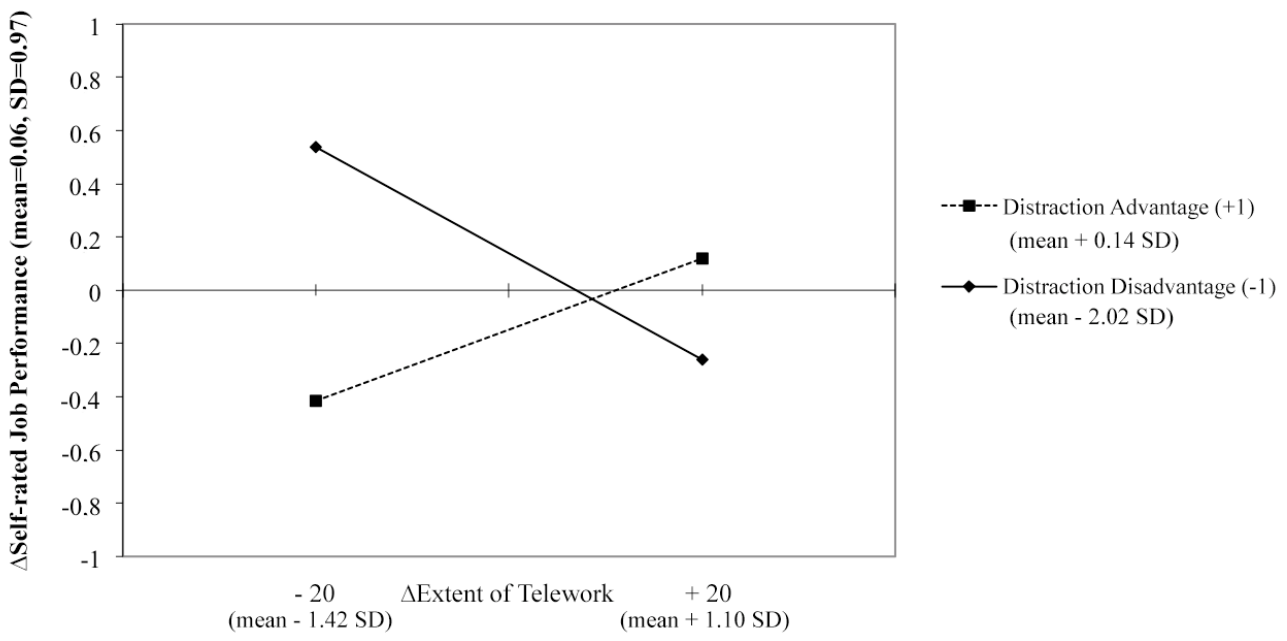


Figure 2.2. Distraction Advantage Interaction Effect at the MEB (Self-rated Job Performance)

2.4.2 Objective Job Performance Results

Table 2.8 provides the results for the hierarchical regression analysis with the objective job performance index of the MEB as criterion variable. These results are comparable to the self-rated job performance results and provide further support for hypotheses 1 and 2. Both the direct relationship ($\beta=.24$, $p<.01$) and the interaction term with distraction advantage ($\beta=.31$, $p<.01$; $\Delta R^2=.07$, $p<.05$; $f^2=.08$) were significant, the other two interaction terms were not. Figure 2.3 provides the simple slope plots for distraction advantage, which were significant when greater than 0.71 ($\beta=6.98$, $p<.05$) or smaller than -2.60 ($\beta=-28.04$, $p<.05$).

	Model 1	Model 2	Model 3	Model 4
Step 1: Control variables				
Δ Hours Worked	.09	.09	.12	.10
Step 2: Hypothesis 1				
Δ Extent of Telework		.24**	.27**	.25*
Step 3				
Distraction Advantage			.00	-.03
Satisfaction Advantage			-.03	.01
Control Advantage			-.13	-.13
Step 4: Hypotheses 2, 3 and 4				
Δ Extent of Telework * Distraction Advantage				.31**
Δ Extent of Telework * Satisfaction Advantage				-.19
Δ Extent of Telework * Control Advantage				-.08
Change in R ²	.00	.07**	.02	.07*
R ² (Adjusted)	.01 (.00)	.07 (.05)	.09 (.04)	.16 (.10)
F	0.87	3.90*	2.03	2.48*

Note. Results based on 115 respondents. *Significance at 5%, **Significance at 1%

Table 2.8 Regression Analysis (Δ Objective Job Performance) for the MEB

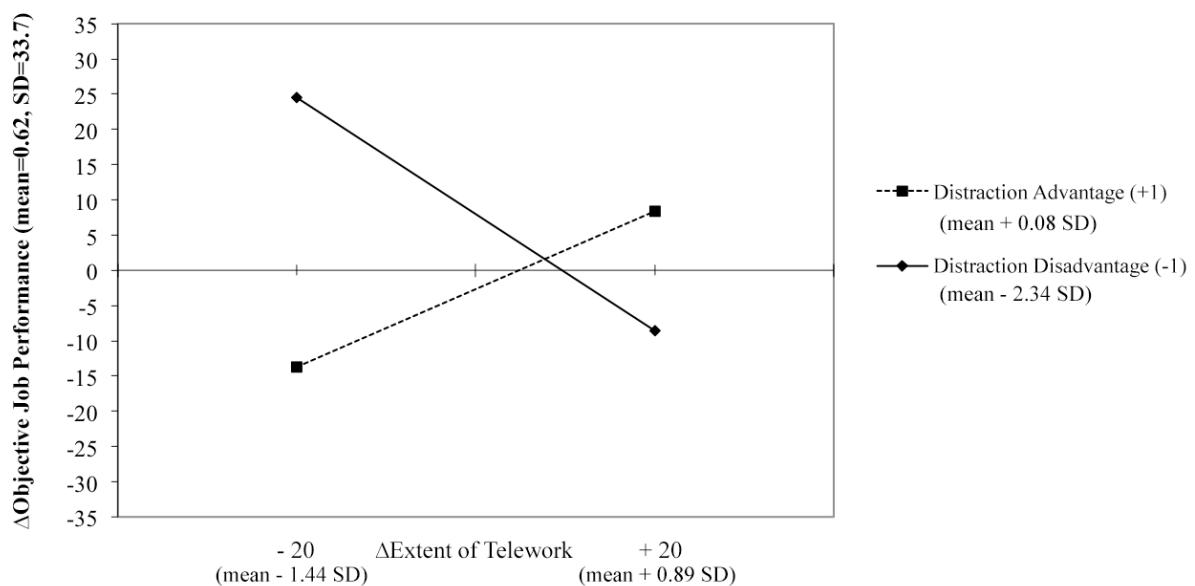


Figure 2.3. Distraction Advantage Interaction Effect at the MEB (Objective Job Performance)

2.5 Discussion

While many practitioners and scholars have alluded to the importance of environmental characteristics for explaining teleworker job performance, only few have articulated a theoretical rationale and none conducted an empirical investigation regarding this relationship (Ng, 2010). Considering the rise of HBT, we developed the concept of telework advantages, proposed a theoretical framework explicating the interaction effect of three such telework advantages (environmental distraction, satisfaction, and control) on the relationship between the extent of telework and job performance, and empirically tested these moderating relationships. In doing so, our study not only answered the call for more research on the impact of (various) organizational physical workspaces on employee outcomes (Ashkanasy et al., 2014), but it also provided much-needed longitudinal insights into the effects of a change in the actual extent of telework through quasi-field experiments.

Our study shows that a change in the extent of telework is directly related to a change in job performance for knowledge workers, but also that this relationship is (in part) contingent on differences in distraction levels between the office and home work environment (i.e. the presence of a distraction (dis)advantage). When taking into account conditions of no distraction advantage, our findings support previous cross-sectional studies that have found no direct relationship between the extent of telework and job performance (i.e. Gajendran et al., 2014; Golden and Veiga, 2008; Golden et al., 2008; Kossek et al., 2006). Consistent with distraction conflict theory (Baron, 1986), however, teleworkers will demonstrate increasing (or decreasing) levels of job performance when a distraction advantage (or disadvantage) exists. For knowledge intensive organizations like the MEB for instance, an average 1-point distraction advantage can result in an objective performance increase of 11% per one day of telework a week. This result exceeds the outcome of the only other (empirical) experimental telework study based on objective data, in which call centre employees self-selecting into a four-day telework program exhibited a 22% performance increase (Bloom et al., 2015).

A reasonable question that arises next is how big of a distraction (dis)advantage is required for significant effects to occur? For the knowledge workers at the two organizations we've studied, the minimal required advantage ranged from +0.71 points to +1.46 points (on a 5-point scale), and the minimal required disadvantage ranged from -1.68 to -2.60. These differences support the view that telework findings are highly context dependent (Allen et al., 2015), and indicate that replications with various job types (differing in characteristics like autonomy, job complexity, and focus requirements) as well as different organizational cultures and policies will be required in order to converge on more broadly generalizable boundary conditions. Our current results may serve as a starting point to that end, and suggest—when factoring in standard deviations—that knowledge workers are less likely to face a performance decrease from a distraction disadvantage than an increase from an advantage.

We also found that satisfaction or control advantages did not interact with the extent of telework—performance relationship, meaning that the existence or achievement of a better fit between overall work requirements and the physical work environment through improvements of environmental satisfaction or control did not drive teleworker job performance. A possible explanation for this finding could be that increased satisfaction or control advantages act as antecedents to the level of distraction advantage instead. Such a model would imply full mediation, which is plausible based on the positive correlations between our three telework advantage variables. Further interactions between these

variables (as hinted by Lee and Brand, 2010) were ruled out after obtaining insignificant test results for three-way interaction effects.

There might, however, be an alternative way in which teleworkers reach adequate levels of work-environment fit: through spatial reflection. Prior telework surveys and qualitative studies show that instead of employers or employees adjusting the work environment to fit *overall* work requirements, employees might actually be adjusting *specific* tasks or work patterns to fit their own ecosystem of work environments (at the office, at home, or elsewhere) (e.g. Halford, 2005; James, 2004; van Heck et al., 2012). Such adjustment behaviours present a fruitful avenue for further empirical investigation, to which Halford's (2005) concept of the hybrid workspace may provide a good starting point.

2.5.1. Practical Implications

For practitioners, our study disputes some of the public rhetoric by company executives on the efficacy of telework (Swisher, 2013; Pepitone, 2013), showing that even part-time HBT can have a substantial positive influence on the job performance of knowledge workers. The important caveat is that this effect is contingent not on the level of distraction at home, but rather on the difference in distraction levels at home and at the office. HBT is thus less likely to lead to performance improvements when organizations provide dedicated offices or focus work areas, as this diminishes the distraction advantage of HBT. For organizations that see telework as an attractive way to cut real-estate costs it is similarly important to realize that not every employee will have a distraction-free work environment and that distraction disadvantages can eventually harm job performance. Solely from a job performance perspective, organizations should thus offer a variety of work environments and practices (such as HBT), so that employees can strategically locate and relocate tasks to wherever they can work on them most effectively. Guiding employees on how to best make use of these different environments and practices is considered crucial, as both organizations in our study provided extensive training programs to prepare their employees for the telework intervention. In terms of facilities or telework requirements, it is important to recognize that the participants in our study were offered the required resources to telework effectively (i.e. a mobile phone, laptop, high speed Internet connection, and communications & collaboration software). Additional investments in facilities or ergonomics resulting in improved environmental satisfaction or control at home seem unwarranted for job performance, at least for cases of part-time HBT in the short to mid-term.

2.5.2. Limitations

With respect to our study's limitations, we should point out that despite our longitudinal research setup with a clear intervention altering our independent variable, we were unable to infer true causality. To do so would require the use of a control group or a staggered implementation of the intervention with multiple waves of data collection—both of which were either not available or not desirable by the companies in our study. Our sample does however include employees who decided not to telework at all (approximately 7% of the participants), representing conditions of no change in the extent of HBT. The specific focus on *home-based* telework, and on situational (rather than individual or social) explanations for teleworker job performance, poses another limitation of our study. Despite HBT being the most prevalent type of telework, this focus potentially limits the generalizability of our findings to more broadly defined types of telework, which may include working on the go, at the customer, or at coworking spaces. Future studies could apply our 'telework advantages' approach across multiple locations to see which characteristics of these working environments are most beneficial to performance. These environments may also offer a variety of additional benefits (such as access to individuals with new

knowledge, skills, or resources) to job performance that have not yet been investigated. As we slowly uncover more individual, relational, and situational factors that ‘make or break’ teleworker performance, these factors should be incorporated in a single study to compare their relative importance. Lastly, we did not include electronic types of environmental distraction, satisfaction, and control in our study. Digital distractions (from e-mail, instant messaging, or (video)conferencing) might for instance mitigate any physical distraction advantage while teleworking, to which new coping strategies to control information and external stimulation could emerge (e.g. Leonardi et al., 2010; Wajcman and Rose, 2011). As our work becomes ever more digitized, it will become increasingly important to investigate the role of digital workspaces in conjunction with physical workplaces.

Chapter 3

Out of Sight, Out of Control?ⁱⁱ

3.1 Introduction

In recent years, the number of employees that substitute part of their typical work hours to work away from their organization's central workplace with the help of ICTs has risen (Allen et al., 2015) and what used to be an idiosyncratic deal reserved for only the most trusted, valuable or 'deserving employees' (Peters et al., 2010; Taskin and Edwards, 2007) is now becoming a common practice. In the United States and European Union, respectively 23 and 15 percent of employees telework at least 'some of the time' (Eurostat, 2016; U.S. Department of Labor, 2015), which poses a potential problem to those who manage these teleworkers: they now face a situation in which they have to re-regulate work in a remote context characterized by reduced visibility and presence (Felstead et al., 2003). Exploratory studies have thus far established various methods of control used in such re-regulation, including behavioural control (Lautsch et al., 2009; Valsecchi, 2006), outcome control (Dambrin, 2004; Halford, 2005; Pearlson and Saunders, 2001; Peters et al., 2010), trust-based (ideological) self-control (Jackson et al., 2006; Peters et al., 2010; Sewell and Taskin, 2015), or an ad-hoc combination of these three methods (Dimitrova, 2003; Felstead et al., 2003; Kurland and Cooper, 2002; Taskin and Edwards, 2007). Due to this absence of consensus regarding the nature of control under conditions of telework (Sewell and Taskin, 2015) as well as a lack of quantitative research regarding the *effectiveness* of the aforementioned control methods in maintaining teleworker performance, we ask ourselves: *'How to best control teleworking employees in order to achieve increased job performance?'*

This particular question gained a lot of public interest in 2013 after the CEOs of several Fortune 500 firms (including Yahoo!, Best Buy, and Hewlett-Packard) announced that they were about to abandon or severely curtail their telework practices by requiring employees to be in the office as much as possible (Hesseldahl, 2013; Pepitone, 2013; Swisher, 2013). It stands to reason that these CEOs considered teleworking employees more valuable to their organizations if they came into the office, implying that (as teleworkers) these employees "[may not have] lived up to their

ⁱⁱ This chapter is based on a working paper by van der Meulen, N., van Baalen, P., van Heck, E., and Mülder, S. 2016. "Out of Sight, Out of Control? Self-Determination, Trust-based Management, and Communication as Drivers of Teleworker Job Performance."

side of the productivity relationship” (Schrage, 2013). Critics claimed that managers of these Fortune 500 firms lost trust in their teleworkers over time, and that in order to regain control and rebuild trust they erroneously reduced employee autonomy—an approach considered out of touch with the requirements of a modern, knowledge-intensive workforce (Schwartz, 2013; Valcour, 2013). Such statements point towards the existence of an implicit psychological contract in which managers provide employees with self-determination in return for greater or equal job performance. Yet they also assume a post-bureaucratic view of telework—in which remote employees are fully ‘emancipated’ from control and operate out of commitment to the organization as a whole (Maravelias, 2003)—that fundamentally overlooks the importance of non-managerial control types in a remote work context. We posit that rather than a fully emancipated or technically superior way to conduct work, telework is typically embedded in (and enabled by) a hierarchical relationship, in which a manager’s level of trust in an employee ultimately results in a form of employee self-control that uses self-determination as its primary driver. Such self-control may very well co-exist with other methods of control (enacted by managers and/or peers), as long as these methods do not fundamentally impinge on the employee’s level of self-determination.

Prior studies have already established that the manager-teleworker relationship interacts with the extent of telework to influence job performance (Gajendran et al., 2014; Golden and Veiga, 2008), and meta-analytic studies call for additional studies that test the likely operation of alternative moderators—preferably in non-idiosyncratic settings (Gajendran and Harrison, 2007; Martin and MacDonnell, 2012). In this paper, we argue that teleworker performance benefits can only be realized when telework is effectively controlled. We therefore combine qualitative research findings on this topic with theories of management control (Eisenhardt, 1985; Ouchi, 1979; Snell, 1992), self-regulation (Bandura, 1991), and psychological contracts (Rousseau and McLean Parks, 1993) to hypothesize types of control which are most effective in realizing teleworker job performance. We test our hypotheses by means of structural equation modelling, using a sample of 1,450 employees of four public and private organizations that have institutionalized telework arrangements in place. By combining the self-reported job performance data of these employees with manager reports, we do not only provide much-needed insight into how the extent of telework is related to job performance (Allen et al., 2015) but also on the conditions under which this relationship might occur.

3.2 Theory and Hypotheses

Ever since its origin in the 1970s (Nilles et al., 1976) telework has been heralded as a source of various personal and organizational benefits, such as increased job satisfaction, improved work—life balance, and higher retention rates (Boell et al., 2013). Nonetheless, teleworkers will have to perform at least as well as their ‘traditional office’ colleagues in order for organizations to consider telework a viable work practice. Reasons for telework performance benefits or drawbacks are multiple and typically depend on the teleworking context. For instance, telework can offer a reduction (e.g. Bloom et al., 2015) or an increase (e.g. Pyöriä, 2003) in distractions that might impact focus work. Similarly, it can allow teleworkers to effectively adjust work to their individual preferences and circadian rhythms (Gajendran and Harrison, 2007), but at the possible cost of collective identity and relationships required for effective knowledge-intensive work (Golden and Raghuram, 2010). Teleworkers are also said to work harder and more hours (even when sick) (Bloom et al., 2015;

Dimitrova, 2003), though management typically fears teleworkers offers a “slacker’s charter” in which teleworkers will become detached from the organization, causing reduced motivation and/or reduced work effort (Felstead et al., 2003).

Overall, meta analytic studies (Gajendran and Harrison, 2007; Martin and MacDonnell, 2012) indicate small but positive performance outcomes for telework practices as a whole, but these findings are rife with heterogeneity and lack details about the actual *extent* of telework (i.e. time spent working away from the central office). In the past decade there have been only four studies that have incorporated this notion of the extent or frequency (intensity) of telework in performance-related research: all of these studies show that the extent of telework is not directly related with job performance (Gajendran et al., 2014; Golden and Veiga, 2008; Golden et al., 2008; Kossek et al., 2006). Yet there are findings indicating that this effect is contingent on contextual issues, such as the manager-teleworker relationship (Gajendran et al., 2014; Golden and Veiga, 2008). To further examine other potential factors that might similarly alter the performance impact of the extent of telework (as suggested by Allen and colleagues (2015)), we direct our focus to one of the major challenges of telework: effective (managerial) control practices (Boell et al., 2013).

Telework decouples work from a central workplace, causing employees to continuously reconfigure their work across multiple locations (Halford, 2005). Such spatial hybridity not only has implications for the employee and his/her work practices, but also for the organization and (pre-existing) ways of managing work. After all, traditional management practices relied heavily on the physical boundaries of the office—where employees were visible and thus easily observed—to adjust, coordinate, divide, and evaluate work (Dambrin, 2004). The removal of these boundaries means that the focus of control and strategies of regulation have to change: it is typically suggested a shift has to take place towards management of the work rather than the worker, in an environment where trust is the norm (Lamond, 2000; Pearlson and Saunders, 2001; Peters et al., 2010). Whereas such a change does not alter the (exploitative) nature of the employment contract itself (Sewell and Taskin, 2015), it does alter the psychological contract: an agreement in which the expectations and obligations of the manager (as an agent of the organization) and the employee are outlined (Rousseau and McLean Parks, 1993). More specifically, teleworkers will expect increased self-determination from managers (hence the required trust), for which managers will expect a certain level of performance (Felstead et al., 2003; Peters et al., 2010). This psychological contract remains intact as long as both the manager and employee uphold their obligations, but will result in negative behaviours when contributions have been insufficiently reciprocated (Herriot et al., 1997; Morrison and Robinson, 1997; Rousseau and McLean Parks, 1993). While such a condition might therefore suggest a relationship devoid of any control, we argue that the opposite is true: it forms the basis for ‘management through exchange’ (Ashford et al., 2007) in which teleworkers develop a socio-ideological (clan) type of self-control that can co-exist alongside other types of control as outlined by management control theory (Eisenhardt, 1985; Ouchi, 1979; Snell, 1992). In subsequent sections, we will outline the recent findings on clan-based, behaviour-based, and outcome-based control types in the context of telework, as well as how they may be enacted by managers, peers, and teleworkers themselves to stimulate job performance.

3.2.1 Clan: Trust-Based Self-Determination

Practitioners and management scholars alike tend to refer to trust as an unavoidable prerequisite for telework (e.g. Felstead et al., 2003; Peters et al., 2010; Schwartz, 2013): without it, telework would not be possible (Lamond, 2000). We posit, however, that trust forms the basis for creating and sustaining a psychological contract, in which managers provide

teleworkers a certain degree of self-determination to decide for themselves how to best execute one's job. As such, trust and self-determination are not prerequisite conditions for telework but for *successful* telework, which requires a distinction between the actual practice of telework (i.e. the implied level of self-determination based on the psychological contract) and the level of self-determination as experienced by the teleworker. This distinction is not merely conceptual: even in organizations with formal institutionalized telework policies, managers have been shown to place boundaries on teleworker self-determination (Peters et al., 2010)—typically in the form of digital surveillance, or by restricting teleworking days or tasks (e.g. Felstead et al., 2003; Kurland and Cooper, 2002; Sewell and Taskin, 2015; Taskin and Edwards, 2007). Such boundaries not only limit the various motivational benefits of self-determination (see Ryan and Deci, 2000), but also constitute a breach of the psychological contract between the manager and the employee. Managers should thus be careful in how they treat their teleworkers, as unmet obligations or feelings of inequity may result in cynicism (e.g. Felstead et al., 2003) and lower performance (e.g. Lautsch et al., 2009).

Organizations benefit from a psychological contract that is intact, as teleworkers are obligated to maintain their performance in exchange for self-determination. In some cases, teleworkers might even accede to increased performance requirements (e.g. Tremblay, 2002). Yet while the self-interest and morality of not breaking the psychological contract might by themselves constitute strong motivators for performance in this context, the self-determination involved can also provide the opportunity for self-control. In the absence of forms of (direct) control from managers and peers, self-control will affect performance through the working of three sub-functions (Bandura, 1991) which have been identified in telework practice through exploratory studies involving self-determining teleworkers. First, self-control involves teleworker self-monitoring for deviant behaviour or under-performance relative to professional or organizational norms (e.g. Jackson et al., 2006; Taskin and Edwards, 2007). Such close self-monitoring is likely to spur a natural tendency to set performance goals of progressive improvement (Bandura, 1991) and helps teleworkers to focus on aspects that are relevant for performance attainment. Second, judgement of (deviant) behaviours relative to own personal standards and environmental circumstances takes place. Teleworkers begin to reflect on (formerly) taken for granted values (e.g. Sewell and Taskin, 2015) and become more conscious of their responsibilities (e.g. Dambrin, 2004) as they process or even internalize organizational standards and develop their own reference framework for performance. This incorporation of organizationally prescribed behaviours, norms, and values is what makes self-control a form of clan control (Eisenhardt, 1985; Ouchi, 1979; Snell, 1992). Third, teleworkers will experience affective reactions (such as pride or satisfaction) from the judgement of their own behavioural actions (e.g. Jackson et al., 2006), stimulating performance even further. When we combine this regulating mechanism of self-determination with the risks of breaching the psychological contract, we derive at the following hypothesis:

Hypothesis 1. An employee's level of self-determination interacts with the extent of telework such that (a) the extent of telework positively affects job performance when the level of self-determination is high, and (b) the extent of telework negatively affects job performance when the level of self-determination is low.

The question is, however, whether self-determination is sustainable in a telework context. This is because telework can make it more difficult for managers and teleworkers to sustain trusting relationships, which are required for self-determination (Gomez and Rosen, 2001; Lamond, 2000). Studies on the nature and functioning of such relationships have shown that trust is built on behavioural evidence (McAllister, 1995), which is obtained through frequent and close interaction (Becerra and Gupta, 2003; Lewis and Weigert, 1985). Teleworkers' reduction in visibility and presence at the

office may complicate this process (e.g. Dambrin, 2004; Dimitrova, 2003; Sewell and Taskin, 2015), meaning that telework may ultimately endanger the self-determination it requires. This is expressed in the following hypotheses:

Hypothesis 2a. The extent of telework negatively affects the employee's relationship with his/her manager.

Hypothesis 2b. The employee's relationship with his/her manager positively affects the manager's trust in the employee.

Hypothesis 2c. The manager's trust in the employee positively affects the employee's level of self-determination.

Communication technologies can help to counteract this negative effect in two ways: by maintaining communication frequency and by maintaining communication synchronicity. The latter is considered important because synchronous communication provides the most information upon which to establish common ground (Dennis et al., 2008) as well as assess intentions and build relationships (Jackson et al., 2006). Managers have therefore been reported doing regular remote check-ins (Lautsch et al., 2009) or “virtual walk abouts” (Halford, 2005: p.30) in which they address work as well as personal issues to prevent isolation and check whether employees might be struggling. Similarly, teleworkers have been found to undertake concerted efforts to check in with managers whenever they are in the office (Dimitrova, 2003) and regularly engage in electronic signalling behaviours meant to demonstrate their honesty and reliability (Sewell and Taskin, 2015; Taskin and Edwards, 2007). This brings us to the following hypothesis:

Hypothesis 3. An employee's (a) frequency of communication and (b) level of communication synchronicity with his/her manager can reduce the negative effect of the extent of telework on the employee's relationship with his/her manager.

