VIRTUAL WORK: BRIDGING RESEARCH CLUSTERS

SUMITA RAGHURAM
School of Labor and Employment Relations
Pennsylvania State University

N. SHARON HILL
School of Business
George Washington University

JENNIFER L. GIBBS
Department of Communication
University of California, Santa Barbara

LIKOEBE M. MARUPING
J. Mack Robinson College of Business
Georgia State University

Forthcoming in The Academy of Management Annals.

VIRTUAL WORK: BRIDGING RESEARCH CLUSTERS

Abstract

Virtual work is becoming the new normal, with employees working from dispersed locations and interacting using computer-mediated communication. Despite the growth in virtual work research, it has tended to occur in siloes focused on different types of virtual work (e.g., virtual teams, telecommuting) that are grounded in different research traditions. This limits opportunities to leverage research across these different domains. We use a co-citation analysis to examine the degree of segmentation in the field of virtual work into disparate research clusters. We find the emergence of three major research clusters: telecommuting, virtual teams, and computer-mediated work. Motivated by this finding, we carry out a comparative review of the literature in each cluster with the objective of seeking ways to exploit opportunities that cut across them. Based on our review, we first develop a conceptual model using the dispersion and technology dependence dimensions of virtuality to compare different approaches to studying virtuality-related issues across clusters. Next, we use our comparative review to propose a systematic approach for developing research questions that bridge research across the clusters by considering how different approaches to studying virtuality and the ensuing problem domains addressed in one cluster might help to advance research in another. To illustrate this approach, we discuss 12 research questions for bridging across the three virtual work clusters. Finally, we discuss the research implications of our conceptual model and bridging approach. Our review and conceptual model along with proposed bridging approach help to facilitate a forward-looking agenda for accelerating and enriching virtual work research.

Introduction

Virtual work has been defined in many different ways, but common to these definitions are geographic dispersion and dependence on technology in work-related interactions between employees (Gibson & Gibbs, 2006; Kirkman & Mathieu, 2005; O'Leary & Cummings, 2007; Nilles, 1994; Walther & Bunz, 2005). Advances in information and communication technology (ICT) have enabled employees to interact across time and space, resulting in the growth of different types of virtual work arrangements that help organizations meet their strategic goals. For example, organizations increasingly offer telecommuting (also known as telework) as a means to create work-life balance for employees, reduce real estate costs, and attract and retain high-quality talent (Gajendran & Harrison, 2007; Raghuram, Garud, Wiesenfeld, & Gupta, 2001). It involves individuals working from locations away from their primary office such as home, client office or a shared office space. The implementation of another virtual work arrangement is also on the rise in the form of virtual teams where members in dispersed locations collaborate via electronic means (Gilson et al., 2015). Virtual teams allow organizations to leverage high-quality talent from far-flung places and be highly responsive to customer needs (Kirkman, Gibson, & Kim, 2012). Also, as mobile technology has permeated into all aspects of our lives, many employees use computer-mediated communication to some degree to interact with others in their job (Hill, Kang, & Seo, 2014; Makarius & Larson, 2017). These virtual work interactions are more organic and may be outside of formal virtual work arrangements for telecommuting and virtual teams (Makarius & Larson, 2017).

Given its different forms, it is difficult to place accurate numbers on the extent of virtual work. Recent surveys show that 96% of business professionals report frequent work interactions using technology (Brooks, 2015; Harter, Agrawal, & Sorenson, 2014). In addition, by some

estimates, at least 43% of the American workforce worked remotely for some time in the year 2016 (Chokshi, 2017). This encompasses a range of industries (e.g., education, insurance, health, and travel) and job types (e.g., marketing, software development, public relations, and community support) (Shin, 2016). The ubiquity of ICT makes employees available virtually anywhere with technology access, resulting in less reliance on their physical presence. Leading technology companies recognize the potential to use enterprise collaboration tools (such as Slack, Google Hangouts or Yammer by Microsoft) in virtual work. Over 500,000 businesses worldwide have adopted Yammer, and Facebook has launched Workplace to compete in the virtual collaboration space (Gaudin, 2015; Computer World, 2016).

Accompanied by the growth in virtual work, research interest in this area has also increased over the past 20 years, attracting attention from a diverse set of disciplines (e.g., information systems, management, urban planning, and communication). Researchers from these disciplines have used multiple perspectives to examine the consequences of working virtually and how to increase the effectiveness of this relatively new way of working. However, there has been a tendency for this research to occur in siloes focused on different types of virtual work (e.g., virtual teams, telecommuting) at different levels of analyses, drawing from different disciplines, and leveraging different methodological designs. As virtual work becomes a more pervasive phenomenon, systematic effort is required to synthesize the different research traditions that have emerged to study it. Indeed, prior reviews have recapitulated developments in virtual work, but these have focused on specific virtual work domains—e.g., virtual teams (Bell & Kozlowski, 2002; Gibson, Huang, Kirkman, & Shapiro, 2014) or telecommuting (Gajendran & Harrison, 2007; Bailey & Kurland, 2002). While these reviews have been useful for advancing research *within* a domain, they do not facilitate integration *across* domains. These

reviews can perpetuate researchers in one domain primarily citing research from within their particular domain. Hence, current reviews of virtual work research are limited in furthering our understanding of broader sets of issues that might cut across the different domains and could allow researchers to leverage developments from one domain to another.