3.2.2 Behaviour: Frequency and Synchronicity of Communication

Aside from trust-based self-determination, there are other control types that might concurrently ensure teleworker performance (Taskin and Edwards, 2007). One such type is behavioural control, which traditionally focused on the work process through procedures, rules, and supervision to appraise employee actions (Eisenhardt, 1985; Ouchi, 1979; Snell, 1992). This type of control benefits from co-location, as visibility and presence allow managers to assess and adjust behaviours over time. In a telework context, however, managers need to devise new behavioural control mechanisms.

The most obvious option to recreate the visibility of employee work activities in a remote situation would involve intensified reliance on ICT surveillance (e.g. Dambrin, 2004; Sewell and Taskin, 2015; Valsecchi, 2006). Most existing ICT systems (such as e-mail, electronic calendars, collaboration suites, or other enterprise systems) have latent surveillance capabilities that can be used to create an ‘electronic panopticon’ (a state of constant surveillance) that might curb opportunistic behaviour by employees (Felstead et al., 2003). Yet the practical effectiveness of this approach is questionable and typically regarded of limited practical use (Dimitrova, 2003; Halford, 2005; Lamond, 2000; Valsecchi, 2006). For one, employees are expected find ways to collectively disrupt these systems (Dambrin, 2004). More importantly, however, teleworkers will consider work surveillance a breach of their psychological contract, as it forms a fundamental sign of distrust and a potential violation of their self-determination (Felstead et al., 2003; Sewell and Taskin, 2015).

Instead, an approach focused on frequent and synchronous interaction with employees is expected to yield more positive results. Whereas remote surveillance is authoritarian in nature and characterized by one-sided information gathering, communication is less likely to constitute a breach of the psychological contract as it is more equitable and already required for maintaining a good working relationship (Lautsch et al., 2009). Frequent interaction may thus not only help teleworkers to feel more supported, visible, and less isolated, but it may also help managers in their assessment, adjustment, and coordination of teleworker's activities (Dimitrova, 2003; Kurland and Cooper, 2002; Taskin and Edwards, 2007). Considering how this type of communication is geared towards mutual sense-making, it would be best supported by synchronous media that provide fast message transmission and a rich context for better understanding (Dennis et al., 2008). These notions are reflected in the following hypotheses:

Hypothesis 4. An employee's frequency of communication with his/her manager interacts with the extent of telework such that (a) the extent of telework positively affects job performance when the frequency of communication is high, and (b) the extent of telework negatively affects job performance when the frequency of communication is low.

Hypothesis 5. An employee's communication synchronicity with his/her manager interacts with the extent of telework such that (a) the extent of telework positively affects job performance when the communication synchronicity is high, and (b) the extent of telework negatively affects job performance when the communication synchronicity is low.

3.2.3 Outcome: Results-Based Control and Peer Monitoring

Behavioural controls require that managers have a good understanding of the means-ends relationship in order to support employees in carrying out their work behaviour (Snell, 1992). When this is not possible, managers might instead resort to using outcome controls: an approach in which outcome criteria are articulated and employees are rewarded for reaching those outcomes (Eisenhardt, 1985; Ouchi, 1979; Snell, 1992). Telework researchers and practitioners often argue that the success of telework practices in knowledge-intensive contexts is dependent on a control shift from behavioural control to outcome control (Dambrin, 2004; Konradt et al., 2003; Lamond, 2000). By setting a series of short to medium-term targets, managers would not only ensure that teleworkers' goals align with those of the organization, but they would also be able to obtain a rolling picture of employee performance (Felstead et al., 2003). Nonetheless, defining or measuring these short-term outcome targets may be problematic, and managers may not be able to adequately attribute collective efforts to individual employees. Furthermore, this approach poses a risk of reducing self-determination—and thus breaching the psychological contract— (Osterloh and Frey, 2002) as well as short-sighted 'target chasing' in which employees are likely to spend less effort on actions that do not enhance their targeted outcomes (Brynjolfsson, 1994). The latter could be especially problematic in a telework context, where teleworkers might easily lose sight of collective goals or the overall strategic objectives of the organization (Dambrin, 2004; Felstead et al., 2003).

Studies suggest a more effective approach would be for managers to focus on teleworkers' long-term results, and rely on peer monitoring to keep shorter-term performance on shared projects or objectives in check (e.g. Sewell and Taskin, 2015; Taskin and Edwards, 2007). These types of control are not likely to breach the psychological contract, as managers do not fundamentally restrict self-determination. Instead, managers' focus on long-term results serves an informing goal (Osterloh and Frey, 2002), which is expected to work in tandem with self-control as it helps to direct employee attention to those aspects that are relevant for goal attainment. As such, employees are likely to increase work effort to attain their goals (Locke and Latham, 1990). This approach also allows for (positive) feedback regarding

performance, which may reduce psychological strain, increase job satisfaction, and serve as a basis for positive affective reactions (such as pride and self-efficacy)—which would stimulate performance even more (Konradt et al., 2003). Finally, peer monitoring has a potentially dual effect on performance: it can guard against opportunism and self-serving behaviours whilst simultaneously helping to recognize potential work problems in an early stage (thereby reducing process loss) (Saavedra et al., 1993). This brings us to our final hypotheses:

Hypothesis 6. Results-based control interacts with the extent of telework such that (a) the extent of telework positively affects job performance when results-based control levels are high, and (b) the extent of telework negatively affects job performance when results-based control levels are low.

Hypothesis 7. Peer monitoring interacts with the extent of telework such that (a) the extent of telework positively affects job performance when peer monitoring levels are high, and (b) the extent of telework negatively affects job performance when peer monitoring levels are low.

3.3 Data and Methods

3.3.1 Study Setting and Procedures

To test our hypotheses, we sought out organizations that allow for a substantial extent of telework by means of active and institutionalized telework arrangements. The arrangements had to be in place for at least one year and had to enable employees to work away from their central workplace via laptops or desktop virtualization systems (allowing remote access to the corporate desktop environment) with solutions for (unified) communication and collaboration. In addition, the decision to telework had to rest with the employees (in order to avoid selection bias) and there had to be no company restrictions on the extent of telework (in order to ensure variability in our dataset).

Four organizations fit our selection criteria and participated in the study: a private company in the high-tech industry (TechOrg, 675 employees), a private company in the financial services industry (FinOrg, 530 employees), a semi-public agency affiliated with the Dutch department of Health (the Medicines Evaluation Board, or MEB, 302 employees) and a public institution belonging to the Dutch department of Health (HealthOrg, 1622 employees). Additional information required to better understand when telework is most effective (as recommended by Allen et al., 2015) is provided in the following section.

Data collection occurred between Q2 2011 and Q4 2012, using online surveys as the preferred data collection method. In order to stimulate the response rate, all participants received a personalized invitation to fill in the survey. Data confidentiality was assured in the introduction of the survey, and participants were informed that only aggregated findings would be reported back to the participating companies. To ensure data security, the survey was hosted on the researchers' university system. The surveys were available for two weeks, with a single reminder sent to non-respondents exactly one week after the invitation.

3.3.2 Sample

TechOrg is one of the leading global providers in communications technology and services and provided 251 completed questionnaires to our total sample. The participants were all based at one of *TechOrg*'s national headquarters; most of the respondents belonged to its local R&D or professional services departments (respectively 23 and 37%). Other respondents were part of marketing and sales, back office, and support departments. *FinOrg*, a local subsidiary of an international financial services company offering operational leasing and employee mobility solutions, provided 229 completed questionnaires and 493 manager reports to our total sample. Most of the respondents were responsible for the organization's sales (40%) and financial operations (36%); other participants held support functions. The *MEB* and *HealthOrg* are both involved in a research and advisory function to the Dutch department of Health; the former provided 214 completed questionnaires and 273 manager reports to our total sample; the latter provided 776 completed questionnaires.

The demographics of the participants in our sample did not differ significantly from those in the overall population of their respective organizations. At *FinOrg* and the *MEB*, there were no significant differences in manager ratings for respondents and non-respondents. After checking for irregular response patterns, we ended up with a total usable sample of 1450 participants. Forty-six percent of these respondents were female. The mean age for our sample was 44 years (with a normal distribution from 22 to 71 years) and the mean organizational tenure was 8 years (ranging from 0 to 47 years). The majority of respondents were highly educated: 18% had a doctorate degree, 26% had a graduate degree, 35% had an associate degree, 16% had a community college degree, and 5% had a high school diploma.

3.3.3 Measures

In our survey, we relied as much as possible on existing work for our (composite) measures. What follows is an outline of the questions, scales, and/or calculations for each of these measures. Please refer to table 3.1 for an overview of all items for each of the seven composite measures, which were measured with Likert scales ranging from 1= 'completely disagree' to 5= 'completely agree.'

Communication Frequency (with manager). We asked employees to indicate how often they communicate with their manager (including direct face-to-face contact) using a scale consisting of the following items: 'less than once a month,' '1 to 4 times per month,' 'once a week,' 'several times a week,' and 'daily.' We subsequently recoded these categories to respectively 0.5, 2, 4, 12 and 21 times per month.

Communication Synchronicity (with manager). Within the organizations of our study, there were various electronic communication media used to stay in contact with managers while teleworking. These media can be categorized as 1) videoconference, 2) telephone conference, 3) instant messaging, 4) electronic project spaces, and 5) e-mail. Categories can cover several technologies: for instance, telephone calls can take place via an organization's conference room system, via mobile phone, or via a voice-over-IP system. Similarly, technologies can cover multiple media: unified communications and collaboration software—which offers instant messaging as well as video and teleconference possibilities—is an example of this. To obtain a good image of the level of synchronicity of the participants' typical media usage repertoire, we asked them to give an indication of how they typically contact their manager by distributing 100 points across the five aforementioned media categories. This distribution is then multiplied with synchronicity scores for each medium, which are based on five media capabilities: transmission velocity, symbol sets, parallelism, rehearsability, and reprocessability.

(Dennis et al., 2008). These capabilities are ranked on a zero to one scale, where Low/Few=0, Medium=0.5, and High/Many=1. Faster transmission velocity and more symbol sets are related to greater synchronicity, whereas higher levels of parallelism, rehearsability and reprocessability are related to lesser synchronicity. To compute the synchronicity score, these rankings are added to (or subtracted from) a ‘medium’ base score of 2: this results in synchronicity scores ranging from 0 (e-mail/low synchronicity) to 3 (videoconference/high synchronicity). Table 3.2 provides an overview of the media and their capabilities.

Measure	Items
Attitude towards telework	<ol style="list-style-type: none"> 1. Teleworking makes it easier to do my work 2. Teleworking improves my work performance 3. Teleworking allows me to accomplish specific tasks more quickly 4. Teleworking is compatible with most aspects of my work 5. Considering my work activities, I find teleworking useful
Relationship with manager	<ol style="list-style-type: none"> 1. I can rely on my manager when I am confronted with problems at work 2. I get along well with my manager 3. My manager is friendly towards me 4. I have a good relationship with my manager
Manager trust in teleworker	<ol style="list-style-type: none"> 1. My manager sees me as a dedicated employee 2. My manager thinks that I perform appropriately 3. My manager regards me to be a reliable person 4. My manager has every confidence in me
Self-determination	<ol style="list-style-type: none"> 1. I have significant autonomy in determining how I do my job 2. I can decide on my own how to go about doing my work 3. I have considerable opportunity for independence and freedom in how I do my job
Peer monitoring	<ol style="list-style-type: none"> 1. My colleagues and I check amongst ourselves whether everybody continues to work on common projects and objectives 2. My colleagues and I check whether everybody meets their obligations with respect to common projects and objectives 3. The progress of colleagues on common projects and objectives is monitored mutually by my colleagues and I
Results-based reward system	<ol style="list-style-type: none"> 1. I am rewarded for delivering high-quality products or services 2. Pay rises depend on how well I do my work 3. Awards in my department depend on how well employees perform their jobs
Job performance (self-rated/manger-rated)	<ol style="list-style-type: none"> 1. Is an effective employee 2. Is an efficient employee 3. Is a productive employee 4. Satisfied with the quality of work results 5. Meets set deadlines 6. Performance is among the top 25% of the department

Table 3.1. Summary of Composite Measures and Items

<i>Medium</i>	<i>Media Capabilities</i>						<i>Communication Synchronicity¹</i>
	<i>Transmission Velocity (+)</i>	<i>Symbol Sets (+)</i>	<i>Parallelism (-)</i>	<i>Rehearsability (-)</i>	<i>Reprocessability (-)</i>	<i>Score</i>	
Videoconference	High	Few-Medium	Low-Medium	Low	Low	3	High
Telephone conference	Medium-High	Few	Low-Medium	Low	Low	2.5	Medium
Instant messaging	Medium-High	Few-Medium	Low-Medium	Medium	Medium-High	1.5	Medium
Electronic project space	Low-Medium	Few-Medium	Medium	High	High	0.5	Low
E-mail	Low-Medium	Few-Medium	High	High	High	0	Low

¹Note: In case of ranged rankings (e.g. Few-Medium), the highest ranking is used for the calculation of the synchronicity score.

Table 3.2. Media Capabilities and Communication Synchronicity Score

<i>Measure</i>	<i>Mean</i>	<i>SD</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
1. Work hours (control)	38.37	7.90	1											
2. Attitude towards telework (control)	3.49	0.89	0.117**	0.819										
3. Extent of telework	21.24	20.40	0.225**	0.360**	1									
4. Communication frequency	9.57	7.00	0.106**	0.072	0.005	1								
5. Communication synchronicity	0.74	0.53	0.155**	0.003	0.074**	0.132**	1							
6. Relationship with manager	4.06	0.64	-0.032	0.010	-0.073**	0.048	0.030	0.885						
7. Manager trust in teleworker	4.11	0.55	0.070**	0.043	0.001	-0.016	0.015	0.544**	0.882					
8. Self-determination	3.99	0.58	0.128**	0.120**	0.105**	-0.009	-0.001	0.322**	0.444**	0.792				
9. Results-based control	3.15	0.81	0.014	0.124**	0.130**	0.005	0.017	0.262**	0.208**	0.145**	0.815			
10. Peer monitoring	3.18	0.71	-0.006	0.081**	0.045	0.089	0.029	0.140**	0.110**	0.021	0.240**	0.826		
11. Job performance (self rated)	3.79	0.48	0.128**	0.150**	0.047	-0.008	0.042	0.148**	0.386**	0.261**	0.054	0.059*	0.716	
12. Job performance (manager rated)	3.86	0.73	0.170**	-0.011	-0.026	0.101*	0.042	0.205**	0.338**	0.235**	0.086	-0.001	0.275**	0.829

*Significance at 5%, **Significance at 1%

Table 3.3. Square Root of AVE (Diagonal) and Correlation Between Variables (Off-Diagonal)

Extent of telework. To assess the extent of telework, we asked respondents to indicate the proportion of an average workweek they typically spend working outside of the office. Past studies have shown that this measure is comparable to those based on the average number of hours spent teleworking per week (Golden and Veiga, 2008).

Job performance. Self-rated and manager-rated job performance levels were measured using six items adapted from an overall productivity measure (Staples et al., 1999).

Manager trust in teleworker. We developed a new four item measure based on Dietz and Den Hartog's (2006) overview of the measurement of trust inside organizations in order to measure the extent to which a manager trusts an employee (general/competence-based).

Peer monitoring. The extent to which employees monitor each other's work efforts on shared projects and objectives is measured using three items from a peer monitoring measure (Langfred, 2004).

Results-based reward system. The extent to which employees are rewarded based on their work outcomes was measured using three items from the Federal Human Capital Survey (U.S. Office of Personnel Management, 2009).

Relationship with manager. The extent to which a manager and employee have a good working relationship was measured using four items adapted from a supervisor social support measure (Karasek et al., 1998).

Self-determination. The extent to which the employee can decide for oneself how to do one's job was measured using a three-item self-determination measure (Spreitzer, 1995).

Control variables. To ensure that changes in the level of self-rated job performance were not conflated with changes in the level of production, we asked respondents to indicate the average number of hours per week that they are generally busy with work (including overtime, but excluding commutes). We also included a measure that asks for one's attitude towards telework to check if changes in self-rated job performance are not the result of an extremely positive or negative stance towards telework. This measure is based on an 'individual impact [of an information system]' measure (Iivari, 2005).

3.4 Results

3.4.1 Measurement Model Assessment

Convergent and discriminant validity as well as internal consistency of all the multiple item measures were evaluated using covariance-based structural equation modelling (via AMOS version 22) prior to testing the structural model according to procedures recommended by Gefen, Straub & Boudreau (2000). The measurement model consisted of the seven composite measures described in table 3.2 and showed adequate fit statistics ($\chi^2/df = 2.30$, NFI = 0.96 CFI = 0.98, TLI = 0.97, RMSEA = 0.03).

Table 3.3 provides an overview of the descriptives and correlations between measures, with the square root of each measure's average variance extracted (AVE) on the boldfaced diagonal. This table shows that for each measure the AVE exceeds 0.5 (Bagozzi and Yi, 1988; Fornell and Larcker, 1981), and all square root of AVE scores are markedly greater than the intercorrelations between measures, which indicates good discriminant validity. Furthermore, an analysis of the factor loadings shows that each item loads well on its intended measure, with all loadings over the minimal

threshold of 0.5 and all but two loadings well over the recommended threshold of 0.7 (Hair et al., 2009). Sufficient discriminant validity was established by comparing each item's factor loading with cross-loadings on other measures, which were all well below the loadings on the intended measure. In addition, composite reliability (all >0.83) and Cronbach alpha scores (all $\alpha > 0.84$) were well above the recommended cut-off points (Hair et al., 2009), indicating good reliability.

Because this study largely relies on self-reported data collected through single (cross-sectional) surveys, there is a potential risk of common method variance causing systematic measurement errors. To test for the presence of common method variance, we assessed the change in factor loadings after including a common latent factor (Podsakoff et al., 2003). This analysis showed that the inclusion of method factor loadings affected substantive loadings on latent measures by less than 10%. Furthermore, the squared factor loadings on the common latent factor were close to zero. While these results cannot exclude common method variance completely, they do suggest that common method variance is not a concern and thus unlikely to obfuscate the interpretation of the results (Williams et al., 2003).

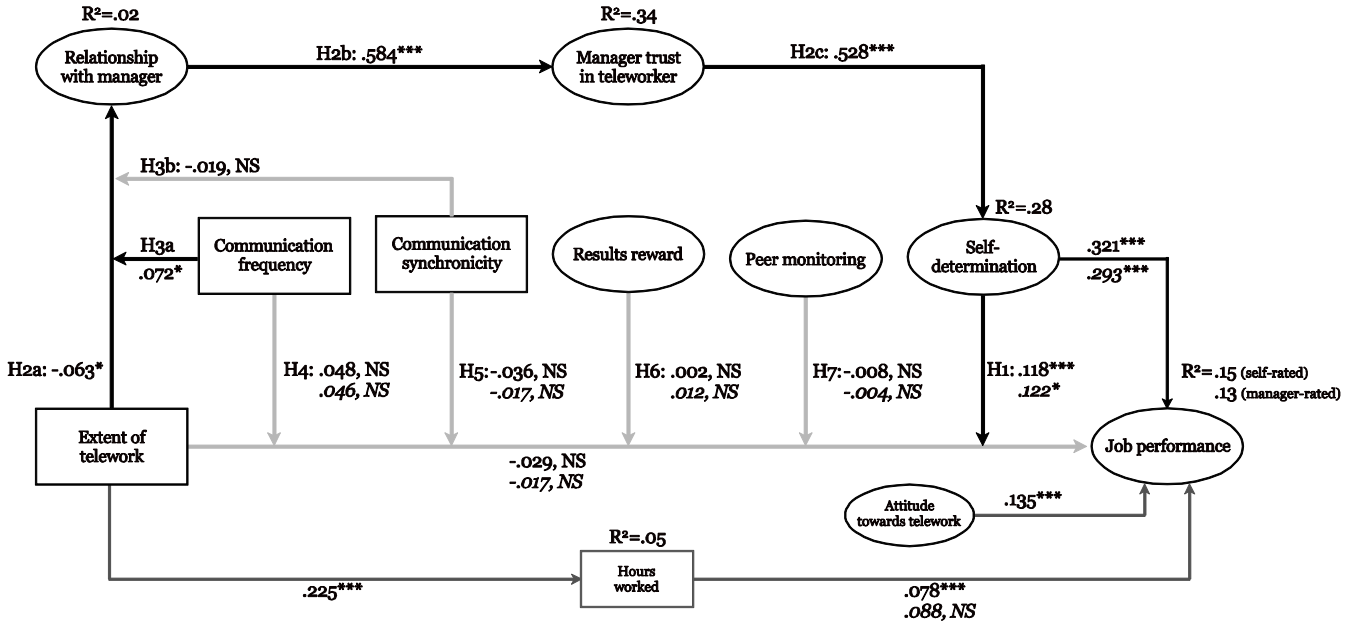
3.4.2. Structural Model Assessment

For the structural models, we used the latent measures as described earlier, combined with paths in line with our hypotheses. New latent interaction measures with orthogonalized (residual centred) product indicators were added to the models to test our hypothesized interaction effects (as per Little et al., 2006). This resulted in models with acceptable fit statistics for self-rated job performance ($\text{Chi}^2/\text{df} = 2.45$, $\text{NFI} = 0.94$, $\text{CFI} = 0.96$, $\text{TLI} = 0.96$, $\text{RMSEA} = .03$) and manager-rated job performance ($\text{Chi}^2/\text{df} = 2.00$, $\text{NFI} = 0.95$, $\text{CFI} = 0.98$, $\text{TLI} = 0.97$, $\text{RMSEA} = .03$). Figure 1 summarizes the model testing results. These models are able to explain 15% of variance in self-rated job performance and 13% of variance in manager-rated job performance.

Figure 3.1 shows that of the mechanisms of control, only self-determination significantly interacted with the extent of telework to affect job performance. This means that we found no support for hypotheses 4, 5, 6, or 7. In accordance with hypothesis 1, the latent interaction measure between the extent of telework and self-determination showed a significant positive relationship with both self-rated and manager-rated job performance. To aid in the assessment of this interaction effect, we plotted simple slopes for low (0) as well as high (60) levels of the extent of telework and for low (3) as well as high (5) levels of self-determination in Figure 3.2 (the interaction pattern and effect size are similar for self-rated and manager-rated performance). Simple slopes tests indicate that a high level of self-determination is required for telework to have a positive effect on job performance ($\beta = .15$, $p < .001$), whereas a low level of self-determination has a detrimental effect ($\beta = -.17$, $p < .001$). In addition to the interaction effect, self-determination was also the only measure to directly influence self-rated ($b = 0.32$, $p < 0.001$) and manager-rated ($b = 0.29$, $p < 0.001$) job performance.

As formulated in hypothesis 2c, the level of self-determination is dependent on the manager's trust in the employee ($\beta = .53$, $p < .001$, $R^2 = .53$). In turn, this trust is positively affected by the employee's relationship with his/her manager ($\beta = .58$, $p < .001$, $R^2 = .34$), which can itself be negatively affected by the extent of telework ($\beta = -.06$, $p < .05$, $R^2 = .02$). This means that hypotheses 2a and 2b are similarly supported. Frequent ($\beta = .07$, $p < .05$) but not synchronous ($\beta = -.02$, NS) communication interacts with the extent of telework to affect the employee's relationship with his/her manager, supporting hypothesis 3a only. Figure 3 illustrates this interaction effect for the lowest (0.5) and highest (21) levels of our frequency scale; simple slopes tests show that a high frequency of communication can negate the negative effect of the

extent of telework on the employee’s relationship with his/her manager ($\beta=.03$, *NS*), whereas a low frequency of communication can exacerbate this effect ($\beta=-.10$, $p<.01$).



Note. Squares represent variables and ellipses represent composite measures. Italicized numbers represent estimates for manager-rated job performance. N=1,450 (self-rated job performance) and N=404 (manager-rated job performance). *Significance at 5%, **Significance at 1%, ***Significance at 0.1%

Figure 3.1. Standardized parameter estimates of the hypothesized model

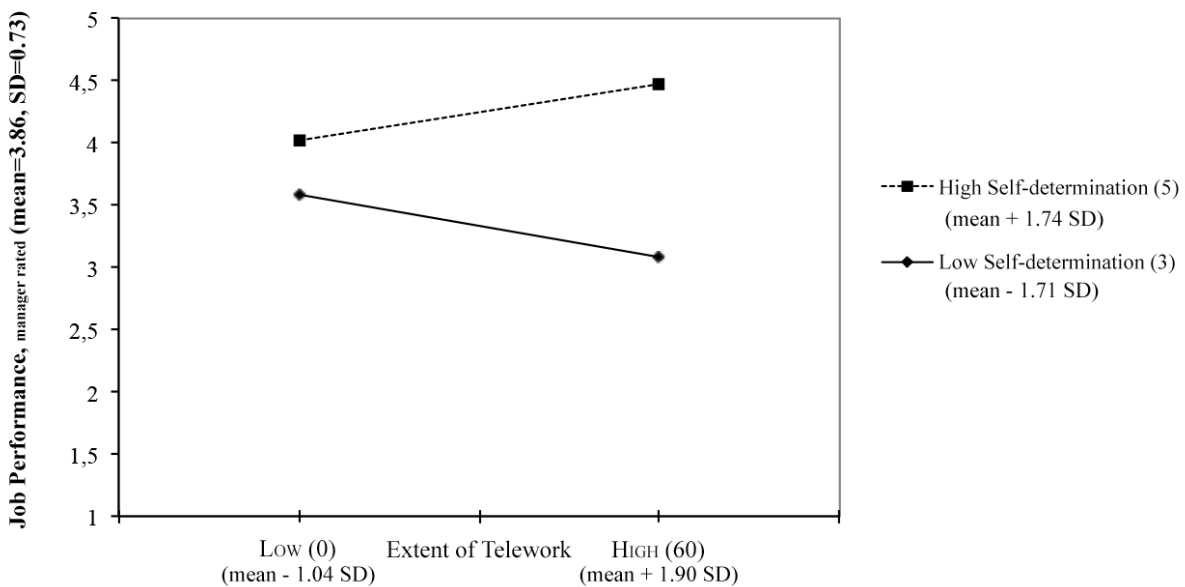


Figure 3.2. Interaction Effect of the Extent of Telework and Self-Determination on Manager-Rated Job Performance

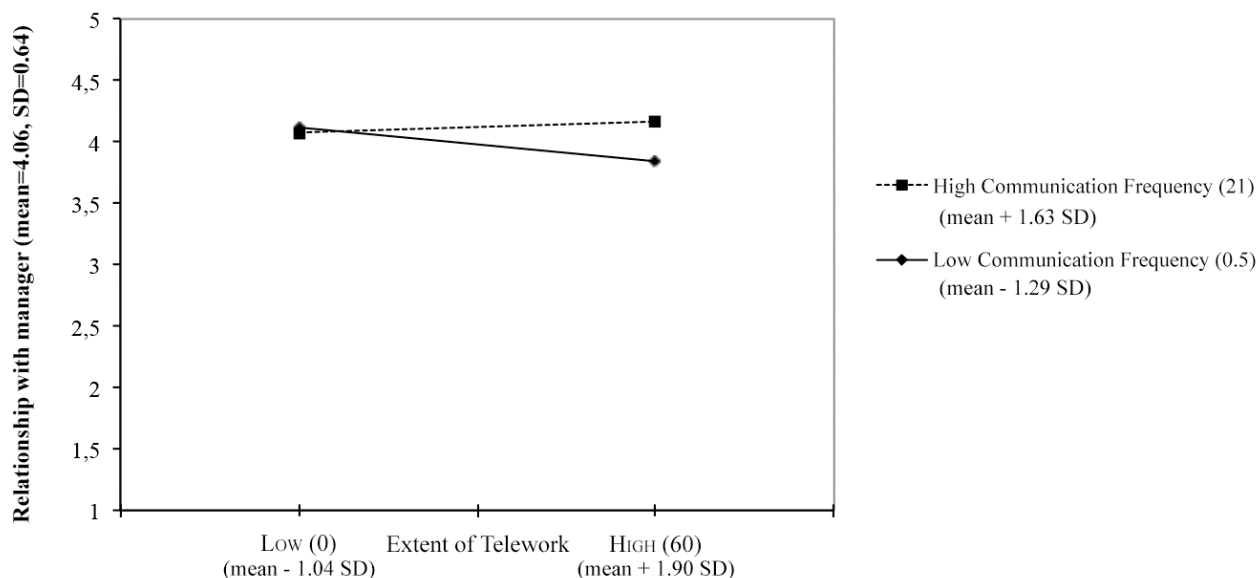


Figure 3.3. Interaction Effect of the Extent of Telework and Communication Frequency on Relationship with Manager

3.5 Discussion

The aim of this study was to quantitatively examine the effectiveness of methods of behavioural, output, and clan-based control for achieving increased job performance from employees in a telework context. Despite only selecting types of control that do not fundamentally breach the psychological contract between the manager and employee, we found that frequent as well as synchronous communication, results-based reward systems, and peer monitoring practices do not relate to teleworker job performance in any capacity. Instead, we found that self-determination is directly related to job performance, and that high levels of self-determination (scoring at least 4.22 on a 5-point scale) are required for the extent of telework to have any positive effect on job performance. Conversely, when the level of self-determination is low (below 3.91 on a 5-point scale), the extent of telework will have a negative effect on job performance. We also found that the level of self-determination can be negatively affected by the extent of telework through a serial mediation chain consisting of an employee's relationship with his/her manager and (subsequently) the manager's trust in the teleworking employee. Frequent communication between the manager and the employee can help to remedy this negative chain, however, as the significant negative effect of the extent of telework on the relationship between the manager and employee disappears when the manager and employee communicate at least several times a week. These findings provide several important contributions to theory and practice.

3.5.1 Theoretical Contributions

First of all, this study contributes to our understanding of management control theory (Eisenhardt, 1985; Ouchi, 1979; Snell, 1992) in a telework context. More specifically, we show that the behaviour and output-based control mechanisms that have been established by several exploratory studies (e.g. Dambrin, 2004; Halford, 2005; Lautsch et al., 2009; Pearlson and Saunders, 2001; Peters et al., 2010; Valsecchi, 2006) are generally ineffective in controlling teleworker job performance. Since we also found no direct effect of these control mechanisms on job performance, we can further assert

that this ineffectiveness may not be due to a potential incompatibility with telework but rather due to the characteristics of those who telework. As in our study, most typical teleworkers can be classified as highly educated knowledge workers (Moore et al., 2011), whose work is generally characterized as interdependent, novel, and non-routine (Davenport, 2005). Teleworking employees might therefore communicate directly with their peers rather than with their manager to coordinate work or obtain support, as peers are more likely than managers to have a good understanding of the complexity of the means-ends relationship. Accordingly, teleworkers are best understood as being ‘in control’ of their own work, but also of their own regulation. Externalized control mechanisms (either enacted by managers or peers) based on goal alignment and the prevention of opportunistic self-serving behaviours (Eisenhardt, 1989) are rendered moot, as psychological contracts and internalized, ideological forms of regulation take its place.

Which brings us to our next contribution: by conceptually separating the level of self-determination from the extent of telework, we were able to demonstrate the (de)motivational potential of a psychological contract in which a manager and teleworking employee are expected to uphold obligations of (respectively) self-determination and job performance. While several studies have alluded to ‘management through exchange’ (Ashford et al., 2007) or the potential importance of psychological contracts in a telework context (e.g. Clear and Dickson, 2005; Harris, 2003; Jaakson and Kallaste, 2010), there have been none (to our knowledge) that have actually quantified the performance effects of a contract that is either upheld or breached by the manager. As our results support psychological contract theory (Rousseau and McLean Parks, 1993), we subsequently question a pervasive notion in the agency theory-led discussion on teleworker control: the assumption of employee shirking. Such a lack of shirking was evidenced by a positive relationship between the extent of telework and number of hours worked, and a lack of a direct relationship with job performance: on average, full-time teleworkers thus perform just as well as those who do not telework at all—even under conditions of infrequent communication with the manager, low peer performance monitoring, and no outcome reward systems. Yet this does not mean that telework is a post-bureaucratic practice in which employees are ‘beyond control.’ Instead, as upholding the obligation of the psychological contract becomes an important goal, it may result in a form of employee self-control that uses self-determination as its primary vehicle. The positive job performance effects of high levels of self-regulation paired with a high extent of telework support this notion, which is in line with the theory of self-regulation (Bandura, 1991) and supports prior qualitative findings (Jackson et al., 2006; Sewell and Taskin, 2015; Taskin and Edwards, 2007). As such, our findings offer exciting new directions for further research on teleworker self-control.

3.5.2. Managerial Contributions

Our investigation addressed how to best control teleworking employees in order to achieve increased job performance, and thereby resulted in straightforward practical advice to managers. First we have discussed managerial practices that should be avoided, as they would limit self-determination and thereby constitute a breach in the psychological contract with employees. These practices include inequitable treatment, work monitoring through ICTs, or short to medium-term target setting. Furthermore, we have identified practices that do not constitute a breach in the psychological contract but have no demonstrated effect on teleworker job performance: behavioural control through frequent or synchronous communication and output-based control via results-based reward systems. Rather than focusing on controlling teleworking employees, we strongly advise managers to support employees through frequent communication (ideally several times a week). This will help to maintain a trusting relationship with their employees, which forms the basis for the provision of employee self-

determination. We advocate that managers provide employees with very high levels of such self-determination, as only absolute freedom to decide for themselves how to best do their jobs is likely to result in increased teleworker job performance and prevents negative work behaviours.

Yet while our findings might provide managers with a 'base level of trust' and some level of assurance that relinquishing their own control over teleworkers may have no detrimental effect on employee performance, we realize that this also entails a change in their own work activities. Managers will thus have to look for ways to support employees in their application of self-control. Self-regulation theory (Bandura, 1991) offers several ways in which this could be done. To aid employees in self-monitoring, managers could for instance provide employees with additional insights into their performance or the effects of their work. Similarly, to help employees better judge their own performance through a collective frame of reference, managers could create greater transparency regarding peer performance. This means that much of the same activities or technologies that would formerly be used to control employees are better used to support employees in controlling themselves.

3.5.3 Strengths, Limitations, and Further Research

The design of our study has several strengths. First of all, our study provides a much more accurate portrayal of the practice of telework and its effects through an extent of telework measure, which is a step up from prevailing dichotomous measures (e.g. Bloom et al., 2015; Collins, 2005; Dutcher, 2012). Furthermore, we examined job performance using multiple sources, reducing the risk of common method variance in our results (an effect we have explicitly tested for during the analysis of our measurement model). This approach allowed us to gather and combine the data from 1450 employees at four public and private organizations with institutionalized (rather than idiosyncratic) telework arrangements, thereby supporting the generalizability of our findings to a broad range of organizations and job functions. Yet there are also limitations in these areas. For one, we were unable to acquire (uniform) objective measures for the assessment the extent of telework or job performance, which could have allayed fears of common method variance even more. We also recognize that the high education level of the employees in our study is likely to limit the generalizability of our findings to teleworkers who are involved in knowledge-intensive work. For this reason, we would welcome future studies that explicitly control for knowledge work characteristics (such as interdependence, novelty, and non-routineness) and investigate how these might affect the relevance of managerial control types in a remote work context.

Furthermore, we would like to point out two common limitations related to our data collection and analytical procedures. For one, our structural model is directed and therefore based on cause and effect assumptions, yet the correlational nature of our field study and cross-sectional data collection prevent us from testing true causal relations. Additionally, this limitation prevents us from testing potentially recursive effects in our model. For instance, while trust affects job performance through self-determination, one could also argue that increased job performance might subsequently lead to increased trust, causing a self-reinforcing relationship. To truly test for such effects, one would have to do a panel study consisting of several waves of data collection to discern temporal effects. An experimental setup with a control group and specific interventions regarding the extent of telework and various control mechanisms would be even more preferable, although we realize that such studies are extremely difficult to realize in practice. Our main recommendations for further research therefore focus on non-methodological subjects.

One of the most promising areas for further research lies in the ‘unpacking’ of teleworker self-control. By gaining insights into the process of teleworker self-monitoring, judging, and reacting, we would be able to better understand the mechanisms by which managers can (indirectly) support job performance. It would enable the investigation of interaction effects of other types of control with self-judgement, such as how performance reward systems could for instance provide employees with a reference for expected performance. Similarly, it could address the fundamental question regarding whether an organization—or a manager as agent of the organization—is able to ‘manage through identity’ (Ashford et al., 2007) and effect or maintain any form of (clan) control over the internalization of norms and values by employees in a remote work context (e.g. Robertson and Swan, 2003). Considering how people do not passively absorb such norms and values from external influences but rather reflectively construct those themselves from a variety of sources, it also becomes interesting to examine the role of non-organizational frameworks of reference (such as those of professional communities or customers) in teleworker self-judgement.

Finally, we encourage future studies to expand on the role of the psychological contract in a telework context. An extension of our current work could involve confirmatory tests of the control mechanisms we have identified as ‘high-risk’ of breaching the psychological contract (such as strict work monitoring). Learning more about the conditions under which such a breach is observed and whether it can be ‘repaired’ would provide substantial managerial relevance (as evidenced by the public discussion following the Yahoo! telework ban). To that end, it might prove insightful to explicitly ask managers and teleworkers about their understanding of the psychological contract, as this would help to uncover potential differences between both parties’ expectations of obligations. We recommend for such an inquiry to expand the contents of the psychological contract (Robinson et al., 1994) beyond self-determination and performance, to include telework-sensitive employer obligations such as coaching, training, and job advancement as well as various extra-role or organizational citizenship behaviours on the part of the teleworker.

3.6 Conclusion

The results of this study challenge commonly held views regarding effective teleworker control. By conceptualizing telework as entailing an exchange-based psychological contract between manager and employee, we show that teleworker job performance is not driven by various kinds of managerial or peer control but rather by a form of employee self-control that uses self-determination as its primary vehicle. Specifically, managers have to provide very high levels of self-determination to employees in order for telework to have any positive impact on performance, and failing to do so can have highly detrimental effects. While the remote nature of telework might indirectly endanger this trust-based self-determination, we found that the eventual negative effect is quite small and that it can be solved via frequent communication between the manager and the employee. Ultimately, these findings open up new avenues for research on how to best facilitate teleworker job performance.

Chapter 4

No Knowledge Worker is an Islandⁱⁱⁱ

4.1 Introduction

Distance is dead. Or is it? For decades, research has shown that physical proximity breeds increased communication, knowledge, and innovation (Alan and Henn, 2007). Yet the rapid spread of information and communication technologies (ICTs) challenged these traditional relationships, which led some to argue that technology altered the social and physical world to such an extent that physical proximity is no longer of any consequence (Cairncross, 2001; Friedman, 2005). ICTs have been a fundamental driver behind new working practices—most notably the uptake of telework—and enable individuals to nowadays work at any time and at any place without losing touch with their organizations. Even so, losing touch with others in the organization through temporal or spatial separation offers certain productivity benefits (such as increased privacy or reduced work interruptions) (Espinosa, Nan and Angus, 2015), and teleworkers may therefore use the connective capabilities offered by ICTs in a strategic fashion to further increase (rather than decrease) this separation (Leonardi *et al.*, 2010). While such choices might improve their performance in the short term, it may be harmful in the mid- to long term as the distance involved may negatively impact an organization's knowledge base as well as interdependent and collaborative work elements. Several multinational firms (including Yahoo!, Best Buy, and HP) have therefore abandoned or severely curtailed telework practices in recent years, claiming that doing so will create a *“connected workforce [which is] more collaborative, productive, and knowledgeable”* (Hesseldahl, 2013). In this paper we investigate such claims by questioning the strictly positive paradigm of ‘working any time, any place.’ Our goal is to tease out interaction effects of temporal/spatial separation and communication media use on interdependent teleworkers’ knowledge networks, and to further explore the social underpinnings of these relationships by investigating mediated paths through factors of social capital.

ⁱⁱⁱ This chapter is based on a working paper by van der Meulen, N., van Baalen, P., van Heck, E., and Mülder, S. 2016. “No Knowledge Worker is an Island: the Impact of Time/Place Separation and Media Use on Knowledge Sharing Networks.”

A common truism in management research is that the competitiveness of modern organizations is increasingly based on their ability to acquire, transform, and exploit knowledge. Organizations are considered part of the knowledge economy and employ knowledge workers, whose performance is generally the product of obtaining the right input from others in order to solve novel and complex problems (Davenport, 2005). Given this importance of knowledge sharing for performance, it is not surprising that a considerable amount of research has focused on the antecedents of knowledge sharing behaviours and theories that might stimulate it. A theoretical framework that has received a lot of attention in that regard is Nahapiet and Ghoshal's (1998) framework of social capital, which posits that networks of relationships—and the resources embedded within them— influence the extent to which interpersonal knowledge sharing occurs among actors within work groups (Yang and Farn, 2009), intracorporate networks (Chow and Chan, 2008; Tsai, 2000), and interorganizational/customer networks (Lang, 2004; Tsai and Ghoshal, 1998; Yli-Renko et al., 2001). Social capital consists of three primary elements (structural, cognitive, and relational social capital), however, that can easily be disrupted by the use of ICTs and flexible (distributed) work practices (Huysman and de Wit, 2004). Studies that have investigated these disrupting effects have thus far focused on specific types of distributed work (such as virtual teams or electronic networks of practice), for which it is generally assumed that separated workers meet rarely—if ever (Hinds and Cramton, 2014). The costs of getting together are often very high in these contexts, and workers are mostly considered strangers to each other (e.g. Chiu et al., 2006; Wasko and Faraj, 2005).

For telework, this tends to be different. First, teleworkers generally have a shared history as well as a future with their (teleworking) colleagues and while they are sometimes outside of each other's immediate presence, the physical and monetary cost of getting together is fairly low as the average home-based teleworker can typically get to the office in 20 to 25 minutes (McKenzie and Rapino, 2011; Parent-Thirion et al., 2007). What's more, with most teleworkers only teleworking part of their working time (Eurostat, 2014; Mateyka et al., 2012), the impact of spatial and temporal separation is expected to be different than in cases of fully distributed or completely virtual types of work (Cummings et al., 2009). Finally, as opposed to research on global virtual work, telework does not introduce time zone differences or cultural ambiguities, nor does the spatial separation of teleworkers necessarily imply temporal separation. All these characteristics make telework uniquely suited to investigate the fine-grained effects of temporal/spatial separation on social capital and knowledge networks, especially since teleworkers represent a substantial and growing part of the labour force. Recent census data from the European Union and United States show that approximately 15 and 23 percent of employees (respectively) telework at least 'some of the time' (Eurostat, 2016; U.S. Department of Labor, 2015). While the term may cover a variety of work arrangements, telework typically involves work that would normally be organized and performed at an employer's premises, but is instead carried out away from this office on a regular basis with the help of ICTs (Monks et al., 2006). In our study, we focus on teleworkers who not only have absolute freedom regarding how often they work outside of the office—from nearly full-time to not at all—but also in how often they work outside of regular 9-to-5 work schedules. All participants have desktop virtualization systems at their disposal to support telework, as well as (cloud-based) solutions for unified communication and collaboration. We pay special attention to the role of these technologies, and reflect on their ability to overcome temporal and spatial divides.

The article is structured as follows. First, we present our theoretical logic and hypotheses, based on existing research on separation as well as theories of social capital and media synchronicity. The resulting conceptual model is tested with three (sociometric) surveys among 64 knowledge workers and their supervisors from a semi-public research and advisory organization. The results of this study show that temporal and spatial separation both influence knowledge

awareness through distinct causal paths, and that communication media may serve to bridge spatial—but not temporal—divides. Finally, we conclude with an in-depth discussion regarding the explanations and implications of these findings.

4.2 Theory and Hypotheses

4.2.1 Knowledge Sharing and Teleworker Performance

Basic forms of telework (enabled by the telephone and mainframe technologies) have been around for nearly half a century. What started out as a solution for societal problems such as traffic congestion and pollution in densely populated areas (Nilles et al., 1976) was soon considered an idyllic work—life policy where “electronic cottages” would “glue the family together again [and] provide greater community stability” (Toffler, 1980: p.219). Yet the uptake of telework by organizations has been slow (Siha and Monroe, 2006), which might partly be explained by its inconclusive effects on employee outcomes. Telework is found both positively and negatively related to individual factors such as morale, job satisfaction, commitment, engagement, and most notably: performance (McCloskey and Igarria, 2003; Pinsonneault and Boisvert, 2001). While meta-analytic studies show that the majority of findings indicate telework a “good thing” for individuals (Gajendran and Harrison, 2007: p.1535) and organizations (Martin and McDonnell, 2012: p.611), there is generally a lack of theoretical understanding as to why this is the case—especially for the relationship between telework and performance (Bailey and Kurland, 2002). Suggested reasons for teleworker performance improvements include working at hours of optimal personal efficiency, stress reduction as a result of no commute, a willingness to work harder to ‘compensate’ for idiosyncratic telework benefits, and being in a comfortable environment conducive to increased concentration (Gajendran et al., 2014; Westfall, 2004). These explanations, however, focus solely on the teleworker as an independent actor. Such a view does not accurately represent the majority of teleworkers, who are typically classified as knowledge workers (Moore et al., 2011) characterized by interdependence (Davenport, 2005). And it is precisely in conjunction with this interdependence that telework-induced separation poses a possible threat to performance.

Numerous authors have asserted that telework leads to social and professional isolation: that teleworkers become invisible to their peers, miss out on spontaneous office interactions, receive less informal feedback and training, and lack social support needed for high performance (e.g. Cooper and Kurland, 2002; Golden et al., 2008; Whittle and Mueller, 2009). Yet hardly any studies have theoretically linked this risk of teleworker isolation with the risk of a deteriorating knowledge network (Taskin and Bridoux, 2010), and none have empirically examined this link. This is surprising, especially because the job performance of knowledge workers is considered dependent on the ability to obtain the right input from others in order to solve novel and complex problems (Davenport, 2005). It is thus not necessarily the *amount* of knowledge sharing—as people often over-invest and acquire more knowledge than needed to do their work (Sproull and Kiesler, 1992)—but more particularly the *source* of knowledge that benefits performance. Network theory has shown that employees with connections that span functional, specialist, or business unit boundaries are more effective knowledge sharers who perform better (Cross and Cummings, 2004; Tsai, 2001; Wong, 2008). In this paper we focus on task-related knowledge sharing, which refers to the exchange of both explicit and tacit knowledge, ideas, experiences or skills among (groups of) individual employees (Cabrera and Cabrera, 2002). In terms of direct (in-role) job performance, such sharing means that work output can be of higher quality, more in line with requirements, and finished in a timelier manner. In addition, knowledge networks also benefit proactive (or innovator-based) performance, which is defined by one’s level of

creativity and innovation on the job as well as the organization as a whole (Griffin et al., 2007; Welbourne et al., 1998). For years, knowledge has been considered the primary source of an organization's innovative potential (Grant, 1996; Newell, 2015; Zhou and Li, 2012), which is also reflected in the community networking model of knowledge management (Swan et al., 1999). This model explicitly underwrites the importance of an individual's boundary-spanning activities within knowledge networks for sense making and the development as well as implementation of new ideas for innovation. It is therefore that we formulate our first hypothesis:

Hypothesis 1: Knowledge sharing across specialist boundaries is more positively related to (a) (in-role) job performance and (b) proactive performance than knowledge sharing within specialist boundaries.

4.2.2 Sharing Among Separated Employees

Negative social effects of telework stem from an increase in both temporal and spatial separation of teleworkers from colleagues in an organization. Yet research on spatial separation of employees dates back as far as several decades (Kiesler and Cummings, 2002), while relatively few empirical studies have incorporated the challenges—let alone a measured degree—of temporal separation in the context of collaborative work (O'Leary and Cummings, 2007). This holds especially for telework research, where temporal separation is mostly an implicit dimension and the bulk of research has focused on extreme types of spatial separation from a physical location (e.g. fully at the office versus fully at home) as a proxy for separation from colleagues (Allen et al., 2015). For this reason, we propose to focus on a more fine-grained conceptualization of separation from colleagues, in which we tease out the effects of daily schedule and location differences between employees in conjunction with communication media use. This interaction effect is important, as each type of separation imposes distinct limits on communication. Whereas spatial separation only removes the ability for face-to-face communication, temporal separation also removes the ability for synchronous (real-time) communication (O'Leary and Cummings, 2007). This might be why initial examinations show that spatial divides are easier to bridge via communication media than temporal divides (Cummings et al., 2009). Temporal separation might therefore be considered more distant than spatial separation, which is why we expect that the network effects of the former will be more pronounced than those of the latter. In the remainder of this subsection, we discuss these direct effects of interaction between communication media use and separation on knowledge (sharing) networks. An outline of the indirect effects via factors of social capital is provided in the next subsection.

Past research efforts have found a strong relationship between dimensions of spatial distance and knowledge sharing. More specifically, we know that individuals naturally tend to place higher importance on what is closest to them and that they are more likely to interact and share knowledge with physically proximate others due to serendipitous interaction and sheer exposure (Allen and Henn, 2007). Physical proximity is also preferred for tacit knowledge sharing, which is inherently rooted in action and based on involvement in a specific context (Roberts, 2000). When employees become separated in space, they lose their face-to-face knowledge sharing capability and instead have to rely on electronic communication media to bridge this new divide. Theoretically, highly synchronous media (such as videoconference) could help to reduce the negative effect of spatial separation on knowledge sharing. Yet prior qualitative investigations have shown that in practice, teleworkers rather prefer to use less synchronous media in order to reap the benefits of separation (Leonardi et al., 2010) – a choice that would likely exacerbate the negative effect of spatial separation on (tacit) knowledge sharing.

One might expect the effect of temporal separation from colleagues to be similar to that of spatial separation; after all, each deviates from the optimal “same time, same place” situation and increases distance. Yet temporal separation is unique in that it reduces time available for real-time interaction, further restraining choices in how and when to communicate. This means that communication will likely be even less frequent and less regular (Espinosa et al., 2015), which will have a negative impact on the frequency of knowledge sharing among colleagues. Knowledge sharing costs will also be higher, as the combination of temporal separation and asynchronous media (e.g. e-mail) use requires the development of new signalling strategies and interaction routines (Thatcher and Zhu, 2006), making knowledge sharing more arduous, formalized, and less spontaneous (Bélanger and Allport, 2008). This difference in interaction effects between the two types of separation and the level of communication media synchronicity is reflected in the following hypotheses:

Hypothesis 2: The negative effect of teleworkers’ temporal separation from colleagues on the frequency of knowledge sharing with these colleagues will be more pronounced than the negative effect of teleworkers’ spatial separation.

Hypothesis 3a: The use of synchronous communication media positively moderates the relationship between teleworkers’ temporal separation from colleagues and the frequency of knowledge sharing with these colleagues.

Hypothesis 3b: The use of synchronous communication media negatively moderates the relationship between teleworkers’ spatial separation from colleagues and the frequency of knowledge sharing with these colleagues.

4.2.3 Teleworkers’ Social Capital

In addition to the direct effect of separation on knowledge sharing, it may also have a negative impact through organizational socialization. Such socialization is continuously constructed through the interactions between a teleworker and his or her peers, and is generally considered the basis for connections between individuals that facilitate knowledge transfer within organizations (Ipe, 2003; Taskin and Bridoux, 2010). Organizational socialization has been conceptualized in a theory of social capital, which distinguishes three dimensions that refer to different types of resources in one’s network of working relationships (Nahapiet and Ghoshal, 1998):

- 1) Structural social capital: the level of connectedness to others in one’s network. For a knowledge sharing network, this is primarily determined by the level of knowledge awareness (who knows what);
- 2) Cognitive social capital: the extent to which members in the network have a common mental framework built on joint experiences, shared language, and shared narratives;
- 3) Relational social capital: the extent to which one’s network is characterized by strong social ties, particularly in the form of co-worker trust.

In the next three subsections, we will discuss how each of these dimensions specifically mediate the relationship between teleworker separation and knowledge sharing.

Structural social capital

The concept of structural social capital posits that an employee's network of working relationships can supplement his or her ability to adequately respond to challenges or opportunities at work. It typically focuses on relationship strength between dyadic linkages or on network properties such as structural equivalence, network range, cohesion, or network density (Reagans and McEvily, 2003; Wong, 2008). In the context of knowledge sharing, it moves beyond the basic tenet of network theory that states 'who you know determines what you come to know.' More specifically, it focuses on 'who knows what,' which is generally considered the baseline requirement for knowledge sharing (Alavi and Tiwana, 2002; Borgatti and Cross, 2003; He et al., 2007). Having such an overview of the availability of knowledge within one's network—knowing who to turn to for relevant expertise—is known as knowledge awareness (Cross and Cummings, 2004). Otherwise referred to as meta-knowledge or expertise location (Faraj and Sproull, 2000), it is considered an indicator of the existence of transactive memory and a crucial element for the successful performance of distributed knowledge systems such as organizations (Lewis and Herndon, 2011; Ren and Argote, 2011; Wegner, 1987). Therefore, we hypothesize:

Hypothesis 4: The knowledge awareness level of teleworkers is positively related to their frequency of knowledge sharing with colleagues.

Knowledge awareness can develop through both interpersonal and technologically-mediated interaction (Moreland, 1999). Prior studies have shown that from an interpersonal perspective, physically proximate employees engage in higher levels of self-disclosure; as they come to know each other better and observe each other in action, colleagues develop a more accurate as well as current understanding of their work and expertise (Allen and Henn, 2007; Borgatti and Cross, 2003). In this sense, temporal and spatial separation are both expected to inhibit the development and maintenance of (deeper levels of) knowledge awareness of both teleworkers and their colleagues (Alavi and Tiwana, 2002). Yet at the same time, knowledge awareness requires *conveyance*: the dissemination and gathering of information to create an image of the knowledge and expertise available in the network. As communication involving a lot of conveyance typically benefits from the use of less synchronous media (Dennis et al., 2008) it stands to reason that—in this case—teleworkers might overcome some of the negative effects of separation through the use of asynchronous media.

Empirical investigations into such interaction effects are small in number and have thus far yielded ambiguous results. Kanawattanachai and Yoo (2007) for instance found that virtual teams of MBA students were able to develop knowledge awareness through the use of mailing lists, whereas He, Butler and King (2007) contradict this finding; in their case, the frequency of e-mail interaction among partially separated undergraduate project teams had no effect on knowledge awareness. We posit that this difference in findings might be the result of a difference in the extent of temporal and spatial separation of their respective subjects. Where the MBA students of Kanawattanachai and Yoo (2007) were unable to meet in person and had to solely rely on asynchronous media, the undergraduate students of He, Butler and King (2007) could meet face-to-face or via teleconference whenever they preferred. Whether these results hold when scaled to departments or organizations is unclear, but they do illustrate the need for additional research in this area as the findings hint at the potential interaction effect of separation and asynchronous media use:

Hypothesis 5: The negative effect of teleworkers' temporal separation from colleagues on their level of knowledge awareness will be more pronounced than the negative effect of teleworkers' spatial separation.

Hypothesis 6: The use of synchronous communication media positively moderates the relationship between teleworkers' temporal (a) and spatial separation (b) from colleagues and their level of knowledge awareness.

Cognitive social capital

As important as awareness is for knowledge sharing, however, it is only the starting point. We adhere to the view that knowledge is inherently a social artefact embedded in a collective context. Employees who share a collective context—and therefore a certain common mental framework—with colleagues will thus find it easier to engage in knowledge sharing activities because of mutual understanding (Bechky, 2003; Weick and Roberts, 1993). This notion lies at the heart of *cognitive social capital*, and it typically comes about through shared language as well as shared narratives and experiences.

As opposed to (global) virtual teams, teleworkers generally do not have to deal with differences in national languages. For them, shared language involves the jargon, codes, and other subtleties used in day-to-day interaction that influence knowledge sharing in two distinct ways (Nahapiet and Ghoshal, 1998). First, shared language represents a certain overlap in knowledge that brings people together and facilitates subsequent access to additional knowledge. Second, it influences perception by providing a 'common conceptual apparatus' when interpreting the environment, which helps to evaluate the benefits of knowledge sharing and make it more efficient. Similar mechanisms hold for shared narratives and experiences (also referred to as war stories or workarounds): these provide a unique way to communicate collective meaning and help to create new interpretations that facilitate knowledge sharing (Nahapiet and Ghoshal, 1998). Empirical studies have shown that these elements of cognitive social capital positively affect the quantity and/or quality of knowledge sharing in a variety of settings, from digitally mediated teams (e.g. Robert et al., 2008) to virtual communities (of practice) (e.g. Chang and Chuang, 2011; Chiu et al., 2006; Wasko and Faraj, 2005). This brings us to the following hypothesis:

Hypothesis 7: The extent to which teleworkers develop a common mental framework with colleagues is positively related to their frequency of knowledge sharing.

Developing a common mental framework implies *convergence*: the creation of shared understanding through discussions about interpretations of information that has already been processed by individuals (Dennis et al., 2008). This typically requires a frequent and interactive type of communication, and is best supported by synchronous interaction. Separated employees' loss of face-to-face interaction is thus expected to negatively affect the development of a common mental framework. This is especially the case for temporally separated teleworkers, as they will have to resort to less engaging and therefore less memorable modes of communication (Latane et al., 1995), leading to lower levels of mutual understanding (DeSanctis and Monge, 1998; Thatcher and Zhu, 2006). Similarly, spatially separated employees will lack (to a certain extent) a shared work environment that acts as a collective interpretive context (Cramton, 2001) where employees can otherwise observe colleagues and their behaviours, gain new shared experiences, develop shared language, and engage in impromptu storytelling (Griffith et al., 2003; Hinds and Mortensen, 2005). Finally, as teleworkers shift their focus towards their own (rather than collective) work tasks, they will experience less social pressures for conformity. This will likely lead to divergent mental frameworks (Levesque et al., 2001):

Hypothesis 8: The negative effect of teleworkers' temporal separation from colleagues on the extent to which they develop a common mental framework with these colleagues will be more pronounced than the negative effect of teleworkers' spatial separation.

Hypothesis 9a: The use of synchronous communication media positively moderates the relationship between teleworkers' temporal separation from colleagues and the extent to which they develop a common mental framework.

Hypothesis 9b: The use of synchronous communication media negatively moderates the relationship between teleworkers' spatial separation from colleagues and the extent to which they develop a common mental framework.

Relational social capital

If we consider knowledge a social artefact, then it stands to reason that relational qualities are important to knowledge sharing as well. One particular relational quality, interpersonal trust, is central to Nahapiet and Ghoshal's (1998) conceptualization of relational social capital and has received consistent attention as a key element in fostering knowledge networks (Abrams et al., 2003; Levin and Cross, 2004). Trust is a necessary mechanism for social exchange relationships with high levels of risk or uncertainty (Riegelsberger et al., 2005) and is characterized by a willingness to be vulnerable to the actions of another party (Mayer et al., 1995). It stems from a lack of information about another's abilities or motivations, which is why conceptualizations of trust typically include cognitive (competence) as well as affective (benevolence, integrity) beliefs or components (e.g. Mayer et al., 1995; McAllister, 1995).

By reducing potential conflicts and the need to check the veracity of knowledge, trust makes knowledge sharing more efficient (Zaheer, McEvily and Perrone, 1998). Additionally, trusting individuals are expected to be (a) more willing to signal their need for additional knowledge, (b) more accepting towards the accuracy and helpfulness of received knowledge, and (c) more likely to believe that given knowledge will be understood and put to good use (Staples and Webster, 2008). These expectations are supported by several empirical findings, which indicate that trust leads to increased knowledge sharing at interpersonal (Andrews and Delahaye, 2000; Hsu and Chang, 2014), team (Mooradian et al., 2006; Staples and Webster, 2008), and (virtual) community levels (Chen and Hung, 2010; Ridings et al., 2002). This is why we hypothesize:

Hypothesis 10: Teleworkers' level of trust in colleagues is positively related to their frequency of knowledge sharing with colleagues.

Interpersonal trust is built on behavioural evidence (Meyerson et al., 1996) and benefits from frequent, close communication (Abrams et al., 2003; Jarvenpaa et al., 1998). Teleworkers' separation from colleagues in time and/or space negatively influences both elements. First, it complicates direct observations of work activities and behaviours of colleagues, which reduces the available information upon which teleworkers can base their evaluation of a colleague's trustworthiness (Becerra and Gupta, 2003). Second, the absence of frequent, direct face-to-face contact makes it harder to form and maintain affective, trusting relationships (Olsen and Olsen, 2012; Sarker and Sahay, 2004). The use of synchronous communication media thus becomes increasingly important to teleworkers, as these provide the most information to assess the behaviours (as well as abilities and intentions) of distant colleagues. While it may take some time to develop, the level of trust obtained in separated contexts with the help of synchronous communication media may near the level of trust obtained face-to-face, although it should be noted that this type of trust could be more fragile (Bos et al., 2002; Rockmann and Northcraft, 2008). Over time, even asynchronous exchanges can help to build trust (and support information sharing) among temporally separated individuals, as long as the communication partners are responsive and willing to share personal information with each other (Ridings et al., 2002). The question is whether these prior

(experimental) findings hold true in partially separated (telework) contexts, where individuals can maintain face-to-face contact with colleagues more easily. To test this, we have formulated the following hypotheses:

Hypothesis 11: The negative effect of teleworkers' temporal separation from colleagues on the level of trust in these colleagues will be more pronounced than the negative effect of teleworkers' spatial separation.

Hypothesis 12a: The use of synchronous communication media positively moderates the relationship between teleworkers' temporal separation from colleagues and the level of trust in these colleagues.

Hypothesis 12b: The use of synchronous communication media negatively moderates the relationship between teleworkers' spatial separation from colleagues and the level of trust in these colleagues.

The conceptual model in Figure 4.1 provides an overview of our hypotheses and forms the basis for our empirical investigation. In the next section, we will discuss the methodological specifics of this investigation.

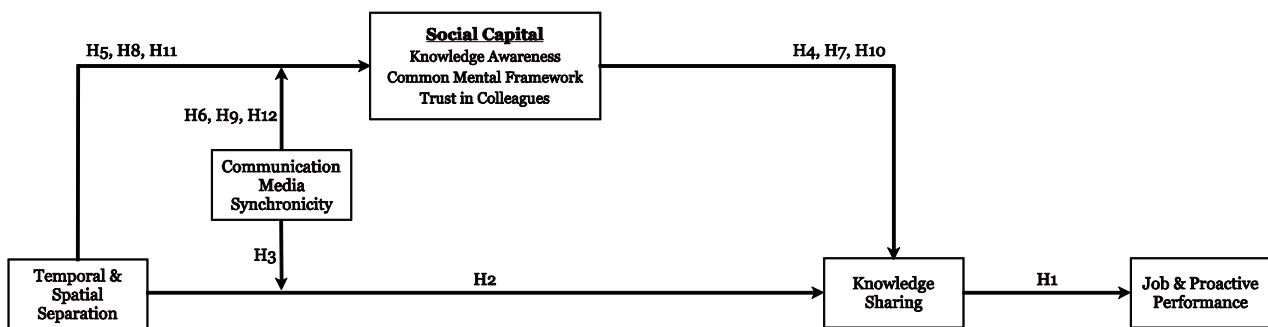


Figure 4.1 Conceptual Model

4.3 Methodology and Data Analysis

4.3.1 Study Setting and Sampling

To empirically test our hypotheses, we collaborated with the Medicines Evaluation Board (MEB): a knowledge-intensive, semi-public organization of approximately 300 FTE that is involved in research and advisory functions to the Dutch government and the European Union. The organization operates from a single (centralized) location but enables all of its employees to telework via a company token and desktop virtualization system, which allows remote access to the company's digital work environment on a company-issued thin client laptop. Also, several solutions for enterprise unified communication and collaboration (i.e. Microsoft Lync, Sharepoint, and an in-house project management system) are available through the virtual desktop and a company-issued smartphone. This ensured that employees had communication media with various degrees of synchronicity at their disposal. Employees are given a lot of autonomy in their work, and they can decide for themselves when, where, how, and on which projects they would like to work. There are no limitations on the timing or number of days they can telework, though employees are expected to keep the interests of the MEB at heart when they make their decisions regarding work times and locations.

Data collection took place in 2014—two years after the MEB introduced its active teleworking program—and consisted of three separate online surveys to prevent common method bias and survey fatigue. In addition, we used the ‘ethnographic sandwich’ approach, placing our quantitative studies between two smaller ethnographic investigations (consisting of participant observations and interviews). The goal of this method is to better align the research question and approach with its context, and to better interpret the findings once these have been obtained (Ofem et al., 2012). To ensure we could do a whole (bounded) network survey, we limited our sample to 90 interdependent knowledge workers who are involved in the MEB’s primary (core) advisory function. Each of these knowledge workers belongs to one of four distinct units that cover specialist advisory areas, although general areas of expertise frequently overlap—resulting in several cross-unit working groups that share best practices and related knowledge.

To obtain more nuanced distinctions regarding specialist boundaries (required for the testing of hypothesis 1), we asked the participants to indicate their areas of expertise from a set list of 30 fields of expertise used throughout the organization. This question was part of a social network survey, in which we also gathered sociometric data on time/place separation, knowledge awareness, and knowledge sharing (77% response rate). Data on communication synchronicity, common mental framework, and trust in colleagues were obtained via a second survey to the participants (71% response rate), which also asked for the number of work hours and years of tenure within the organization. The latter two questions serve as controls to rule out (partial) spurious effects with the aforementioned measures. Lastly, we obtained data on job and proactive performance via a third survey to the participants’ supervisors (80% response rate). The three surveys combined led to a usable sample size of 64 participants, consisting of 27 males and 37 females with ages spread almost evenly from 25 to 66 years old. All participants were highly educated, with doctorate (45%) or graduate (55%) degrees.

4.3.2 Measures

In our surveys, we mostly relied on existing work to create eight measures that fit the organizational context. The basis for the four composite measures—all of which were measured with Likert scales ranging from 1=‘completely disagree’ to 5=‘completely agree’—are summarized in table 4.1. In addition, the sociometric questions for knowledge awareness and knowledge sharing were based on Cross and Cummings (2004) and the score for communication synchronicity was based on Dennis, Fuller and Valacich (2008). The measures for temporal and spatial separation were newly designed. In the final stages of survey development, the measures were discussed and pretested by several participants, which led to minor changes in question wording as well as the addition of fill-in instructions. What follows is an outline of the questions, scales, and calculations for each of these measures.

Temporal / spatial separation

To assess the temporal and spatial separation from colleagues, each participant was asked to indicate—for a typical workweek—their working times and locations on a 3x5 “time/place grid” outlining the times of the day (morning, afternoon, and evening) and days of the week (Monday through Friday). Participants were asked to only fill out a time slot with a location (at the office or elsewhere) if they actually worked at this location for at least 2 hours during the time slot. Table 4.2 provides an example of the grid and summarizes the total percentage of employees working at certain times and locations. The separation scores for each participant were calculated by dividing the number of slots combinations that do not temporally/spatially overlap (with those of all the other colleagues) by the potential maximum of overlapping slots; 945 in case of temporal separation (15 slots * (N-1) participants) and 630 in case of spatial separation (10 slots * (N-1)

participants). Note that the total number of available slots combinations for spatial separation is lower due to the fact that co-location at the office is not possible during the evenings (see table 4.2).

<i>Measures and items</i>	<i>Mean</i>	<i>SD</i>	<i>Stand. factor loading</i>	<i>AVE</i>	<i>CR</i>	<i>Cronbach alpha</i>
<i>Common mental framework (based on Nahapiet and Ghoshal, 1998)</i>				0.646	0.844	0.842
Discussion of organizational developments with colleagues.	3.71	0.82	0.923			
Sharing of (work-related) success stories with colleagues.	3.43	0.77	0.700			
Use of organization-specific codes / jargon with colleagues.	3.81	0.79	0.773			
<i>Trust in colleagues (based on Cook and Wall, 1980)</i>				0.593	0.813	0.806
Colleagues can be relied upon to do as they say they will do.	3.76	0.44	0.780			
Confidence in the skills of colleagues.	3.73	0.52	0.704			
Colleagues will always try to treat the participant fairly.	3.85	0.48	0.821			
<i>Job (in-role) performance (based on Welbourne et al., 1998)</i>				0.708	0.922	0.913
Quality of work output.	4.08	0.84	0.950			
Worker productivity.	3.70	1.05	0.694			
Effectiveness (doing the right things).	4.02	0.86	0.963			
Timeliness (meeting deadlines). ¹	3.66	0.88	0.640			
Accuracy (meeting requirements).	4.05	0.83	0.904			
<i>Proactive performance (based on Welbourne et al., 1998)</i>				0.829	0.951	0.950
Coming up with new ideas.	3.38	1.05	0.943			
Supporting the implementation of new ideas.	3.56	0.91	0.893			
Finding improved ways to do things. ¹	3.39	0.97	0.913			
Creating better processes and routines.	3.62	1.00	0.892			

Note. SD = Standard deviation, AVE = Average variance extracted, CR = Composite reliability.

¹Responses have been reversed prior to evaluation.

Table 4.1. Quality Criteria of Survey Measures

	<i>Morning</i>	<i>Afternoon</i>	<i>Evening</i>
Monday	80% - (38%)	83% - (41%)	16% - (0%)
Tuesday	91% - (64%)	92% - (66%)	13% - (0%)
Wednesday	83% - (44%)	75% - (48%)	20% - (0%)
Thursday	94% - (75%)	97% - (80%)	14% - (0%)
Friday	75% - (25%)	66% - (23%)	11% - (0%)

Table 4.2. Time/Place Grid with Percentages of Employees Working – (at the Office)

Communication Synchronicity

When teleworking, the participants typically use a variety of electronic communication media to connect with colleagues and share knowledge. These media can be categorized as 1) videoconference, 2) telephone conference, 3) instant messaging, 4) electronic project spaces, and 5) e-mail. Categories can cover several technologies: for instance, telephone calls can take place via the organization's conference room system, via mobile phone, or via the voice-over-IP system (available through the virtual desktop). Similarly, technologies can cover multiple media: the unified communications and collaboration software—which offers instant messaging as well as video and teleconference possibilities—is an example of this. To obtain a good image of the level of synchronicity of the participants' typical media usage repertoire, we asked them to give an indication of how they typically contact their colleagues by distributing 100 points across the five aforementioned media categories. This distribution is then multiplied with synchronicity scores for each medium, which are based on five media capabilities: transmission velocity, symbol sets, parallelism, rehearsability, and reprocessability (Dennis et al., 2008). These capabilities are ranked on a zero to one scale, where Low/Few=0, Medium=0.5, and High/Many=1. Faster transmission velocity and more symbol sets are related to greater synchronicity, whereas higher levels of parallelism, rehearsability and reprocessability are related to lesser synchronicity. To compute the synchronicity score, these rankings are added to (or subtracted from) a 'medium' base score of 2: this results in synchronicity scores ranging from 0 (e-mail/low synchronicity) to 3 (videoconference/high synchronicity). Table 4.3 provides an overview of the media and their capabilities.

Knowledge awareness / sharing

We assessed knowledge awareness and sharing via the roster method (listing all 90 colleagues involved in the MEB's primary advisory function) in conjunction with single sociometric questions, as is common in sociometric surveys (Borgatti and Cross, 2003). To ensure our measures were appropriate, we constructed items that were specific and focused on long-term patterns rather than one-time events. A roster approach typically enhances the user friendliness of a survey and improves the accuracy of reports on weaker ties (Ferligoj and Hlebec, 1999).

For the directed knowledge awareness network, the participants were asked to assess for each colleague on the roster to what extent they are aware of the colleague's knowledge and expertise (from 0= 'not at all aware' to 4= 'very well aware'). We then calculated a participant's out-degree centrality (the extent to which a participant is aware of the knowledge and expertise of his/her colleagues) by aggregating his/her responses and dividing this score by (N-1), where N represented the number of employees in the network. Similarly, we calculated a participant's in-degree centrality by aggregating the responses of colleagues on how aware they are of the participant's knowledge and expertise, which was also subsequently divided by (N-1). The average of these two degree centrality scores comprised a participant's knowledge awareness score, depicted as a node's size in the knowledge awareness sociogram of figure 4.2.

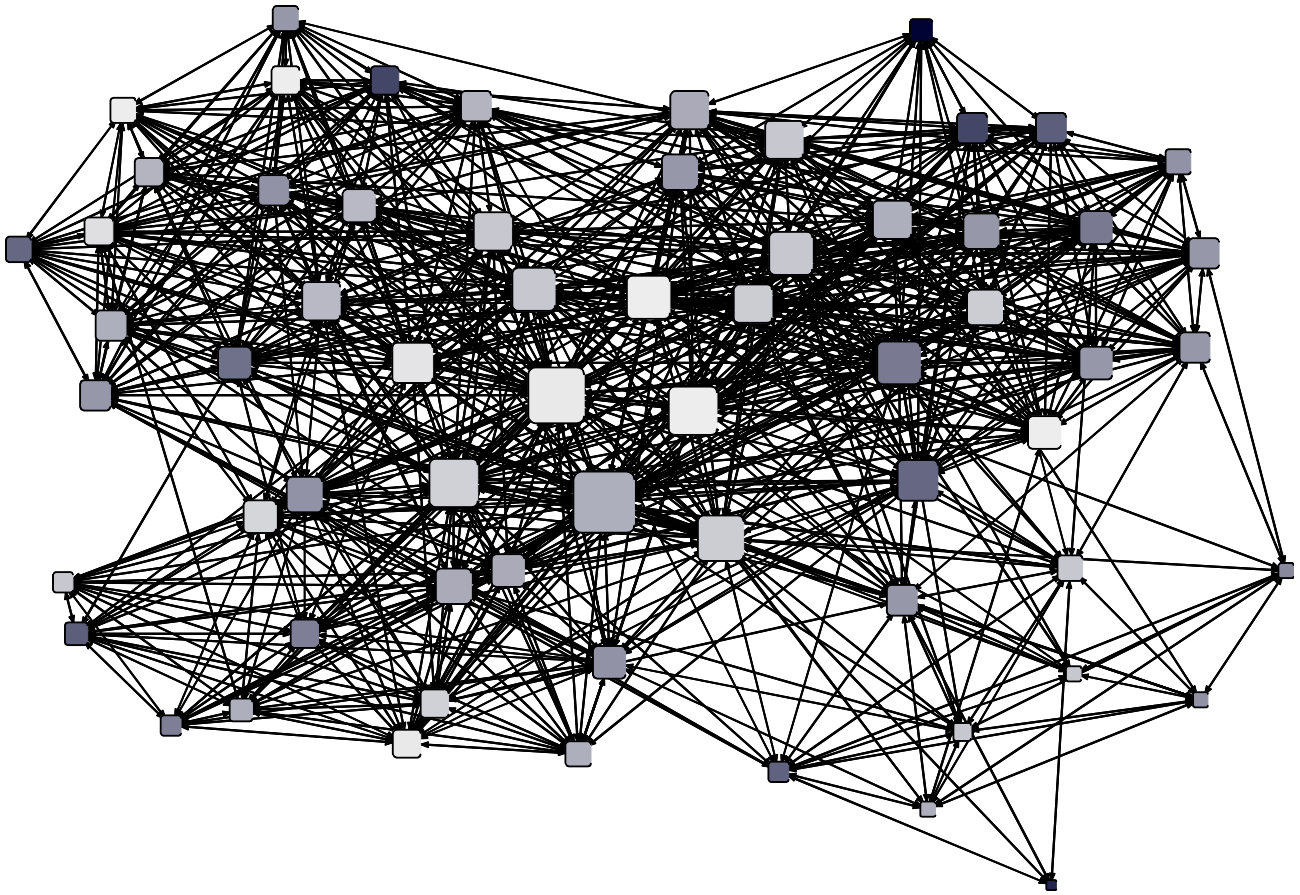
In terms of knowledge sharing, we asked participants to indicate how often they exchanged knowledge with each colleague on the roster in the two months prior to the survey (in order to prevent recall bias). Possible answers were 'never,' 'less than once a month,' '1 to 4 times a month,' 'once a week,' 'several times a week,' and 'daily,' which were respectively recorded as 0, 0.5, 2, 4, 12 and 21 times a month. The undirected network was based on estimate pooling, meaning that we took the average of 1) the response of a participant's frequency of knowledge sharing with a colleague, and 2) this colleague's response regarding his/her frequency of knowledge sharing with the participant—resulting in a

<i>Medium</i>	<i>Media Capabilities</i>					<i>Communication Synchronicity¹</i>
	Transmission Velocity (+)	Symbol Sets (+)	Parallelism (-)	Rehearsability (-)	Reprocessability (-)	Score
Videconference	High	Few-Medium	Low-Medium	Low	Low	3
Telephone conference	Medium-High	Few	Low-Medium	Low	Low	2.5
Instant messaging	Medium-High	Few-Medium	Low-Medium	Medium	Medium-High	1.5
Electronic project space	Low-Medium	Few-Medium	Medium	High	High	0.5
E-mail	Low-Medium	Few-Medium	High	High	High	0
						Overall
						High
						Medium
						Medium
						Low
						Low

¹Note: In case of ranged rankings (e.g. Few-Medium), the highest ranking is used for the calculation of the synchronicity score.

Table 4.3. Media Capabilities and Communication Synchronicity Score

symmetric adjacency matrix. From this matrix we calculated a valued degree centrality measure by aggregating a participant's responses and dividing this score by (N-1), which we used as an indicator of a participant's frequency of knowledge sharing with colleagues. This measure is depicted as a node's size in the knowledge sharing sociogram of figure 4.3.

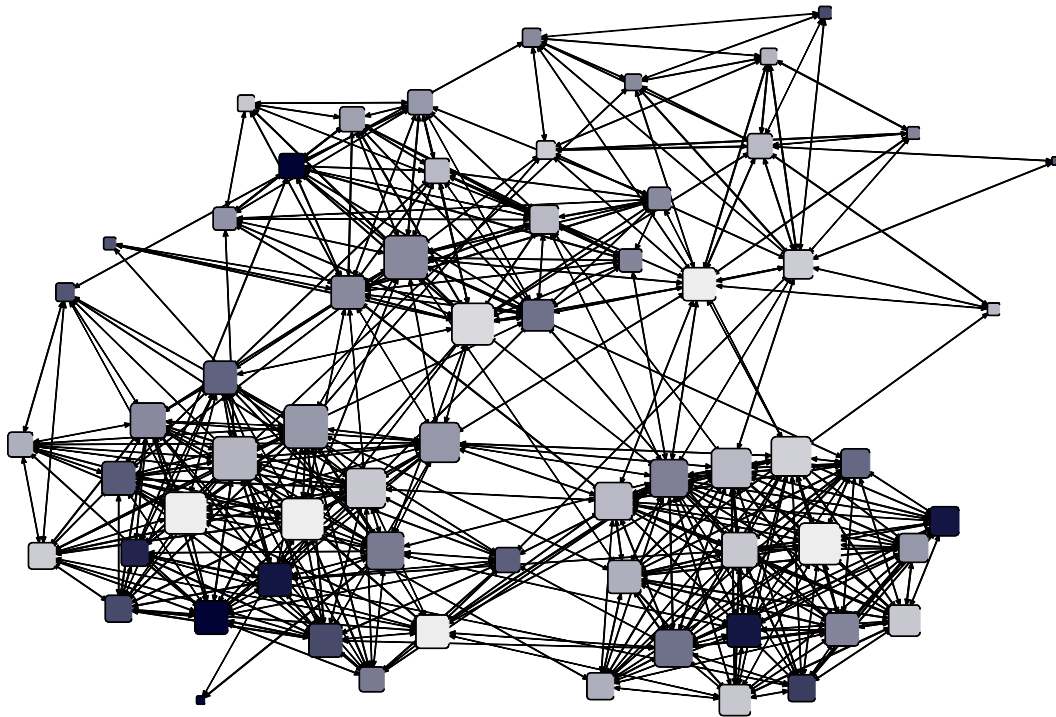


Note. Generated with NetDraw version 2.154. Contains edges when participants are (very well) aware of each other's knowledge. Node placement is based on MDS (geodesic distances) with spring embedding. Node size is based on Degree centrality. Node colour is based on temporal separation (darker colours represent greater separation).

Figure 4.2 Knowledge Awareness Sociogram

4.4 Confirmatory Factor Analysis

We assessed the reliability and validity of our composite measures by means of confirmatory factor analysis (CFA) with maximum likelihood estimation in AMOS 22. In this model, the observed items were loaded on their respective latent measures, which were in turn allowed to covariate. The model provided good overall fit ($\chi^2/df = 1.110$, CFI = 0.987, TLI = 0.984, SRMR = 0.060, RMSEA = 0.042), with all indicators outperforming the recommended cut-off criteria. In addition, the ratio of participants to observed items exceeds the recommended 4:1 ratio for models with good communalities (MacCallum et al., 2001), meaning that the CFA results in table 4.4 are based on sufficient samples.



Note. Generated with NetDraw version 2.154. Contains edges when participants share knowledge at least once a week. Node placement is based on MDS (geodesic distances) with spring embedding. Node size is based on Degree centrality. Node colour is based on spatial separation (darker colours represent greater separation).

Figure 4.3 Knowledge Sharing Sociogram

Overall, our CFA results show that all composite measures are both reliable and valid. First, indications for internal consistency are good, with Cronbach's alpha scores well above the recommended 0.7 cut-off point (Hair et al., 2009). Second, all major criteria regarding convergent validity were met: factor loadings were significant and above 0.5, composite reliability scores were above 0.7, and the average variance extracted (AVE) scores were above the recommended 0.5 cut-off point—indicating that variance in the measures consists of explained variance rather than error variance (Hair et al., 2009). Finally, table 4.5 shows that the square root of AVE scores (on the diagonal) are greater than the squared correlation estimates between the composite measures, indicating good discriminant validity as well.

<i>Goodness-of-fit measure</i>	<i>Recommended cut-off criterion (Hair et al., 2009)</i>	<i>CFA</i>	<i>Structural model</i>	<i>Structural model (within specialism)</i>	<i>Structural model (across specialism)</i>
χ^2 p-value	Insignificant at the 5% level	0.230	0.245	0.253	0.253
χ^2 / df	<2 for adequate fit	1.110	1.154	1.147	1.149
CFI	0.95 or better	0.987	0.981	0.980	0.986
TLI	0.95 or better	0.984	0.959	0.955	0.967
SRMR	<0.08 (with CFI > 0.95)	0.060	0.071	0.080	0.071
RMSEA	<0.08 (with CFI > 0.95)	0.042	0.049	0.048	0.049

Table 4.4. Goodness-of-Fit Measures for Confirmatory Factor Analysis and Path Models

<i>Measure</i>	<i>Mean</i>	<i>SD</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>
1. Work hours (control)	34.70	7.80	1										
2. Years of tenure (control)	7.14	5.14	-0.002	1									
3. Temporal separation	0.51	0.11	-0.793**	-0.089	1								
4. Spatial separation	0.70	0.14	-0.411**	0.058	0.437**	1							
5. Communication synchronicity	0.67	0.34	-0.052	-0.160	0.007	-0.032	1						
6. Knowledge awareness	1.71	0.50	0.281*	0.493**	-0.404**	-0.165	0.023	1					
7. Knowledge sharing	2.12	0.89	0.259*	0.361**	-0.312*	-0.265*	0.136	0.656**	1				
8. Common mental framework	3.65	0.69	0.306*	-0.025	-0.291*	-0.425**	-0.034	0.174	0.160	0.804			
9. Trust in colleagues	3.78	0.41	0.122	-0.105	0.008	-0.073	-0.113	-0.112	-0.094	0.268*	0.770		
10. Job performance	3.90	0.77	0.246	-0.024	-0.237	-0.094	0.099	0.311*	0.360**	0.083	-0.099	0.841	
11. Proactive performance	3.49	0.92	0.229	0.090	-0.126	-0.268*	0.016	0.240	0.325**	0.175	-0.001	0.511**	0.910

*Significance at 5%, **Significance at 1%

Table 4.5. Square Root of AVE (Diagonal) and Correlation Between Variables (Off-Diagonal)

<i>Hypothesis</i>	<i>Construct A</i> → <i>Construct B</i>	<i>Path coefficient combined model</i>	<i>Path coefficient within specialism model</i>	<i>Path coefficient across specialism model</i>	<i>Rejected / supported</i>
H1a	Knowledge sharing → Job performance	0.191*	0.105	0.343**	Supported¹
H1b	Knowledge sharing → Proactive performance	0.282*	0.258*	0.357**	Supported
H2	Temporal separation → Knowledge sharing	0.034	0.008	0.063	Rejected¹
	Spatial separation → Knowledge sharing	-0.152*	-0.303**	-0.114*	No support
H3a	Temporal separation*Communication synchronicity → Knowledge sharing	0.032	0.023	0.116	Rejected¹
H3b	Spatial separation*Communication synchronicity → Knowledge sharing	-0.489**	-0.313	-0.091	Supported
H4	Knowledge awareness → Knowledge sharing	0.602***	0.506***	0.896***	Supported¹
H5	Temporal separation → Knowledge awareness	-0.355*	-0.366*	-0.356*	Supported¹
	Spatial separation → Knowledge awareness	-0.043	0.024	-0.094	No support
H6a	Temporal separation*Communication synchronicity → Knowledge awareness	0.087	0.239	-0.035	No support
H6b	Spatial separation*Communication synchronicity → Knowledge awareness	-0.039	-0.280	0.064	No support
H7	Common mental framework → Knowledge sharing	0.058	-0.024	-0.026	No support
H8	Temporal separation → Common mental framework	-0.020	-0.106	0.038	Rejected¹
	Spatial separation → Common mental framework	-0.358**	-0.345**	-0.356**	No support
H9a	Temporal separation*Communication synchronicity → Common mental framework	-0.106	-0.096	-0.119	Supported
H9b	Spatial separation*Communication synchronicity → Common mental framework	0.243*	0.199**	0.267*	No support
H10	Trust in colleagues → Knowledge sharing	0.111	0.131	-0.136	No support
	Temporal separation → Trust in colleagues	-0.253	-0.435*	-0.124	No support
H11	Spatial separation → Trust in colleagues	-0.113	-0.152	-0.079	No support
H12a	Temporal separation*Communication synchronicity → Trust in colleagues	-0.078	0.013	-0.106	No support
H12b	Spatial separation*Communication synchronicity → Trust in colleagues	0.178	0.038	0.245	No support

*Significance at 5%, **Significance at 1%, ***Significance at 0.1%, ¹Refer to the results section for further details.

Table 4.6. Standardized Path Coefficients and Hypothesis Evaluation

4.4 Results

As most measures in our structural model consist of single indicators, we conducted a path analysis without latent measures to test our structural model in AMOS 22. This approach is commensurate with our sample size, and required the averaging of items for each of our composite measures. All paths in our model were in line with our hypotheses and control conditions. Exogenous variables were allowed to covary amongst each other (including the interaction terms with their parent measures) in order to account for systematic statistical correlations, as was the control measure regarding the number of work hours with time/place separation. The residuals of job and proactive performance were allowed to covary for the same reason, resulting in a model that meets the recommended cut-off criteria for good model fit ($\chi^2/df = 1.154$, CFI = 0.981, TLI = 0.959, SRMR = 0.071, RMSEA = 0.049). Overall fit scores for the two additional structural models (in which the sociometric questions were calculated for colleagues within and across specialist boundaries) are included in table 4.4. We also tested an alternative model, in which the measure for trust in colleagues interacts with temporal and spatial separation, to examine if this might improve model fit. The interaction effects were insignificant, however, and fit statistics were markedly worse ($\chi^2/df = 1.353$, CFI = 0.937, TLI = 0.888, SRMR = 0.073, RMSEA = 0.075).

Table 4.6 summarizes our structural model's standardized path coefficients as well as significance levels on the basis of maximum likelihood, providing support for several of our hypotheses. First of all, knowledge sharing across specialist boundaries is more positively related to job and proactive performance than knowledge sharing within specialist boundaries, providing support for hypothesis 1. In the case of job performance, the effect of knowledge sharing within specialist boundaries is insignificant and only able to explain 2% of variance, whereas knowledge sharing across specialist boundaries is highly significant and able to explain 13% of variance in job performance. Knowledge sharing is in turn determined by both temporal and spatial separation from colleagues, through two separate pathways. Contrary to hypothesis 2, only spatial separation shows indications of a direct negative effect on knowledge sharing (particularly with colleagues from one's own area(s) of expertise). Moreover, this effect is positively moderated by the use of synchronous communication media, which refutes hypothesis 3b. To aid in the assessment of this interaction effect, we plotted simple slopes for high and low levels (+1 and -1 standard deviation) of the independent variable and for medium and low levels (+1.97 and -1.97 standard deviation) of the moderator variable in Figure 4. Simple slopes tests indicate that the use of synchronous media can exacerbate the negative effect of spatial separation on knowledge sharing ($\beta = -.89$, $p < .01$), while the use of asynchronous media might reverse it ($\beta = .61$, $p < .05$). With an f^2 effect size value of 0.22, the additional impact of this interaction measure on knowledge sharing is classified as 'medium' (Cohen, 1988).

Next, temporal separation (rather than spatial separation) from colleagues negatively influences knowledge sharing through reduced knowledge awareness, providing credence to hypotheses 4 and 5. This reduced awareness is especially detrimental when it concerns the knowledge awareness of colleagues outside of one's own area(s) of expertise, as it accounts for approximately half of the explained variance in knowledge sharing across specialist boundaries ($\Delta R^2 = 0.43$). Finally, we found that spatial separation (as opposed to temporal separation) of teleworkers negatively affects the extent to which they develop a common mental framework with their colleagues, refuting hypothesis 8. This effect is negatively moderated by the use of synchronous communication media, however, which supports hypothesis 9b. The nature of this interaction effect is depicted in Figure 4.5, which shows that the use of synchronous communication media almost completely offsets the negative effect of spatial separation on the development of a common mental framework

($\beta=.12$, $n.s.$, $f^2=.08$). Figure 4.6 graphically summarizes the significant results obtained from our analyses, and provides an overview of the variance explained across our three structural models.

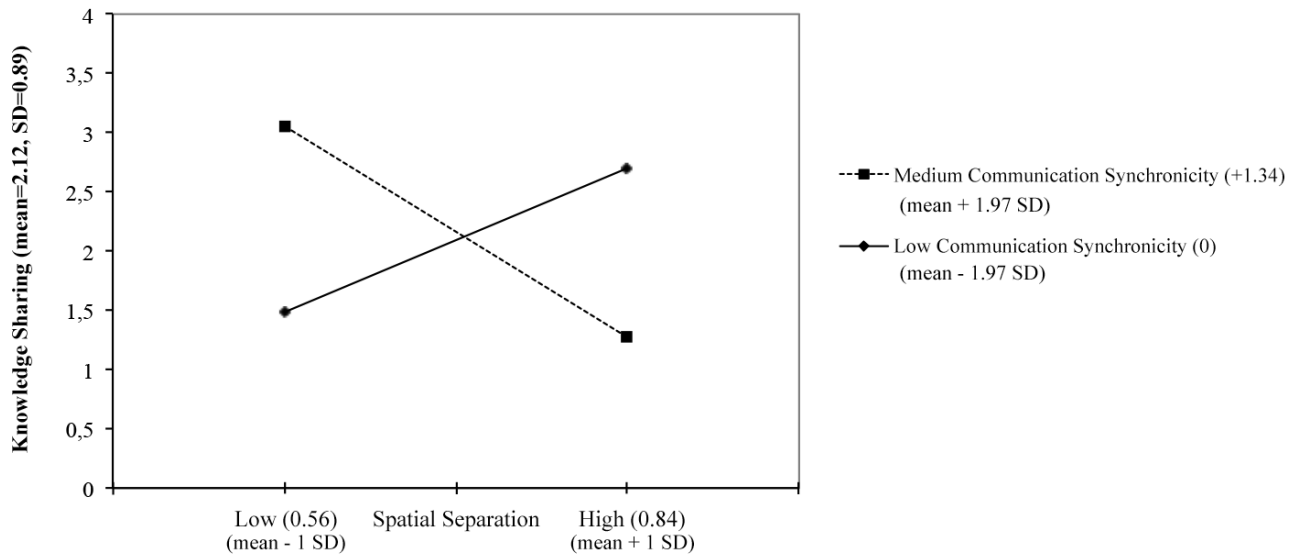


Figure 4.4. Interaction Effect of Spatial Separation and Media Synchronicity on Knowledge Sharing

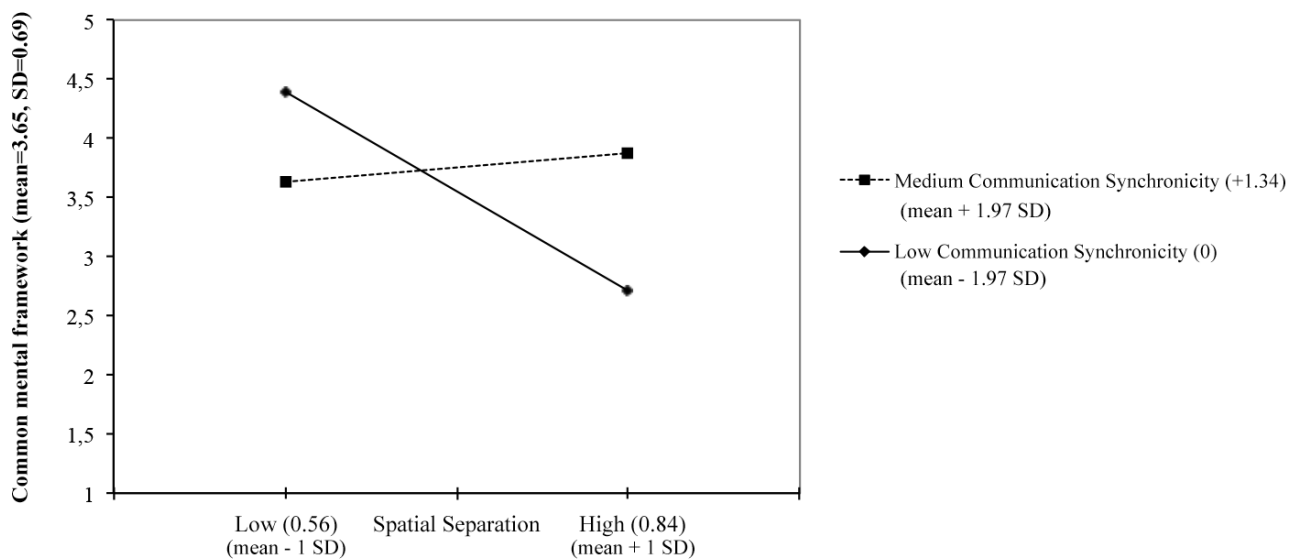
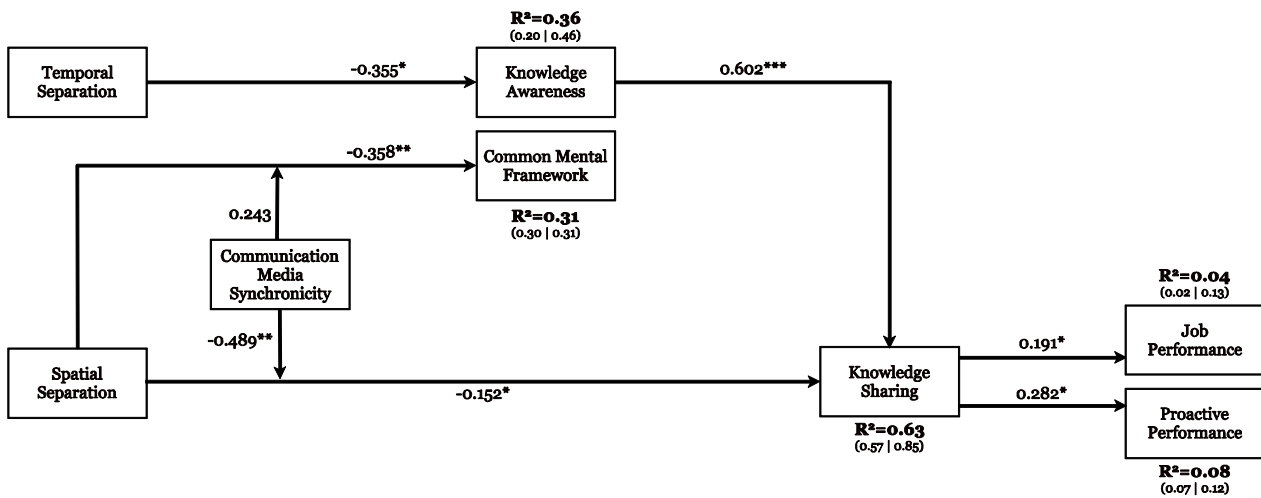


Figure 4.5. Interaction Effect of Spatial Separation and Media Synchronicity on Common Mental Framework



Note. Numbers represent standardized coefficients. R^2 scores in parentheses respectively apply to the within and between specialism models. ** Significance at 1%, *** Significance at 0.1%

Figure 4.6. Tested Model Results

4.5 Discussion

In this study we examined how daily schedule and location differences between colleagues, in conjunction with (a)synchronous communication media use, influence (the social underpinnings of) knowledge sharing networks. Despite the fact that the cross-sectional nature of our study prevents us from inferring true causality between measures, we have made three important contributions to existing literature. First, to the literature on distributed work, we introduced a new (extent of) telework measure that distinguishes between temporal and spatial separation from colleagues. With this measure, we were able to tease apart the individual effects of both types of separation, showing that each influences a knowledge network through distinct causal paths. Second, we add to the literature on social capital by examining its mediating effect on the relationship between temporal/spatial separation and knowledge sharing in an under-investigated setting of limited contextual variation (i.e. telework). Third, we applied media synchronicity theory in a quantitative context, showing that (a)synchronous media use interacts with the level of spatial separation to affect cognitive social capital and the frequency of knowledge sharing. We will further elaborate on these contributions as well as our limitations and recommendations for future research in the following paragraphs.

In line with previous studies (e.g. Allen and Henn, 2007), we found that spatial separation directly harms the frequency of sharing in a knowledge network—most particularly with colleagues from one’s own area(s) of expertise—which we posit has mostly to do with exposure. The more an individual’s working locations deviate from those of his or her colleagues, the less likely he or she is to (serendipitously) interact and subsequently share knowledge with them. Participants illustrated this point by indicating that colleagues at the office will first try to obtain knowledge from physically proximate colleagues; if they at first cannot obtain the knowledge they need this way, only then will they turn to their more distant colleagues. Their subsequent choice of communication medium is primarily determined by immediacy of the knowledge inquiry; interactions that would normally take place face-to-face are therefore not automatically substituted by relatively synchronous media. Teleworkers adhere to much the same ‘immediacy’ logic and typically

replace the partial loss of face-to-face interaction with e-mail or instant messages, as this allows them to structure their knowledge sharing activities and devote more time to focus work. Figure 4.4 clearly illustrates this behaviour, and supports exploratory findings by Leonardi, Treem and Jackson (2010). Part time teleworkers in particular can afford such a communication repertoire, as they can still arrange for—and reap the benefits of—regular face time when they are at the office. Unfortunately, we cannot draw any conclusions regarding the effect of spatial separation and (a)synchronous media use on the quality or type of knowledge (e.g. tacit versus explicit) being shared, as our main investigation was limited to the frequency of knowledge sharing in general. Anecdotal evidence from a prior study by Bélanger and Allport (2008) has shown that such a change in teleworker’s technology use could lead to an increased focus on explicit knowledge and a decrease in tacit knowledge flow, but from discussions with our own participants we gleaned that teleworkers are more likely to reconfigure their various knowledge sharing activities across time, space, and communication media instead. The intricacies and limits of this interplay, combined with a focus on how temporal/spatial separation and various knowledge sharing activities influence the appropriation of communication media, could provide an interesting area for further research.

Contrasting the effect of spatial separation, we found that temporal separation did not directly influence sharing in a knowledge network. Instead, it works negatively through knowledge awareness (a form of structural social capital), meaning that the more an individual’s chosen working times deviate from those of his or her colleagues, the less he or she will be aware of the knowledge and areas of expertise of these colleagues. Working in locations that are different from one’s colleagues, however, does not seem to influence one’s level of knowledge awareness. This means that not the lack of direct physical proximity, but rather the lack of working time synchronicity results in reduced awareness in a knowledge network. Our expectation was that asynchronous communication media could help to mitigate this negative effect, but we found no such moderating effect. Participants clarified this finding by stating that they rather not use the communication media at their disposal for signalling or discovering expertise. They prefer to do this in person (at presentations or during shared office interactions) or with the help of unilateral technological solutions (e.g. through searching shared documents or by consulting expert yellow pages). Our findings thus do not rule out the possibility that knowledge awareness can be developed with the help of technology (as suggested by Moreland (1999)), but they do oppose earlier experimental findings in which e-mail (Kanawattanachai and Yoo, 2007) and telephone (He et al., 2007) interactions played a vital role in developing knowledge awareness among separated colleagues (albeit in the context of virtual teams). As such, we posit that different media capabilities might be required when it comes to developing the knowledge awareness of (part-time) teleworkers. One particular capability that was lacking in the communication media of our study was the ability to search among prior interactions between other colleagues. Media such as enterprise social networks—which typically provide transparency of directional communication (Leonardi et al., 2013)—might therefore be better suited for developing knowledge awareness. An added benefit of such media is that they can also allow for ‘planned serendipity’ (Majchrzak et al., 2009), in which potentially valuable but under-explored relationships in the knowledge network can be proactively presented to teleworkers. We therefore highly recommend that future research efforts focus on (part-time) teleworkers’ use of enterprise social networks or other media with high levels of transparency and serendipity as a way to maintain knowledge awareness in separated work settings.

Of the two remaining dimensions of social capital, only cognitive social capital is negatively affected by spatial separation. This negative effect can almost completely be mitigated by the use of synchronous communication media

though, which provides empirical support for the premise that convergent communication processes benefit from synchronous media use (Dennis et al., 2008). The interaction also suggests that the difficulty in developing a common mental framework with spatially separated colleagues primarily stems from a reduction in face-to-face contact rather than from an absence of a collective interpretive context or reduced social pressures for conformity. Based on the premise that such reduced face-to-face contact would lead to a broader ‘de-socialization process’ (Taskin and Bridoux, 2010), we formulated the hypothesis that trust between colleagues would be similarly affected. Our empirical findings provide no basis for this theorized relationship, nor does the level of trust between colleagues interact with temporal or spatial separation to influence knowledge sharing. One could argue that (with an average 7+ years of tenure) our participants may have had enough time to gather behavioural evidence about each other, which could have served to create a form of habitual trust that is impervious to separation or a shift towards increased electronic communication media use (Robert et al., 2009). To rule out this confounding effect, however, we controlled for the number of years of tenure in the organization. This calls into question existing claims that “relational qualities clearly play a vital role in teleworker knowledge sharing” (Golden and Raghuram, 2010), especially since we also found no relationship between either cognitive or relational social capital with the frequency of sharing in a knowledge network. This could have been the result of one of our study’s main contributions to the theory of social capital: the study setting. Whereas existing studies (based on virtual teams and communities of practice) typically dealt with interactions between relative strangers from various national or organizational contexts, our study focused on teleworkers from a single organization operating out of a centralized office in one country. This difference leads us to believe that cognitive and relational dimensions of social capital are less important for knowledge sharing when contextual variations are limited. It is important to note, however, that none of our participants indicated neither a lack of a common mental framework nor distrust among colleagues, meaning that we cannot exclude whether low scores on these measures lead to a reduced knowledge sharing frequency. In addition, participants indicated that our focal organization (the MEB) has a knowledge-intensive culture in which excellence, transparency, and sharing are the norm. Such cultural norms generally have a substantial influence on knowledge sharing behaviours (Newell, 2015) and could have partially replaced trust as an antecedent of knowledge sharing, as they reduce the risks and uncertainties related to the abilities and intentions of colleagues. Prior studies have found similar effects (e.g. Chow and Chan, 2008) and replication of our study across several organizations with the explicit inclusion of cultural norm measures would help to further validate our results and the existence of such a trade-off.

Ultimately, our research shows that less frequent knowledge sharing (especially across specialist boundaries) is likely to result in reduced job and proactive performance. This is expected to affect an organization’s innovative potential as well as its bottom line, meaning that managers should aim to minimize the negative impacts of telework on the organization’s knowledge base. In part, this could be done by limiting extreme instances of telework, as we found that negative effects of spatial separation can be overcome if teleworkers are supported in consciously reconfiguring their various knowledge sharing activities across working locations and various communication media. Regular face-to-face contact with colleagues (e.g. at the office) is an important part of this reconfiguration process, which should be encouraged. In addition, we advise to synchronize (core) working times, as this improves knowledge awareness between otherwise separated colleagues. Managers themselves play an important role here as well: they should stay on top of the knowledge needs of their employees and serve as bridges between various specialist groups to connect employees when it is most beneficial. Eventually, new technologies (such as enterprise social networks) might proactively support teleworkers in maintaining their knowledge awareness. We urge organizations to be on the lookout for these technologies

and experiment with them, as solving the issue of reduced knowledge awareness would reduce the main (structural) threat to a teleworker's knowledge sharing network.

4.6 Conclusion

Researchers and practitioners need to understand how telework and the use of communication media affect knowledge networks and ultimately, employee performance. This article shows that working 'any time, any place' with the help of ICT is not without consequences: teleworkers' temporal and spatial separation from colleagues may lead to a workforce which shares less knowledge, performs worse, and has less innovative potential. Contrary to commonly held views, this is not due to reduced cognitive or relational social capital, but (partially) the result of reduced structural social capital. More specifically: temporally separated teleworkers are less aware of the knowledge and expertise available in the organization, which is a major determinant of knowledge sharing within and across specialist boundaries. An additional direct negative effect of spatial separation on the frequency of knowledge sharing can be mitigated through the use of asynchronous communication media, but such an interaction effect does not hold for temporal separation. Organizations supporting telework practices should therefore be mindful of the adverse effects on its knowledge base, and encourage teleworkers to reflect on how they structure their knowledge sharing activities across working times, locations, and communication media.

Chapter 5

Distinctively Digital^{iv}

5.1 Introduction

Today's workplace is undergoing a revolution. Faced with rising competitive pressures from global environments and changing employee needs, organizations are forced to reassess where, when, and especially how their employees work. Advances in digital technologies have not only spurred changes in the work environment, however, but also in related organizational practices and culture. Take mobile (tele)working: while the practice itself is already four decades old (Nilles et al., 1976), there is no denying that it has undergone significant changes due to the ubiquitous presence of cheap and reliable broadband communications, portable computing technologies, and cloud-based 'software as a service' solutions. With an estimated 15 to 20 percent of employees now working remotely at least 'some of the time' in the European Union and United States (Eurostat, 2016; U.S. Department of Labor, 2015), many organizations are in turn faced with lower occupancy rates at the office (often prompting a redesign), changing leadership requirements, or the increased reliance on enterprise social networks. Such people, place, and technology-related dimensions of work are tightly coupled (Kane, 2015) and increasingly embedded into digital workplace concepts that have the potential to "enable new, more effective ways of working, raise employee engagement and agility; and exploit consumer-oriented styles and technologies" (Tay and Cain, 2015).

It seems clear that organizations cannot remain stagnant in the face of digital disruption (Kane et al., 2015). Yet finding out which concepts from a veritable ecosystem of digital workplace practices actually work for improving organizational performance is a challenging task. Organizations such as Best Buy, HP, and Yahoo have for instance all recently decided to take a step back from remote and autonomous (results-only) work practices to focus on co-location and collaboration in open environments—decisions that were in turn widely challenged by the popular press (e.g. Schwartz, 2013; Valcour, 2013). Unfortunately, there is no particular research stream on the digital workplace (Köffer, 2015) to guide or interpret such decisions. Moreover, existing research on the large variety of its possible constituent practices

^{iv} This chapter is based on a working paper by van der Meulen, N., Dery, K., and Sebastian, I. 2016. "Distinctively Digital: Workplace Transformation for High Performance." This version has been submitted to the 37th International Conference on Information Systems. The European Research and Advisory organization referred to in the qualitative section of this paper is the Medicines Evaluation Board.

typically focuses on individual employee effects that do not translate well into organizational performance (Fuller, 2016). The objective of this article is therefore to describe how digital workplace design affects organizational performance. We focus on the following two research questions:

- 1) How are organizations designing digital workplaces that simplify work in complex environments, and*
- 2) Do these digital workplace design choices contribute to organizational performance?*

To answer these questions, we have conducted a series of interviews with 63 executives at 27 large global organizations (that were implementing digital workplaces) to develop a framework that outlines the various design elements of a digital workplace. Subsequently, we have quantitatively tested the importance of these design elements in driving organizational performance using an online survey among senior managers and policymakers from 113 organizations. We will illustrate our findings with examples from organizations that consider the digital workplace an integral part of their digital strategy and discuss them in the light of current literature.

The remainder of this article is structured as follows. First, we elaborate on the methodological details of the qualitative and quantitative investigations that form the basis for our mixed methods research design. We then proceed to present our qualitative findings, which led to the creation of the 6S Digital Workplace Framework. This framework unpacks the digital workplace into a series of design and management levers and is subsequently applied to our quantitative results section, where we explore how these (combined) levers relate to organizational performance. Next, we will discuss the value and novelty of our findings, along with possible limitations. We ultimately conclude this article with a set of recommendations to management practitioners as well as possible avenues for further research to management scholars.

5.2 Research Method

Identified by Gartner as a ‘transformational megatrend’ (Burton and Willis, 2015), the digital workplace—and how it can deliver value by facilitating new ways of working in digital economies—is a relatively new area of research. We have therefore used a so-called ‘exploratory sequential mixed methods’ (Cresswell, 2013) research design, in which we first conducted a qualitative set of exploratory interviews to develop a framework and hypotheses that guide subsequent quantitative tests. The datasets used for this investigation originate from two separate studies conducted independently at two universities. The qualitative study at the Massachusetts Institute of Technology Sloan Center for Information Systems Research (CISR) was conducted from 2015 to 2016, and the findings were then used to analyse the quantitative data that had been collected at the Rotterdam School of Management, Erasmus University (RSM) between 2011 and 2014. While the studies were designed independently, they had similar objectives and were found to be complimentary. The data from RSM therefore proved useful in testing the findings from the exploratory interviews conducted by CISR. The researchers from both studies collaborated closely during the analysis stages of both datasets, and worked co-located for several months to enhance the critical perspective that has resulted in this paper. The methodologies used in both studies are discussed in detail in the following subsections.

5.2.1 Qualitative Research Study

Exploratory expert interviews for this study were conducted in 2015 and were designed to gain a better understanding of what organizations mean when they talk about the digital workplace. We also wanted to know more about the various elements that organizations considered important in rethinking the way work was done to be more effective in a digital environment. In other words, we needed to understand 1) how organizations defined the digital workplace, 2) what activities or areas of work were given new consideration, 3) why organizations considered it important to focus on the workplace to build new capabilities, and 4) how they were going about designing and implementing new workplaces. Note that we were interested more in what they were doing and why they were doing it, rather than the change management practices that surrounded the transition to the new workplace.

We used a semi-structured interview approach in which we invited participants to openly share their experiences. Organizations self-selected into the study based on their response to a 'request for participation' email that was distributed to a broad industry cross-section of large organizations (consisting of at least 500 employees) in the United States of America, Europe, and Australia. We then conducted a series of interviews with executives identified as responsible for the digital workplace. Each interview lasted between 30 to 40 minutes, and in some organizations we interviewed multiple people with responsibilities across IT, HR, Facilities, and Digital. In total 63 interviews were conducted over 27 organizations. Most interviews were recorded and transcribed, although for some it was only possible to gather written notes due to confidentiality restrictions. The interview transcripts were utilized for within-case and cross-case analysis.

During the analysis phase, the interview data was coded based on emerging categories that were debated and agreed on by the two researchers responsible for this investigation. Additional feedback was acquired from the broader research team as the work was frequently presented throughout the data collection period. A framework (known as the 6S Digital Workplace Framework, described in the following section) was ultimately developed from this data and subsequently applied to the quantitative dataset to gain further insights into how high performing organizations use the digital workplace design elements differently to add organizational value.

5.2.2 Quantitative Research Study

Data collection for the quantitative part of our paper occurred between 2011 and 2014 by means of an online survey. The goal of the research instrument was to explore the prevalence of digital workplace practices as well as their effects and possible obstacles. Development of the corresponding items took place in collaboration with a team of 10 subject matter experts from three research institutes. The survey instrument was pre-tested in the final stage of development with the help of six corporate partners. This feedback led to minor changes in question wording, the addition of fill-in instructions, and the inclusion of definitions when deemed necessary. Invitations to participate in the survey were sent to senior managers and corporate policymakers (i.e. informed respondents for their respective organizations) throughout the data collection period by the corresponding research team and affiliated research partners. Even though the data collection process spanned several years, the research set-up was cross-sectional in nature; participants were therefore instructed to disregard invitations in case of prior participation. In order to ensure truthful responses, the introduction of the survey further assured respondents that the data collection process was anonymous, and that their answers would be treated confidentially. To ensure data security, the survey was hosted on the researchers' university system.

Usable responses		Absolute 113	Relative 100%
Organizational size	1-50 employees	33	29%
	51-100 employees	13	12%
	101-500 employees	22	19%
	>500 employees	45	40%
Years in operation	0-5 years	19	17%
	6-25 years	40	35%
	26-100 years	37	33%
	>100 years	17	15%
Industry	Banking & Insurance	15	13%
	Business Services	24	21%
	Construction	1	1%
	Consultancy	15	13%
	Government	15	13%
	Healthcare	1	1%
	ICT & Media	14	12%
	Industry	1	1%
	Logistics	2	2%
	Research & Education	7	6%
	Utilities	3	3%
	Undisclosed	15	13%

Table 5.1. Quantitative Sample Characteristics

In total, 318 participants completely filled out the survey. Five of these responses were ignored, however, as they represented abnormal response patterns or unusually low completion times. Of the remaining 313 organizations there were 113 organizations that had experience with the digital workplace; other organizations indicated that they were either still learning about or preparing themselves for the digital workplace. Considering this paper's focus on digital workplace design, we focused on the 113 organizations in our dataset that had made conscious choices to design a digital workplace. Table 5.1 summarizes the characteristics of this sample, which represents a wide range of industries, organizational sizes, and years in operation.

5.3 The 6S Digital Workplace Framework

Our qualitative investigation shows that the digital workplace is about a fundamentally different way of working. The digital economy transforms most industries into turbulent, unpredictable environments that require organizations to shift from relatively stable, slow moving hierarchies to dynamic and fluid cultures of influence. Trying to deliver more complex customer solutions in traditional workplaces is like asking employees to run in sand; it makes working life really hard. In order to build more dynamic and collaborative ways of working, organizations need to address the workplace in ways that go beyond isolated changes to the physical work environment or information technology (IT). What is required instead, is a holistic approach to the changing nature of work that revolves around the employee. For employees to effectively deal with novel and non-routine business processes, the organization has to offer a high degree of segmentation (making the environment suitable for various tasks and job functions) as well as a high degree of choice (regarding when and where work takes place) —which has significant implications for workplace design (Davenport et al., 2002). We define the

digital workplace as *the technological advances and related physical and cultural practices that simplify working life in complex, dynamic, and often unstructured business environments*. As such, the digital workplace combines several elements from related management concepts such as high performance work systems (e.g. Ramsay et al., 2000), workplace innovation (e.g. Kesselring et al., 2014) and workplace flexibility (e.g. Kossek et al., 2015).

The reason for this holistic approach is rooted in the viewpoint that isolated efforts by facilities, human resources, or IT departments are insufficient for effecting meaningful change in the way work is conducted. As one senior executive lamented:

“If you just imagine the microcosm of an individual workplace in our company, then every part of it is owned by a different part of the company. The screen, laptop and video camera belong to IT, the phone to communications, the desk and chair to facilities, and the person sitting at it is governed by HR. Without all of these parts moving together we are in danger of simply playing an old game with new rules. This is not workplace transformation.” (Facilities manager at a Global Insurance Organization)

This description, which depicts a common concern among workplace management in our research sample, supports the viewpoint of an organization as an ecosystem where people, place, and technology elements either mutually reinforce one another or place individual constraints on organizational performance. All elements need to be aligned and changed in dynamic harmony to create a competitive advantage (see Becker, 2007).

We learned that organizations typically transform their workplace using four design levers: 1) physical and virtual space, 2) systems that support getting work done, 3) enterprise social media, and 4) the symbols (branding) that communicate the strategic significance of the digital workplace design. In addition, we identified that successful organizations guide digital workplace transformation with two management levers: leadership with a sustained focus on supporting the digital workplace design, and systemic learning processes that ensure continuous improvements in the way work is conducted (Dery et al., 2015). Without these management levers, organizations' efforts to transform the workplace tend to stagnate in pilot projects and suboptimal designs. Figure 5.1 provides a graphical overview of the entire framework and its four design and two management levers; we will briefly discuss each of these and illustrate them with typical practices derived from our interviews.

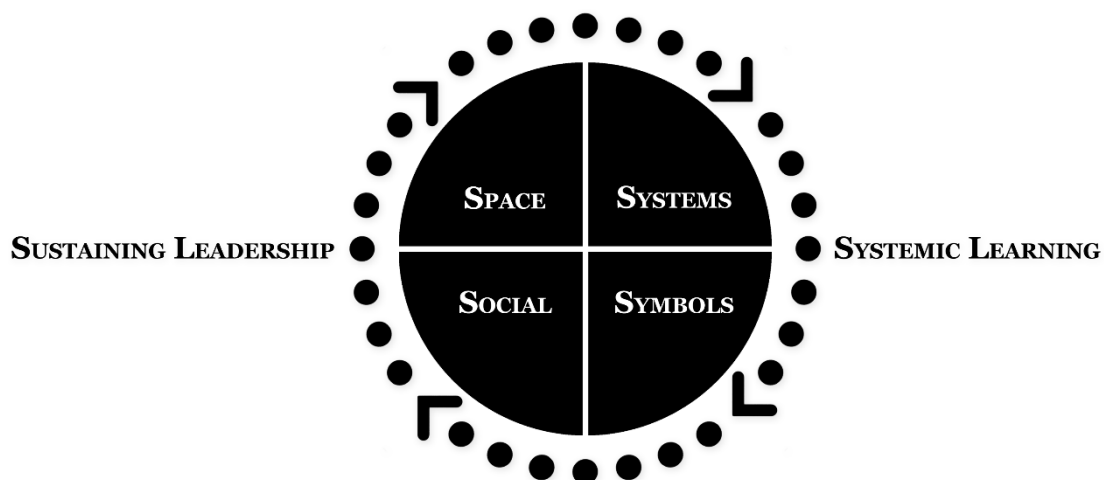


Figure 5.1 The 6S Digital Workplace Framework

5.3.1 Design Levers

Space

The physical work environment is the traditional embodiment of the workplace, and therefore also remains an important cornerstone of the digital workplace. Whether physical or virtual, space refers to those elements that provide choice in the work environment and allow for collaborative behaviours. That is why in nearly all organizations we have studied, decisions regarding the work environment are taken with interaction in mind. The way in which these goals are to be achieved, however, differs. For instance, some organizations deliberately designed (specific parts of) the work environment in such a way that it maximizes collaboration and the number of ‘collisionable hours’—i.e. the frequency of chance encounters and unplanned interactions between employees (Waber et al., 2014):

“We consider the decision to have a central open staircase a major cause for our success. People meet there by chance and if we wouldn’t have these open stairs, they would need to go through several doors to reach another floor. In our view that would lead to a separation of people; obstructing the cooperation and communication that we aimed for.” (Digital Workplace Steering Committee Member at a European Research and Advisory Organization).

Employee mobility within offices is further enabled by mobile technologies, fast Wi-Fi connections, and the use of open work environments with flexible seating. Interviewees indicated that these make employees more visible and approachable, also across hierarchies:

“I find that I know more about what my teams are working on and when new issues are arising, I don’t have to wait for them to turn into a formal [...] I’m hearing about it in the hallway.” (CIO at a large North American Motor Vehicle Manufacturing Organization)

Yet while removing office walls altogether may increase interaction, there is a risk of it doing so at the cost of privacy and focus. In terms of choice and segmentation, a flexible open office design provides choices regarding intra-office mobility, but it does not necessarily provide segmentation. This is why several organizations envisioned their work environment around ‘personas’—each with its own specific requirements and experiences. These personas extend to requirements for remote working (at home, at co-working spaces, or on the go), resulting in an integrated perspective on workplace experiences where employees can choose environments in which they can optimally perform (see also van Heck et al., 2012). In the physical office, different work requirements by individuals and teams typically led to more nuanced work environments, providing a variety of work settings for specific activities or job functions:

“We’re really looking at a distributed work model now, where we’ll have hoteling, we’ll have client space, we’ll have focus space, we’ll have community areas, and we’ll have touchdown points where teams can touch down and sit near each other but not have an assigned desk.” (CIO at a large North American Management and Consulting Services Organization)

Finally, forward-looking organizations are examining ways in which technology can be used to augment the work environment even further. One such example is Deloitte in the Netherlands. Its new Amsterdam office building, known as The Edge, has an interconnected lighting system with 6,000 sensors linked to mobile phones in order to provide employees with a more comfortable and personalized work environment. Additionally, this system can provide real-time information

about building occupancy, allowing employees to quickly find teammates or colleagues with certain areas of expertise for face-to-face interaction (Randall, 2015).

Systems

Digital workplace systems comprise the technologies that revolve around ‘the way people work.’ These technologies differ from those that are directly associated with specific work processes and tasks, such as customer relationship management systems or research analysis software. Organizations that successfully leverage the systems lever strive to address three elements—mobility, unified communications and collaboration (UCC), and employee enablement—in a coherent approach that focuses on simplifying the way work is conducted:

“A digital enterprise [...] demands a company whose business rules and policies are completely digital, where people’s jobs are represented in a digital fashion and, most importantly, a technology ecosystem that makes the company’s information both secure and, for those with the right access, easy to find and share. It’s a philosophy of how work is going to get done.” (CIO at a large North American Financial Services Organization)

Most organizations have enhanced employees’ mobility by virtualizing their workflow: all required work-related information is digitized and made available at any time and any place through external access to corporate systems. Whereas some organizations use dedicated devices to achieve this, others rely on virtualization tools in combination with a ‘Bring Your Own Device’ (BYOD) policy. These policies are typically supported by cloud-based solutions and UCC systems, especially in large, distributed organizations. Organizations in our research sample sought to facilitate collaboration by providing searchable knowledge bases to connect with others, and by making it easy for employees to work together both physically and virtually:

“In general, [our UCC system] just makes it very, very easy to connect with any colleague anywhere in the world [...] if they’re online you can just respond. It makes everything faster, quicker, more efficient. You don’t have to necessarily wait for a certain day and time to talk to them or, what if they are not at their desk – they can’t take their landline phone, etcetera. Just ping them on [the UCC system]. I think that’s just become the norm now of how people want to connect with one another.” (Enterprise Architect at a large European Oil and Gas Organization)

We also learned that organizations are increasingly focused on employee enablement, which revolves around 1) providing the right technologies to get work done (faster) as well as 2) removing potential barriers to employee performance. Organizations commonly found that it is difficult to alleviate complexity of workplace systems (such as difficulties with technologies in virtual meeting rooms, log-in issues, printer connectivity, complex travel systems etc.) that create ‘speed bumps’ to getting work done. One crucial way in which enablement is therefore achieved is by providing technological support quickly whenever and wherever it is needed, as well as by constantly servicing technologies to preempt problems. Additionally, organizations are experimenting with ways to augment the office through location and presence indicator systems, which help employees to quickly find available spaces to work and create awareness of where and when colleagues are available to collaborate. A select group of organizations have started to approach enablement from a perspective of personalization: a large financial services organization for instance enabled employees to choose from personalized technology toolkits based on their work needs:

"We created a user needs map, which basically said, what are we trying to do from an employee technology perspective? It's to communicate, to get people to collaborate, to improve knowledge management, to facilitate them to get things done on a day-to-day basis. And if that's the goal, then how do you [...] measure it and see progress? How would an employee see a difference? That was an equally important thing." (CIO at a large North American Financial Services Organization)

Social

In most of the organizations in our study, social media played a role in simplifying working life and facilitating access to corporate conversations at different levels. Enterprise social media (ESM) such as Yammer, Chatter, or Jive have the potential to facilitate the sharing of ideas and discussions across the organization and across hierarchies. Organizations that used ESM as a primary component in workplace transformation described how executive teams engaged with employees to stimulate ideas, develop innovations, reduce siloed thinking, and identify influencers as well as insights about improving the workplace. When ESM are utilized effectively, sourcing of ideas becomes more transparent:

"We had to find ways of shining the spotlight into dark corners of our organization to find those people who had much to say, but [who] found it hard to be heard [...] in a traditional hierarchical structure." (Partner Digital Transformation at an Australian Professional Services Organization)

While some organizations found social media useful to build the corporate conversation and enable broader and more diverse participation, others were not so convinced and the take-up was patchy. The value for organizations is in the ability to build active networks where employees share and build ideas. In many cases this was challenging and smaller implementations did not always progress to larger communities:

"[The employees in innovation departments] need the social network tools, and they're very engaged with the technology, and that's a much easier call, but getting it to process oriented work is much more difficult." (Senior Architect Manager at a large North American Insurance Organization)

IT leadership responsible for ESM often pursues a different and parallel approach for ESM on the team/group level with the purpose of simplifying workflows and collaboration within groups. Some organizations let teams choose which social media platforms they wanted to use for sharing information. Yet other organizations sought to increase team use of ESM through integration into frequently used systems. One executive responsible for ESM in a large North American software organization indicated that the most successful implementations occurred when social capabilities and experiences were placed in virtual environments where people were already working—giving rise to a trade-off between siloed adoption in customized environments and organization-wide adoption.

Just as the amplification of the customer voice forms one of the fundamental pillars of successful digital business models, it is the employee voice that underpins the digital workplace. In the world of digital where speed, innovation and agility are critical to success, the ability to hear what your employees are saying becomes more important than ever before. ESM have the potential to not only build communities to share ideas, but also for discussions to be transparent in ways they have never have been before. Organizational listening via ESM provides opportunities to understand more about customers, identify new ideas and new talent within the organization, find the speed bumps to effective work-practices, and to change conversations through interactions across silos and hierarchies. Most of the organizations in our study with engaged social media communities had dedicated organizational listening teams to keep communities active and influential.

Symbols

An important lever for guiding transitions is management communication through meaningful as well as powerful symbols and actions. Lasting change requires that senior management 'lives' and communicates the importance of the digital workplace strategy to employees and provides them with a clear vision. Organizations utilize symbols to reinforce communication of how they are changing to stay or become competitive in the digital economy, and how they expect employees to change with them through the adoption of new behavioural norms (such as being more collaborative, creative, or innovative). These symbols are much more than communication campaigns: they initiate changes in the way people in the organization define their working lives.

“You want to be in a situation where you are able to challenge things that have never been challenged before, whether business ideas or processes. Too often we see things being done because that’s how they’ve always been done.” (Director of Strategy at an Australian Professional Services Organization)

Organizations that conduct major workplace changes in coherent, well thought-out initiatives typically create brands and graphic symbols that identify the digital workplace initiative as well as the digital workplace team as an entity in the organization:

“They [the digital workplace group] have built a Digital Workplace brand. They have a nice identity with a consistent banner, and a consistent look and feel for all of the messages that come out. The program is well recognized within the company now. They tend to start out with nice, broad messaging that really hammers home the business value and why it’s important for people to do this, and how it will help them do their job better. Each communication now has a banner at the bottom as well that is a link to feedback.” (VP of Communications at a large North American Financial Services Organization)

Ultimately, senior management actions also provide high symbolic value for reinforcing the workplace strategy to employees. Many organizations find it essential that senior management exemplifies new ways of working, for example by initiating discussions about innovative ideas with employees on ESM, or by sharing open office space with employees and engaging in more frequent, ad-hoc, informal meetings:

“The main purpose [...] is to spur collaboration, that you get people to meet that otherwise wouldn’t have. We converted all manager offices into collaboration space, and everybody just sits at a table. So I think that’s the other, the cultural message we want to send, that this is a flat organization. We no longer have a hierarchy. Everyone has the ability to collaborate with each other without perceived silos, you know, boundaries that people had.” (CIO at a large North American Financial Services Organization)

5.3.2 Management Levers

Sustaining Leadership

The sustaining leadership lever is critical to support, project, and promote the (strategic role of the) digital workplace in the organization. In organizations with successful digital workplaces, a broad management mind shift that cascaded throughout management layers was required to actively reinforce the new ways of working that the design levers facilitate. For instance, managers had to provide employees with autonomy in order to benefit from teleworking arrangements; they

had to trust that employees would responsibly use BYOD arrangements; and they had to stimulate transparency in work practices in line with open work environments and digitized work flows. Collaboration of digital workplace leadership with management at different levels is needed to ensure alignment of the capabilities of digital workplace design and the day-to-day management of employees.

Equally important—and likely critical for this broad management mind shift to occur—is that we found that organizations with a successful digital workplace establish a dedicated digital workplace leadership team with its own accountabilities, goals, and access to ensure strategic relevance and allocation of sufficient resources. These leadership teams are increasingly cross-functional in order to benefit from collective expertise and governance, and are typically headed by a member of the C-suite (such as the Chief Information Officer or the Chief People Officer: see for instance van Heck et al., 2012). While it is this leadership team's responsibility to design the digital workplace, we see that successful leadership does not usually organize this design process in a top-down or directive manner, but rather in an organic, facilitative fashion in conjunction with the rest of the organization. The value of such an approach has been shown in studies of user-centred design (Brown, 2008).

“We have a leadership Chatter group. I am close to it with new offerings, our CEO posts with messages; our Chief Talent Officer posts with messages, and we'll ask things like, 'How has this [digital workplace initiative] helped you out? Please share.' And then the entire company is posting on these internal boards that look like Facebook.” (CIO at a large North American Professional Services Organization)

Systemic Learning

The systemic learning lever refers to the process by which the digital workplace leadership team continuously adapts the design of the digital workplace through real-time experimentation and feedback. Organizations following such an approach recognize that not every element of the design can be an immediate success, and therefore 'fail forward' by continuously fine-tuning or replacing individual elements that do not work out rather than maintaining suboptimal designs or lingering complexity. In order to learn what works, organizations openly and continuously gather input throughout its ranks by such means as employee surveys, ESM discussions with digital workplace champions, or even Internet of Things sensors.

“Our strength is the governance with the business. [A digital workplace leader] has done an incredible job in organizing our digital workplace champions. I've talked to most of our peers. Almost nobody that I've talked to has 450 digital workplace champions in every line of business and the entire organization. So when we went live with the prototype of [our internal knowledge repository], it went out to 200 senior leaders within our technology organization and all of our digital workplace champions. They got to see it actually at the same time as our senior management and give us feedback.” (Managing Director Digital Workplace Technology at a large North American Financial Services Organization)

In addition to improving the digital workplace design, the systemic learning process can also help to create employee buy-in and legitimacy through storytelling and shared experiences:

“We spent a lot of time training and talking to managers, to groups, and to all employees. Because we considered the changes as major. It is a complete different way of working where everyone has his own challenges, his worries, his way of accepting it. We had several ways and moments to share information and listen to each other's input. There were

meetings, intranet messages, mail messages, but also social media played a growing role. [This communication] is extremely important, apart from a nice building, a laptop, and a smartphone." (Digital Workplace Steering Committee Member at a European Research and Advisory Organization)

Organizations in transitional phases sought to accelerate learning in additional ways. One organization for instance awarded a monthly trophy to the employee who did the best job in implementing digital workplace principles. We further found that training and coaching were considered equally essential for the realization of new behavioural norms:

"It seems that some found this difficult at times [to deal with the increased levels of autonomy that the digital workplace provided]. We are [therefore] devoting more attention to the development of our staff, including self-management skills." (Head of HR at a European Research and Advisory Organization)

Ultimately, as organizations learn how to effectively measure the digital workplace, systems also begin to take a greater role in systemic learning as data on the use of workplace capabilities and associated outcomes are openly provided to employees. One organization created a dashboard, at which employees could see their use of laptops, printing, and communications platforms, and benchmark them with best practices in the organization.

"That's the place where employees can get information about how they're using the tools that they have at their fingertips [...] We're going to propose a challenge to see how many employees use it, and we'll gather metrics to show how effective they are in using the technology and translate that to savings for the company." (VP of Communications at a large North American Financial Services Organization)

5.4 Quantitative Results

With the 6S Digital Workplace Framework in place, we proceeded to analyse the quantitative data regarding how digital workplace design affects organizational performance. To this end, we mapped a total of 23 statements representing the six digital workplace levers on our framework. Respondents answered each statement on a five-point Likert scale ranging from 1= 'completely disagree' to 5= 'completely agree.' In addition, we measured organizational performance relative to direct competitors on five dimensions: revenue growth, profit growth, growth in market share, ability to attract new customers, and employee satisfaction. We used a five-point Likert scale ranging from 1= 'far worse' to 5= 'far better.' Scores on the five dimensions were averaged to create an overall organizational performance score. Table 5.2 shows the survey items mapped to the six digital workplace design levers, the means and standard deviations of all measures, as well as their correlations with organizations performance.

By examining the correlation coefficients, we can deduce that workplace design elements for five of the six levers are significantly related to organizational performance. However, not all design elements (items) are equally important. More specifically, we find the most and highest correlations for elements of the two management levers, such as stimulating transparency ($r=.37, p<.01$), finding a balance between trust and control ($r=.37, p<.01$), and enabling autonomous work ($r=.35, p<.01$). With regards to the Space design lever, we see that popular office designs focused on flexible open work environments ($r=.10, p=.33$), specific activities ($r=.12, p=.22$), or the reduction of floor space ($r=.08, p=.42$) do not significantly relate to performance. Instead, organizations seem to derive more value from environments specifically designed to enable and support collaboration ($r=.33, p<.01$) as well as from active telework arrangements

($r=.30, p<.01$). The use of co-working spaces was very uncommon within our sample and proved non-significant ($r=.08, p=.43$). In terms of the Systems and Social levers, we see that technologies that support autonomous and remote work—i.e. any time/any place ($r=.27, p<.01$) as well as digitized work & information flow technologies ($r=.20, p=.04$)—relate to performance, but BYOD policies ($r=-.08, p=.41$) and the use of enterprise social media ($r=.14, p=.15$) do not. Finally, we found that providing direction to the digital workplace by means of a clear mission and/or vision is also an important element to take into account, as this Symbols lever is also significantly related to performance ($r=.24, p=.01$).

Yet while such correlations provide useful insights, they fail to shed any light on the ecosystem as a whole or on whether elements from the various levers work in dynamic harmony or constraint. We therefore conducted an additional K-means clustering analysis to determine groups with differing digital workplace strategies. Differences between these groups were subsequently examined using one-way analysis of variance, as reported in table 5.3. Consistent with our qualitative findings, we find that those organizations that act on all four design levers as well as the two management levers tend to outperform their competitors the most (as shown in cluster 4 with an average performance score of 3.84)—especially compared to those organizations that primarily focus on opening up space (cluster 1, scoring 3.02). There are, however, two clusters with intermediate organizational performance. The first (cluster 2, scoring 3.43) focuses primarily on Space and Systemic Learning levers that derive value from co-location (i.e. activity-based working environments and an open knowledge sharing policy) yet severely limits autonomy and remote working practices and technologies. Whereas the other cluster (cluster 3, scoring 3.64) seems to take the exact opposite approach; here we see hardly any focus on traditional Space elements but a lot of attention to remote working, autonomy, and employee voice (with management being more open to employee initiatives). We shall elaborate further on these findings and their potential implications in the discussion section.

5.5 Discussion

Our qualitative results point out that organizations consider the digital workplace an important strategic asset in order to 1) increase collaboration across traditional working silos and hierarchies, 2) simplify the way work is done to allow employees to handle more complex work, and 3) become more agile by engaging with digital technologies and developments. The key defining characteristic that distinguishes the digital workplace from more traditional (analogue) workplaces, however, is the constant re-evaluation of work and subsequent iterative change process. Evidence-based decision making becomes critical in these environments to identify the speed bumps that are making work difficult. This requires significant digitization to gather data in combination with effective informal feedback channels.

The primary contribution of this paper lies in the formulation of a framework that unpacks the components (levers) of digital workplace designs and can be used to examine organizations in a more structured way. One of our major expectations was that in order to derive a competitive advantage from the digital workplace, organizations would need a holistic approach in which all four design levers from our 6S Digital Workplace Framework are addressed in conjunction with its additional two management levers. Our quantitative findings confirm this assertion, showing that such 'dynamic harmony' (as per Becker, 2007) indeed provides the highest average level of competitive advantage—leading to higher scores than the other clusters across the entire portfolio of lever elements. Yet we also find support for idiosyncratic combinations of individual elements in other clusters, indicating that even partial digital workplace designs (or pilots) can add *some* value above industry averages.

<i>Statements</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Correlation with org. performance</i>
Organizational performance	3.46	0.77	-
Space			
1. Our work environment is based on flexible (open) workspaces	3.58	1.14	0.097
2. Employees consider our work environment to be inspiring	3.29	0.92	0.185
3. Our work environment enables and supports collaboration	3.57	0.90	0.329**
4. Our work environment follows 'activity-based working' principles	3.48	1.22	0.120
5. We found an optimal balance between required and available workspaces	3.07	0.96	0.079
6. We enable the use of co-working spaces	2.52	1.19	0.079
7. We actively support employees who telework	3.60	0.96	0.300**
Systems			
8. We provide our employees with the technological solutions they need to work (together) at any time and any place	3.68	0.98	0.273**
9. All the work-related information our employees need, is made digitally available to them	3.68	1.00	0.203*
10. Our employees' (corporate) technology use is not limited to the solutions we provide to them	2.59	0.90	-0.081
Social			
11. We use enterprise social media to foster social cohesion/collaboration	3.05	1.16	0.142
Symbols			
12. Our organization has a clear mission/vision that provides direction (to the digital workplace)	3.71	0.81	0.239*
Sustaining Leadership			
13. Our employees are enabled to work autonomously	3.67	0.90	0.347**
14. Our employees can determine their own working hours/times	3.72	0.89	0.206*
15. We hold our employees accountable to pre-set goals or targets	3.54	0.86	0.111
16. We found a good balance between employee trust and control	3.39	0.89	0.366**
17. We follow an organic management approach, without strictly defined job roles and tasks	2.96	0.98	0.139
18. We see management's role as facilitative rather than directive	3.24	0.91	0.265**
19. Our organization stimulates transparency in work activities	3.69	0.80	0.374**
Systemic Learning			
20. Our top management team is open to employees' initiatives	3.72	0.90	0.277**
21. It is our corporate policy to openly share knowledge and information	3.53	1.00	0.256**
22. Our employees openly share their mistakes and failures, so that everyone may learn from them and find solutions	3.31	0.81	0.332**
23. We train our employees on aspects of the digital workplace	3.24	0.98	0.084

*Significance (two-tailed) at 5%, **Significance (two-tailed) at 1%

Table 5.2. 6S Statement Means, Standard Deviations, and Correlations with Organizational Performance (N=113)

<i>Measure</i>	<i>Clusters</i>				<i>ANOVA</i>
	<i>1 (n=34)</i>	<i>2 (n=14)</i>	<i>3 (n=19)</i>	<i>4 (n=38)</i>	
	<i>Open</i>	<i>Activity-based</i>	<i>Mobile</i>	<i>Hybrid</i>	<i>F</i>
Organizational performance	3.02	3.43	3.64	3.84	10.08
Space					
1. Flexible open work environment	3.76	2.43	2.37	4.47	41.37
2. Inspiring work environment	3.21	2.86	2.68	3.82	9.91
3. Designed for collaboration	3.24	3.21	3.16	4.21	12.97
4. Activity-based work environment	3.44	3.71	1.89	4.16	24.12
5. Optimal use of space (reduce m ²)	2.91	3.43	2.11	3.61	16.15
6. Enable use of co-working space	2.47	2.14	1.95	2.95	3.80
7. Enable + support telework	3.24	2.93	3.42	4.24	12.46
Systems					
8. Any time/any place technology	3.32	2.79	3.84	4.16	10.70
9. Digitized work/information flow	3.29	3.07	3.37	4.42	15.06
10. BYOD policy	2.79	2.50	2.37	2.58	1.00
Social					
11. Use of (enterprise) social media	3.00	3.00	2.47	3.37	2.55
Symbols					
12. Providing a clear mission/vision	3.29	3.43	3.84	4.16	8.96
Sustaining Leadership					
13. Enable autonomous work	3.21	2.64	3.74	4.34	29.35
14. Allow flexible hours	3.35	2.57	3.68	4.47	36.87
15. Output-based management focus	3.18	3.57	3.47	3.89	5.20
16. Trust vs. control balance	2.59	3.36	3.37	4.13	32.57
17. Organic management	2.68	2.86	2.89	3.26	2.40
18. Facilitative management	2.94	2.93	3.00	3.74	6.57
19. Stimulating transparency	2.79	3.57	3.16	3.71	32.26
Systemic Learning					
20. Management open to initiatives	3.09	3.56	3.95	4.29	16.47
21. Open knowledge sharing	2.94	3.93	3.63	4.29	16.62
22. Learning from failure (culture)	2.97	3.07	3.42	4.29	10.43
23. Digital workplace training	3.04	2.71	3.20	3.56	2.04

Table 5.3. 6S Statement Means and ANOVAs for K-Means Clusters

By examining the extent to which such individual elements relate to organizational performance, we provide a unique comparison between several organizational practices that are seldom investigated in conjunction. Of particular interest is the finding that practices with the strongest relationship to organizational performance belong to the sustaining leadership lever. This is in keeping with the resource-based view (RBV) of the firm (Barney, 1991), which argues that durable competitive advantage comes from the unique interactions between the characteristics of the firm, its management

practices, and cultural norms. The RBV would suggest that the adoption of several universal 'plug and play' elements from our space or systems levers might be too easily imitated, thereby lacking the scarcity to be of true competitive value. This does not mean, however, that these elements are unimportant. Open, inspiring, or activity-based work environments and BYOD policies might not directly relate to organizational performance, but our study participants have indicated that these are most definitely required to deal with expectations from millennials that form today's top talent in the digital economy. The scores on (several of) these elements by the high performing cluster of organizations further indicate that such elements have become so-called 'table stakes.'

These results nuance our understanding of the space lever. While previous academic research has found "no common elements of the physical environment (e.g. enclosures and barriers in work spaces, adjustable work arrangements, personalized work spaces, and ambient surroundings) that are consistently and exclusively associated with desired outcomes" (Elsbach and Pratt, 2007: p.181), we find that digital workplace designs focused on supporting collaboration as well as telework do seem to add competitive value on an organizational level. This latter finding is also in line with previous studies on the organizational effects of telework (e.g. Martinez-Sánchez et al., 2007). Our interviews have shown that supporting collaboration means more than opening up floor space, however: it requires thought about how employees will be able to easily interact and find each other in physical and virtual space—also with the help of various systems levers. Restricting work environment choices (such as in the recent cases of Best Buy, HP, and Yahoo) under the guise of increased collaboration is thus likely to have adverse effects on the competitive advantage of an organization.

Enterprise social media are in a unique position to support collaboration within the organization, as they can build networks to enable employees to share and participate in activities outside of their traditional work boundaries. Yet despite the established uptake outside of organizations, social media platforms varied in their uptake and importance to the workplace design in organizations we have studied. Large organizations in particular see value in its global reach, ability to bridge hierarchies, and its use as a transparent form of communication. For some organizations this purpose is akin to the metaphor of a 'leaky pipe' (Leonardi et al., 2013), without making full use of ESM's capabilities in building communities (i.e. the 'echo chamber') and supporting interpersonal connections (i.e. the 'social lubricant'). For others, however, we saw a centrality of social media that was having a significant impact on collaborative practices. While our quantitative study did not indicate a correlation between social media adoption and performance, we had more positive perceptions reported in the interview data. Given the rapid growth of ESM over the last 2 years, the time difference between our qualitative and quantitative investigations may account for this difference. It could also be explained by the recognized need for better communication systems that offer more than email. The high focus on collaboration as a desirable outcome of the digital workplace leads us to surmise that when organizations manage to make full use of the range of ESN capabilities, that social media might start to significantly relate to organizational performance.

Of further importance is that organizations in our study treated employee choice and segmentation as part of the digital workplace design rather than an idiosyncratic deal on a per-employee basis (e.g. Rousseau et al., 2006). This presents a challenge, however, as organizations need to take a whole-systems perspective on work that is able to account for individual requirements. In terms of technology, we thus find that those systems that enable autonomy and collaboration manage to drive organizational performance, whereas BYOD policies do not. Our expectation is that the latter might be due to potentially limited technological support and/or limited integration of employees' own devices into organizational systems, which would only serve to make working life harder.

We learned that digital workplaces in our study have typically defined a limited number of (golden) rules to counter complexity, providing a lot of autonomy to employees who are trusted to use good judgment and common sense instead. This approach is in line with findings from previous studies (e.g. Besseyre et al., 2012) that have found that in more mobile, flexible work environments, work stress is reduced when employees feel supported and have control over the dimensions involved in the execution of their work. In some organizations, these approaches were combined with an output-based focus by management, although we have found no demonstrable relationship with organizational performance in those cases. We did find anecdotal evidence of particularly successful organizations in which employees were also involved in making (or adjusting) the rules. One such organization used a crowdsourcing platform to formulate its social media usage rules. This approach reduced the size of the document by over 80%, it created a wording in plain English that was readily understandable, and it placed control back in the employees' hands.

To ensure that the ambitions for the digital workplace are clearly understood and 'lived,' organizations make sure to use comprehensive communication strategies and symbols. Whether these are heavily branded campaigns, a regularly repeated set of mission statements, or other symbolic actions by management (such as a tolerance or encouragement of failure), these enacted statements of strategic intent play an important role in the digital workplace success of competitive organizations. This seems particularly evident in arenas where innovation is an important strategic driver and organizations are focused on workplace attributes that encourage sharing and contributing to new ideas.

Finally, we found correlations between systemic learning capabilities and facilitative, open leadership in higher performing organizations. These firms had leadership teams with a dedication to the amplification of employee voice (possibly using digital channels) and also a management style that was more facilitative than directive. There was little quantitative evidence to suggest that the leadership of the higher performing firms was distributed. Instead, we found that it doesn't matter whether leadership is top-down or bottom-up, provided there are clearly recognizable channels for employees to provide their input and voice their concerns. Feedback was thus being accessed in many ways, and decisions on how such input was used to keep redesigning the workplace were facilitated by a dedicated management function or team.

5.6 Conclusion and Recommendations for Managers

In this paper, we have used a multi-method research approach to build an understanding of the digital workplace. We clarified what is meant by the digital workplace, developed a framework that can be used by academics as well as practitioners for design and research purposes, and offered insights into what successful organizations do to gain a competitive advantage. Our study is likely to invite as many questions as it answers: a phenomenon not uncommon for a new research topic. Yet after discussing our findings in the light of existing literature, we are able to provide several suggestions to management practitioners as well as proposals for future investigations.

First and foremost, we encourage managers to develop a holistic digital workplace design, in which the four design elements are supported by related leadership practices. We recognize that digital workplace management is challenging, as we have encountered various management structures to deal with its design and/or development (ranging from cross-functional teams of senior managers to dedicated digital workplace executives and everything in between). There does not seem to be a single best structure, although a combination of IT, human relations, facilities, and

communications expertise is recommended. Furthermore, we suggest that managers create solutions that are focused on a wide variety of personas within the organization and also offer choice in where, when, and how employees can work. Learning about the various needs within the organization requires engagement of employees as well as a (management) mind-set in which it is common practice—also for employees—to experiment with new ways of working (and occasionally fail). To this end, managers should take the following into account:

Data is the currency of effective digital workplace management. Digital capabilities enable us to collect more data, more easily. The ability for organizations to effectively gather meaningful feedback and use that input to make evidence-based decisions about workplace design is a critical step to making it easier to get work done in complex environments.

Dashboards maintain attention on smoothing speed bumps. Maintaining the organizational focus and momentum on the on-going development of digital workplace capabilities is hard. Setting up transparent dashboards that provide actionable analytics at all levels of the organization will ensure that 1) the digital workplace remains central to strategic decision making across the organization, and 2) that management can collectively focus on identical performance indicators to guide informed discussions about workplace design.

Governance is moving from risk minimization to opportunity maximization. Making working life easier when conventional business rules are focused on building roadblocks and restrictions is really difficult. Effective new ways to amplify the voice of the employee in contemporary digital workplace governance include crowdsourcing, social media debates, and diversity in management teams.

Digitizing builds greater capabilities to deal with complex customer solutions. Organizations with successful digital workplaces are constantly examining the environment to find ways to digitize and make working life easier. The challenge for management is to fill the gaps created by digitization with the additional skills and capabilities to deliver more complex customer solutions.

5.6.1 Future Research

This paper provides a fertile starting ground for further research on whether organizations are deriving value from the digital workplace. First, the 6S Framework can be used to identify digital workplace elements that have not been quantitatively examined. After all, the digital workplace is ever evolving, with new developments such as proactive search, peer-to-peer level IT support, and virtual personal assistants just around the corner (Tay and Cain, 2015). We therefore invite researchers to replicate our findings across larger/wider samples and with additional elements.

Second, larger samples would enable additional tests on the subject of dynamic harmony and constraint. By testing for necessary and sufficient conditions of elements for organizational performance, we could obtain a better understanding of the interaction between the various design and management levers.

Last, we also encourage researchers to develop quantitative models that include causal chains with intermediary effects. A particularly fruitful effort would involve unpacking the relation between digital workplace elements, specific behavioural norms (such as collaboration, creativity, or proactivity) and organizational performance. Alternatively, researchers could investigate the various ways in which the digital workplace manages to reduce off-task complexity.

Chapter 6

General Discussion

Technological developments caused the way we work to continuously evolve over the past couple of decades, particularly by changing the ease with which we can bridge physical and temporal distances. As telework became ever more commonplace, however, our understanding of its effect on employee and organizational performance remained limited. The goal for this dissertation was therefore to create a better understanding of how the temporal and spatial flexibility inherent in telework affect such performance. This was done by applying multiple theoretical perspectives, levels of analysis, and analytical methods in four studies, each of which addressed a specific distance dilemma. In short, these studies indicate that telework arrangements contribute to above-industry-average organizational performance (chapter 5), but also that teleworker job performance is contingent on the level of self-determination (enabled by the teleworker's manager: chapter 3). Furthermore, the distance from colleagues by telework is both a benefit and a drawback to performance: as shown, it can potentially aid focus work through reduced distractions (chapter 2) but it can also harm collaborative knowledge sharing activities that are pivotal to a knowledge worker's success (chapter 4).

The risk in using a concept such as the 'extent of telework' is that it might imply a 'universal optimum' or ideal level of temporal and spatial separation. In practice, however, every teleworker will have to find his or her own optimum, which according to our findings will most notably depend on striking a balance between concentration and collaboration in an increasingly interdependent work environment (as per chapters 2 and 4). This means that the teleworker's distance dilemma is real and not easily solved, even though electronic communication media can play a minor role in reducing the negative effects of spatial separation by maintaining interpersonal relationships and knowledge sharing efforts (chapters 3 and 4). On average, most of the organizations described in this dissertation therefore found teleworkers to be just as effective as on-site workers, as both teleworkers and their in-office colleagues and managers will gradually adjust to new work realities. This type of 'social elasticity' implies that rather than a sudden revolution, employees are experiencing a much slower evolution in which they are stretching the mould of the organization, its practices, and its workplace design. We found that ICTs are an important enabler for doing so, but also that these are hardly the game changer they are often purported to be in the popular press.

Contrary to the teleworker's distance dilemma, we learned that the manager's distance dilemma is solvable. This is because giving up control (by entrusting employees with greater levels of self-determination) can ultimately equate to maintaining control through an exchange-based psychological contract with the employee (chapter 3). Not being able to observe employees at any time does not therefore have to be a problem, as employees will regulate their own performance to maintain their self-determination. Furthermore, the distance involved does not necessarily have to endanger the trust upon which this contract is built, as the negative effect of telework on their interpersonal relationship is small (further supporting the notion of social elasticity) and easily remedied through frequent contact—either in person or with the help of electronic communication media.

For organizations, it turns out there is no distance dilemma *per se*. Here we find additional support for the presence of social elasticity, as practices that support changing employee needs do not seem to introduce additional work complexity that could preclude corporate agility. More specifically, our clustering analysis (chapter 5) showed that even though organizations with a mobile approach to the workplace outperform those with a co-located design, it is generally more advisable to invest in a hybrid—or rather: holistic—solution that works for a wide variety of personas within the organization and offers choice in where, when, and how employees can work (including at the office). Such segmentation and choice are pivotal in maximizing organizational performance.

Figure 6.1 summarizes our findings for each of the three distance dilemmas. It provides insight into how temporal and spatial flexibility affect employee and organizational performance (i.e. the main research question) and thereby provides opportunities to improve such performance. The remainder of this chapter expands on these findings as well as their implications for theory and practice.

6.1 Summary of the Main Findings and Contributions

Chapter 2 addressed the importance of workplace characteristics for explaining the relationship between the extent of (home-based) telework and employee job performance. Through a quasi-experimental field study, we show that telework performance benefits are mostly contingent on the difference between distraction levels experienced at the home workplace and those at the central office environment (also called a 'distraction advantage'). This means that the home work environment needs to provide a place of refuge from unwanted noise and constant interruptions at the office: without such a difference, the extent of telework seems to have no discernible effect on knowledge workers' job performance. Conversely, the potential for the creation of a better fit between overall work requirements and the physical environment through improvements of experienced levels of environmental satisfaction or control (i.e. a 'satisfaction advantage' or 'control advantage') did not play a significant moderating role in this relationship. This chapter's main contribution lies in the additional context that is created through the longitudinal investigation of changes in the extent of telework, as this is an area where telework research to date is severely lacking (Allen et al., 2015). It also answered the call for more research on the impact of different organizational physical workspaces on employee outcomes (Ashkanasy et al., 2014), thereby providing an interesting starting point for additional investigations into other types of work environments (such as coworking spaces, public areas, or new office designs). As such, its value extends beyond the domain of telework research into larger domains of organizational behaviour, facilities management, and environmental psychology.

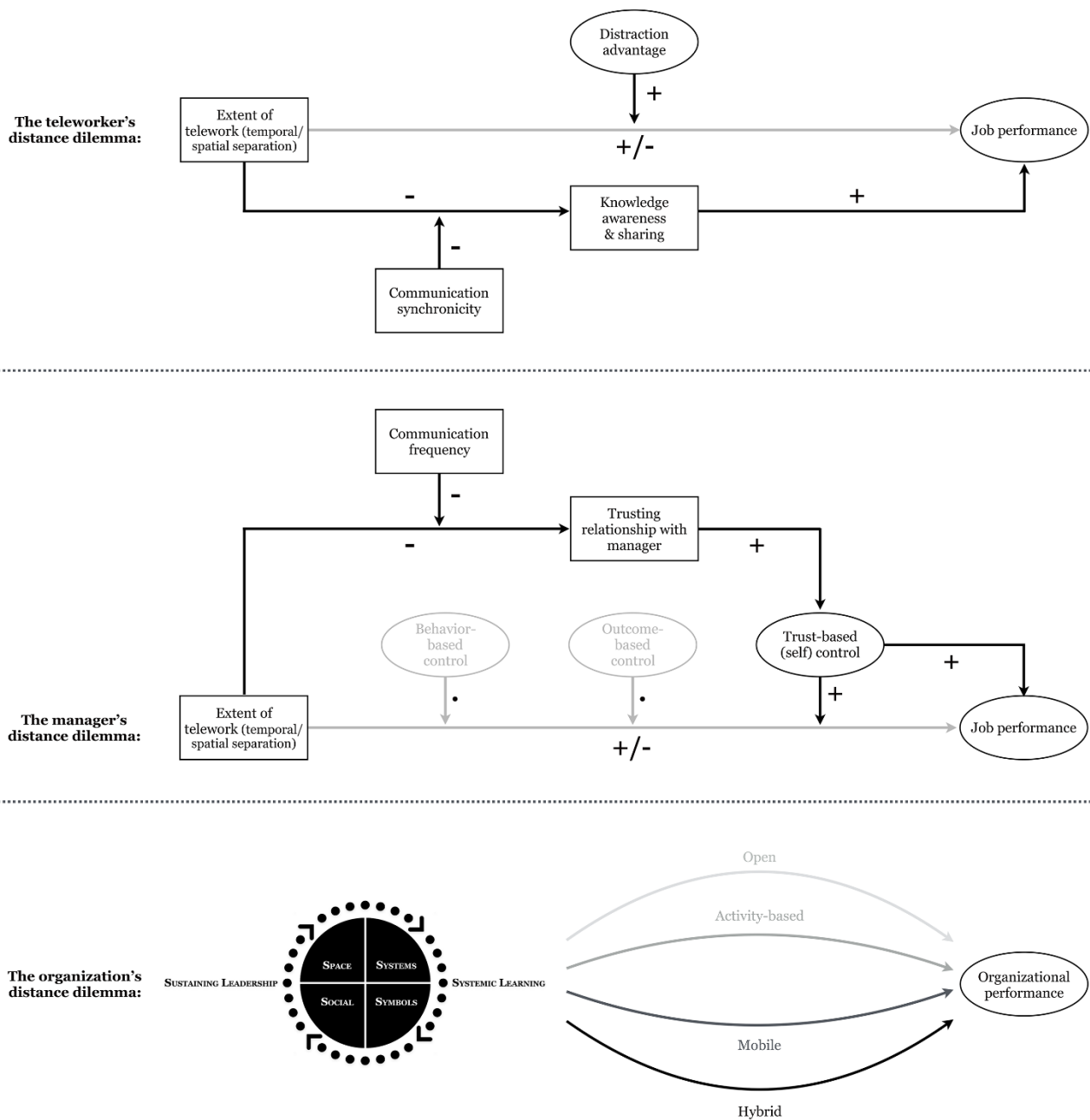


Figure 6.1 Summary of Research Findings (as Conceptual Models)

In chapter 3 we extended our analysis from the single teleworker to the relationship with his/her manager and focus on which control mechanisms are most effective in realizing job performance in an any time/any place work environment. Our findings illustrate that traditional externalized control mechanisms (either enacted by managers or peers) based on behavioural monitoring, goal alignment (output), or other forms meant to prevent opportunistic self-serving behaviours are ill-suited for managing teleworkers. Yet this does not mean that telework is a post-bureaucratic practice in which employees are beyond any form of control. Instead, we found that an internalized ideological form of regulation takes its place: teleworkers are thus not just ‘in control’ of their own work, but also of their own regulation through an

exchange-based psychological contract that revolves around self-determination and needs to be upheld with adequate performance. In turn, this type of control is embedded in—and enabled by—a trusting relationship between a manager and employee, which requires frequent communication. Similar to chapter 2, the effect of the extent of telework on job performance is mostly contingent on a moderating factor (this time the level of self-determination), which further supports our original assertion that telework cannot be meaningfully understood without taking into account various contextual elements. The added value of this chapter lies in its ability to question commonly held beliefs regarding effective teleworker control as well as the pervasive (agency theory-based) assumption of teleworker shirking. Its main contributions are therefore in the domain of telework research as well as the broader domain of management control theory and its relationship to knowledge worker performance.

Chapter 4 deals with daily schedule and location differences between colleagues and how these interact with the use of (a)synchronous communication media to influence the social underpinnings of knowledge sharing networks. It shows that spatial separation directly reduces the frequency of knowledge sharing between colleagues—especially among those from one’s own area of expertise—whereas temporal separation affects knowledge sharing through reduced structural social capital. More specifically: temporally separated teleworkers are less aware of the knowledge and expertise available in the organization. Cognitive and relational social capital do not influence knowledge sharing, although cognitive social capital is negatively affected by spatial separation. The use of (a)synchronous media can serve to mitigate most of the negative effects of spatial separation but not those of temporal separation, which ultimately results in lower job and proactive performance. The primary contribution of this chapter is that it offers a unique insight into the negative (social) network effects of telework, which is a research domain that has not received any empirical attention to date (Taskin and Bridoux, 2010). Due to the new separation measures used, however, the findings might also apply to other contexts in which employees become partially separated from their colleagues in either time and/or space (such as flexible scheduling, job sharing, or virtual teaming).

Finally, in chapter 5 we explored telework in a broader ecosystem of digital workplace practices and shifted our level of analysis towards the organization. In doing so, we learned that telework is a key element in digital workplace design and that it is related to organizational performance above industry averages. Restricting work environment choices under the guise of increased collaboration is thus likely to have adverse effects on the competitive advantage of organizations. Through the development of our digital workplace framework and subsequent analysis, we also found support for many other findings and discussions from earlier chapters. These include the crucial role of knowledge sharing and partial co-location (chapter 4), the importance of employee autonomy and trust (chapter 3), the ineffectiveness of outcome controls (chapter 3), and the narrow role of the physical work environment (chapter 2). We went on to show that telework and related contextual elements of space, systems, social media, symbols, sustaining leadership, and systemic learning need to be treated in an integrated manner and as strategic assets (rather than privileges or idiosyncratic deals) in order to derive the most value from them.

6.2 Recommendations for the Future of Work

A dissertation on the fundamentally practical topic of telework would be incomplete without several recommendations to practitioners. In this section I therefore summarize the most important recommendations from each of the main chapters for three stakeholders: teleworkers, their managers, and their organizations.

For teleworkers it is important to realize that there is no ‘universal optimum’ with regards to the extent of telework. This means that teleworkers will have to discover their own personal ‘physical minimum’ and ‘virtual optimum’ by strategically linking (the nature of) their planned tasks to the domestic, organizational, and virtual spaces where they are carried out most effectively. Generally speaking, this means that focus work is best carried out at home, where experienced distraction levels are typically lower than at the office (chapter 2). Yet teleworkers should also realize that while telework may provide refuge from interruptions from colleagues or managers, it remains important to keep in regular (synchronous) contact with these people to prevent negative effects on the relationship with one’s manager (chapter 3) or cognitive social capital (chapter 4). Lean communication media may help to keep knowledge sharing activities up to par in remote settings (chapter 4).

Managers, in turn, need to realize that teleworkers are no slackers: chapters 2 and 3 show that on average, the extent of telework does not negatively affect job performance (rather the opposite). Even though it might have slightly negative performance effects through knowledge sharing and knowledge awareness (chapter 4), managers could try to reduce such an effect by acting as a ‘linking pin’ or connector in a teleworker’s knowledge network. In addition, managers should be aware of the psychological contract that they have with their teleworkers and that it is very important to provide absolute levels of self-determination in order to let teleworkers make the most of this practice (chapter 3). In order to make sure that their trust in these teleworkers does not deteriorate, they should also aim to stay in frequent contact with their teleworking employees (yet without resorting to behavioural control mechanisms) (chapter 3).

Organizations would do well to adopt telework; nearly all of the high performing organizations in our study (chapter 5) consider it an important practice, and it ranks among the top digital workplace practices that are correlated with organizational performance above industry averages. For such positive performance effects to occur, however, it is important to consider telework as a strategic asset rather than a privilege or idiosyncratic deal limited to only a select number of employees. Equally important is the notion that telework is part of a larger ecosystem of digital workplace practices. In terms of space, organizations should keep in mind that teleworking is not for everyone as some employees may not have access to a satisfactory or distraction-free work environment outside of the office (chapter 2). This means that organizations should not create any sort of mandatory telework days, and that office environments also need to provide sufficient areas to conduct focus work. With regards to systems and social media, organizations primarily need to digitize the work-related information that teleworkers need and provide these over systems that allow employees to work at any time and any place. Support for Bring Your Own Device or enterprise social networks is of lesser concern, as these do not seem to offer any competitive advantage. When it comes to symbols, organizations need to primarily manage their managers’ expectations and help them to cope with a new reality in which teleworkers will regulate themselves and managers need to ‘let go’ by providing high levels of self-determination. Finally, organizations should be open to initiatives from their employees and be willing to continuously experiment, learn and evolve the way in which they design their work practices.

6.3 Recommendations for Future Research

While we have provided multiple recommendations for further research in each of this dissertation's main chapters, I would like to point out three overarching recommendations (that stem from their combined consideration) to those who wish to contribute to research streams on telework, flexible working practices, and/or the digital workplace.

First and foremost, I would hope that—in a field of study where change is the status quo—others will use the new concepts, measures and frameworks developed throughout this dissertation to replicate and extend our results with new contextual dimensions from the areas of management and organization, information technology, and workplace design. By focusing on additional job or knowledge worker types (as shown in chapter 2), organizational cultures and policies (such as discussed in chapters 3 and 4), new technologies (as discussed in chapters 2 and 4), or work environments (as discussed in chapters 2 and 5) we will eventually converge on more generalizable boundary conditions for successful telework and learn how we can best support it. In addition, this thesis has shown that telework needs to be investigated in a much more granular (and preferably longitudinal) way. I therefore also recommend that future studies use new data collection methods that allow us to more accurately and precisely measure spatial and especially temporal separation, for instance through sociometric surveys and badges, virtual diary studies, or logs of remote work systems.

Second, I recommend researchers to—whenever possible—look into the sociomaterial research approach (Orlikowski and Scott, 2008) as a way to investigate the aforementioned contextual dimensions in an integrated fashion. This is because existing telework research (including this dissertation) either considers technology as ‘the great enabler’ or as a concept that is still separated from organizational life, while in practice technology has become increasingly inseparable from work. One way in which such a sociomaterial approach can for instance be introduced is by examining the affordances of electronic communication media or collaboration platforms, which would require a focus on the way they are entangled with teleworkers and enacted in practice rather than deterministically inferred from functional characteristics (as we did in chapters 3 and 4 with media synchronicity). Such an approach could similarly help to create a better understanding of the role of pervasive ‘digital distractions’—an area that might prove even more salient than physical distractions in the workplace.

Third, the distance dilemma outlined in this dissertation has shown the need for additional research into the proactive ways in which teleworkers shape their work and its contexts. Proactive employees take the initiative to anticipate and create changes in how work is performed based on uncertainty and dynamism (Grant and Parker, 2009), which might prove pivotal in finding a good fit between work requirements (e.g. concentration or collaborative tasks) and the work environment. I therefore recommend that future studies build on the concept of task—technology fit (Goodhue and Thompson, 1995) to create a measure of task—environment fit that helps to assess whether it has a potential mitigating effect on job performance. This phenomenon could alternatively be examined as part of teleworkers' self-regulation activities, which needs to be unpacked in terms of self-monitoring, judging, and reacting to better understand how teleworkers drive their own performance.

6.4 Limitations

Although each empirical chapter includes references to its limitations, there is one overarching limitation that requires some final words. The introduction of this dissertation outlined the important challenge of finding new ways to drive knowledge worker performance in the 21st century. While the evaluation of performance has always been a key component of management, we encountered that both the definition and measurement of such performance are still hotly contested topics in academia as in practice. This was not always the case: traditional (Fordist) definitions were straightforward and narrowly focused on productivity, consisting of a comparison between outputs (typically the number of units produced) and inputs (typically the number of hours of labour). Unfortunately this purely economic definition no longer applies, as the cognitive nature of knowledge workers' jobs makes it hard to classify outputs in terms of quantity (Davenport, 2005; Drucker, 1999). Neither does there still necessarily exist a direct correlation between the number of hours of labour and eventual output, which is why other dimensions should be taken into account as well. In addition to productivity, we therefore included evaluations of quality, efficiency, effectiveness, timeliness, and accuracy in our studies. In chapter 4, we also included a proactive performance measure to assess creativity and innovative capabilities. These dimensions were chosen because they made sense for the organizations under study and because they are all generally considered among the most important of performance dimensions (Ramirez and Nembhard, 2004). It remains important to realize, however, that there is no universal measure that covers performance in its entirety—let alone for every type of knowledge worker. Similarly, there is also no single source of information that can provide a complete, fully accurate, and generalizable account of performance. We therefore chose to combine data from complementary sources, including self-reports (chapters 2 and 3), manager reports (chapters 3 and 4), and corporate databases (chapter 2) to gain the best possible understanding of the effect of telework on employee performance. Naturally, this means that some of the results presented throughout this dissertation are prone to typical response biases. Be that as it may, for key dimensions such as work quality there simply do not exist any suitable alternatives to subjective measure (yet).

6.5 Concluding Remarks

In an era where increasingly mobile knowledge workers determine organizational success, it is especially important to learn about the conditions that might stimulate their performance. My aim for this dissertation was therefore to create a better understanding of how the extent of telework (i.e. temporal and spatial flexibility) affects both employee and organizational performance. In order to realize this, I have empirically investigated some of the most common concerns and explanations for teleworker performance benefits and drawbacks, most notably with regards to characteristics of the work environment, management control types, media synchronicity, and social capital. While the four studies in this dissertation are mostly limited to knowledge work in the broadest sense and hardly give an exhaustive overview of telework and all its nuances, they do contribute to the possible optimization of its context and provide a springboard for additional investigations in this area. We are facing a future where workplaces will become more quantified, reality will be augmented, and robots will most assuredly become a part of our daily working life. I can therefore only hope that the insights, perspectives, and frameworks presented in this dissertation will inspire further research in the exciting area of digital workplace design.

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Summary

For the past couple of decades, technological developments have caused the way in which we work to continuously evolve, particularly by changing the ease with which we can bridge physical and temporal distances. Combined with rising competitive pressures and changing employee expectations, this has led to a substantial uptake of flexible working practices. Most notable among these is telework, which is a technologically enabled form of organizing work in which employees can decide for themselves where and when they wish to conduct their work. Whether telework actually *works*, however, still remains to be seen: existing studies on its relation with performance are limited, typically lacking both an indication of how frequently employees telework as well as a solid theoretical foundation that could help elucidate its underlying causal structure. These shortcomings are an important motivation behind the research presented in this dissertation, which focuses on creating a better understanding of how the extent of telework (through enacted temporal and spatial flexibility) affects employee and organizational performance. This was done by applying multiple theoretical perspectives, levels of analysis, and analytical methods in four empirical studies, each of which addresses specific distance dilemmas inherent in telework. For teleworkers themselves, this dissertation shows that the distance dilemma lies in managing the separation from colleagues. Such separation provides a salient benefit to performance as it can aid focus work through reduced distractions, yet also demonstrably harms collaborative knowledge sharing activities that are pivotal to a knowledge worker's success. Each teleworker will therefore have to find his or her optimal 'extent of telework,' which will depend on striking a balance between concentration and collaboration in an increasingly interdependent work environment. Contrary to popular belief, electronic communication media can only play a minor role in reducing the negative effects of such separation. This dissertation further shows that high performance is only possible if a manager provides the teleworker with absolute levels of self-determination. Doing so requires a trusting relationship, meaning that managers should stay in frequent contact with their teleworking employees (yet without resorting to restricting behavioural or output control mechanisms). Finally, by exploring telework in a broader ecosystem of digital workplace practices, this dissertation shows that telework is a key element in obtaining above-industry-average organizational performance. Highest performance was observed for organizations that combine telework with co-located practices however, as this maximizes segmentation as well as employee choice in where when, and how work is best conducted. Overall, the findings, perspectives, and frameworks presented in this dissertation offer important insights into how to maximize employee and organizational performance in a telework context, and contribute a springboard for additional investigations in this area.

Nederlandse Samenvatting

Technologische ontwikkelingen hebben in de afgelopen decennia onze manier van werken veranderd, met name doordat ze tijd en ruimte overbrugbaar hebben gemaakt. Deze ontwikkelingen, gecombineerd met toenemende concurrentiedruk en veranderende werknemersverwachtingen, hebben geleid tot een toenemende adoptie van flexibele werkvormen. Een van de voornaamste vormen is telewerken, waarbij werknemers door middel van technologie zelf kunnen bepalen waar en wanneer ze werken. Of telewerken ook daadwerkelijk *werkt* moet echter nog blijken: studies omtrent de relatie van telewerken en de prestaties van medewerkers of organisaties zijn beperkt, met name doordat er geen theoretische onderbouwing wordt gegeven die de relatie kan verklaren of omdat er informatie ontbreekt omtrent hoe vaak medewerkers daadwerkelijk telewerken. Dergelijke tekortkomingen vormen de aanleiding voor het onderzoek in deze dissertatie, welke zich richt op het verkrijgen van inzicht in de manier waarop de mate van telewerken (door gebruik van tijd- en plaatsafhankelijkheid) invloed heeft op de prestaties van medewerkers en organisaties. Dit inzicht is verkregen door het toepassen van verschillende theoretische perspectieven alsmede verschillende analyseniveaus en -methoden in vier empirische studies die ieder een specifiek telewerk-gerelateerd afstands dilemma behandelen. Voor de telewerkers zelf betreft dit dilemma het omgaan met de afstand ten aanzien van collega's. Deze dissertatie toont aan dat dergelijke afstand een aanzienlijk voordeel biedt wanneer men concentratiewerk moet uitvoeren (door een reductie van afleiding), maar ook dat diezelfde afstand schadelijk kan zijn voor samenwerking en kennisdelingsactiviteiten die cruciaal zijn voor het succes van een kenniswerker. Elke telewerker zal dus zijn of haar eigen optimum moeten zoeken ten aanzien van de mate van telewerken, wat betekent dat men een balans zal moeten vinden tussen (individueel) concentratiewerk en samenwerking. De oplossingen die communicatiemediën kunnen bieden zijn (in tegenstelling tot wat algemeen wordt aangenomen) in dit geval beperkt. Voorts toont deze dissertatie aan dat uitmuntende prestaties alleen mogelijk zijn als managers voldoende zelfbeschikking bieden. Dit vereist echter vertrouwen, wat betekent dat de managers regelmatig moeten blijven communiceren met telewerkende medewerkers (zonder hierbij terug te vallen op beperkende gedrags- of resultaatgerichte controlemechanismen). Tot slot plaatst deze dissertatie telewerk in een breder perspectief van de digitale werkomgeving ('Het Nieuwe Werken'), waarin het een essentieel onderdeel vormt voor organisaties die boven het industrie gemiddelde willen presteren. Het beste presteren echter organisaties die telewerken combineren met colocatie, aangezien dit zowel de segmentatie van de werkomgeving alsook de keuzemogelijkheden voor werknemers vergroot: zij kunnen dan nog beter bepalen waar, wanneer, en hoe ze willen werken. Bijeen genomen bieden de resultaten, perspectieven en raamwerken in deze dissertatie belangrijke inzichten in hoe de prestaties van medewerkers en organisaties het beste kunnen worden gemaximaliseerd in een telewerk context. Tevens bieden ze een solide uitgangspunt voor verder onderzoek in dit gebied.

Curriculum Vitae



Dominique (Nick) van der Meulen was born July 16 1986 in Vlaardingen, the Netherlands. He studied at the Rotterdam School of Management, Erasmus University, where he obtained BSc and MSc degrees in Business Administration, with a specialization in Business Information Management (2010). Upon graduation, Nick continued as a research scientist affiliated with the Erasmus@Work research centre, at which time he participated in several national public-private partnership projects and conducted case studies to assess the impact of New Ways of Working at several organizations. In September 2011, Nick started his PhD at the department of Decision and Information Sciences at the Rotterdam School of Management, Erasmus University and during the Fall term of 2015 he was a visiting researcher at the MIT Sloan Center for Information Systems Research (CISR). Currently, he is an Assistant Professor in Information Management at the Amsterdam Business School, University of Amsterdam.

Nick's primary research interests lie at the intersection of information technology and organizational behaviour, and include computer mediated communication and collaboration, the management of technology and innovation in the workplace, as well as organizational knowledge and social networks. His research has been conducted in close collaboration with practice and has been supported by the Medicines Evaluation Board (which was awarded the title of 'Public Organization 2.0 of the year' in 2011), where he was researcher-in-residence. The resulting work has been presented at various international conferences, including the International Conference on Information Systems, the Annual Meeting of the Academy of Management, and the International Conference on Organizational Learning, Knowledge and Capabilities. In addition, he has been involved in teaching at both the Bachelor and Master level, in courses on Managing Knowledge and Information, New Ways of Working, and the Future of Work. Apart from his research and teaching activities, Nick has served as a representative in the ERIM PhD Council, he was a member of his department's Housing and Workplace Design Committee, and he presented his research to the public in theatres throughout the Netherlands as a founding member of ScienceBattle.

Portfolio

Publications in Refereed Journals

van Heck, E., van Baalen, P., van der Meulen, N., and van Oosterhout, M. 2012. "Achieving High Performance in a Mobile and Green Workplace: Lessons from Microsoft Netherlands," *MIS Quarterly Executive* (11:4), pp. 175–188.

Professional Publications

Dery, K., Sebastian, I., and van der Meulen, N. 2016 "Building Business Value from the Digital Workplace," *MIT CISR Research Briefing* (16:9), pp. 1–4.

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Grants, Honors and Awards

- **Travel Grant, Erasmus Trustfonds.**
Supported my research visit to the MIT Center for Information Systems Research (Massachusetts Institute of Technology, Sloan School of Management) in 2015.
- **Selected Participant, Doctoral Consortium at the 2013 Organizational Learning, Knowledge and Capabilities Conference, Washington DC.**
George Washington University. Facilitated by prof. B. Elkjaer (Aarhus University).
- **Impact Award, Erasmus Research Institute of Management (with Erasmus@Work).**
Awarded to researchers who have successfully impacted management practice. The award can be given for a paper, report or article in the academic or in the applied press, describing the research and its impact. A committee of highly regarded representatives of the business community selects the award recipients.

Media Coverage

- "Recht auf Heimarbeit eingeführt," *Deutschlandfunk*, July 1, 2015 (available at http://www.deutschlandfunk.de/niederlande-recht-auf-heimarbeit-eingefuehrt.795.de.html?dram:article_id=324177).
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The ERIM PhD Series contains PhD dissertations in the field of Research in Management defended at Erasmus University Rotterdam and supervised by senior researchers affiliated to the Erasmus Research Institute of Management (ERIM). All dissertations in the ERIM PhD Series are available in full text through the ERIM Electronic Series Portal: <http://repub.eur.nl/pub>. ERIM is the joint research institute of the Rotterdam School of Management (RSM) and the Erasmus School of Economics at the Erasmus University Rotterdam (EUR).

Dissertations in the last five years

Abbink, E.J., *Crew Management in Passenger Rail Transport*, Promotors: Prof. L.G. Kroon & Prof. A.P.M. Wagelmans, EPS-2014-325-LIS, <http://repub.eur.nl/pub/76927>

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- Duyvesteyn, J.G. *Empirical Studies on Sovereign Fixed Income Markets*, Promotors: Prof. P.Verwijmeren & Prof. M.P.E. Martens, EPS-2015-361-F&A, hdl.handle.net/1765/79033
- Duursema, H., *Strategic Leadership: Moving Beyond the Leader-Follower Dyad*, Promotor: Prof. R.J.M. van Tulder, EPS-2013-279-ORG, <http://repub.eur.nl/pub/39129>
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For the past couple of decades, technological developments have caused the way in which we work to continuously evolve, particularly by changing the ease with which we can bridge physical and temporal distances. Combined with rising competitive pressures and changing employee expectations, this has led to a substantial uptake of flexible working practices. Most notable among these is telework. Whether telework actually works, however, still remains to be seen: existing studies on its relation with performance are limited, typically lacking both an indication of how frequently employees telework as well as a solid theoretical foundation that could help elucidate its underlying causal structure. These shortcomings are an important motivation behind the research presented in this dissertation, which focuses on creating a better understanding of how the extent of telework (through enacted temporal and spatial flexibility) affects employee and organizational performance. This was done by applying multiple theoretical perspectives, levels of analysis, and analytical methods in four empirical studies, each of which addresses specific distance dilemmas inherent in telework. Overall, the findings, perspectives, and frameworks presented in this dissertation offer important insights into how to maximize employee and organizational performance in a telework context, and contribute a springboard for additional investigations in this area.

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