The purpose of the current review is to advance virtual work research by providing a more holistic view of research across different domains with the goal of breaking down the siloes that exist between them. In doing so, we make several important contributions to the field of virtual work. First, we make researchers who focus on a particular domain more aware of the larger body of virtual work research. Second, by synthesizing and integrating research from different domains, we highlight opportunities to bridge research across them. This bridging is critical to facilitate a more integrative approach that accelerates and enriches the virtual work research agenda that keeps pace with developments in organizations. Third, we offer potential explanations for conflicting findings in virtual work research based on differences in approaches to studying virtual work highlighted in our integrative review. Fourth, we provide a methodology for integrating related but segmented research domains that can be applied to other fields of research. Finally, our review provides a framework and common language to facilitate dialogue and collaboration among researchers from different virtual work domains.

To accomplish the goals of our review, we first examine the degree to which the aforementioned siloed approach to virtual work research has resulted in segmentation of the field into disparate research clusters. We use a methodological approach known as co-citation analysis. For this analysis, we draw from research focused on an employment-related context and exclude other forms of virtual interactions such as e-learning or electronically-mediated interactions unrelated to the employment context. Results of our co-citation analysis verify the

existence of three major virtual work research clusters: telecommuting, virtual teams, and computer-mediated work. Second, drawing on the results of the co-citation analysis, we conduct a comparative review of developments in these virtual work research clusters to identify opportunities to advance the field of virtual work by integrating research across clusters. Based on the review, we propose an integrative conceptual model that compares approaches to conceptualizing and studying virtuality across the virtual work clusters. Third, we use the conceptual model as a foundation to propose a systematic approach for building bridges across the virtual work research clusters. To illustrate the approach, we identify twelve research questions as examples of bridges and discuss how they advance virtual work research. Finally, we discuss the research implications of our conceptual model and bridging approach.

VIRTUAL WORK RESEARCH CO-CITATION ANALYSIS

To fairly and thoroughly organize the literature that has proliferated, we carried out a co-citation analysis, which is a bibliometric technique that applies statistical methods to determine use and impact of research articles in a field (Small & Griffith, 1974). Co-citation analysis is a specific type of citation analysis used to identify clusters of references "co-cited" by subsequent articles (Small, 1973). By co-citing references in their bibliography, contributing authors establish connections between two or more references that have been published in the past. Co-citation analysis allows for the creation of visual maps showing the strength of the relationship between two co-cited articles. This visual representation makes relationships between articles easier to understand and also shows how related articles coalesce into research clusters (see Figure 1). Hence, co-citation analysis is an effective way to identify the intellectual bases and underlying connections between articles in any field, but especially when the analysis draws from diverse disciplines that are otherwise not within the reach of a researcher from any single

discipline (Boyack & Klavans, 2010; Raghuram, Tuertscher, & Garud, 2010). Co-citation analysis is quantitatively rigorous and reduces subjective evaluation of literature by researchers in a particular area because of its reliance on bibliometric methods (Zupic & Cater, 2015)[1]. It does not necessarily replace traditional structured qualitative reviews or meta-analyses, rather it complements these review methods (Raghuram et al., 2010; Zupic & Cater, 2015). A descriptive review remains useful for an in-depth analysis and description of the context, and a meta-analysis remains useful in distilling research on the statistical relationship between a few selected variables (Raghuram et al., 2010).

Researchers in strategic management have used this approach to identify influential articles and the links between them, and to understand the changes that have taken place in the intellectual structure of strategic management (Ramos-Rodriquez & Ruiz-Navarro, 2004), including the subfields and their interrelationships (Nerur, Rasheed, & Natarajan, 2008). Innovation management researchers have used co-citation analysis to investigate how interdisciplinary collaborations evolve over time (Raasch, Lee, Spaeth, & Herstatt, 2013). Similarly, well-being researchers have used it to organize the vast literature and to understand its historical development (Parker, Morgeson, & Johns, 2017), and human resource management (HRM) researchers have used it to review the evolution of topic areas and the intellectual structure of HRM (Markoulli, Lee, Byington, & Felps, 2017). Consistent with these uses of co-citation analysis, we aim to carry out a systematic review of the virtual work literature, providing insights into research clusters that have emerged over time, the researcher community that comprises each cluster, where these clusters overlap, and where they are distinct. We

[1] For a detailed description of different bibliometric techniques and the steps involved in the analysis, readers are encouraged to read an article by Zupic and Cater (2015).

believe that virtual work research is at a stage where some form of interdisciplinary overlap in the form of citations still exists and scholars might be open to ideas emerging from other research areas. This is an important phase because once individual research clusters become highly mature and firmly established, researchers are more likely to be bound to their own disciplinary lenses and less likely to cross boundaries (see Raasch et al., 2013).

To create a co-citation map of the field of virtual work, we identified related articles listed in the Web of Science database and published between 1995 and 2018 (February). We chose 1995 as a starting point because research activity in this area started to increase around that time. We generated a list of search terms using a snowballing technique with help from virtual work researchers[2]. This helped to minimize researcher bias in the search process. The search yielded 1769 articles published within the specified timeframe. These 1769 articles cited 55,439 references or citations, which were the basis for the co-citation analysis. For the co-citation analysis, we used the software developed by van Eck and Waltman (2010). To focus on impactful citations, we chose a threshold such that each reference was cited at least 15 times. This included 537 such references (almost 1% of the 55,439 references). This threshold provided an adequately granular visualization of the intellectual base. For the 537 references, the clustering algorithm calculated the total strength of co-citation links and selected cited references with the strongest total link strength[3].

Research Clusters Revealed by Co-Citation Analysis

[2] Search terms used in ISI Web of Science: virtual team*, virtual group*, virtual work*, distributed team*, distributed group*, distributed work*, mobile work*, remote work*, dispersed group*, dispersed team*, dispersed work*, technology mediated work*, technology mediat* team*, technology mediated group*, computer mediated group*, computer mediat* team*, computer mediat* work, telework*, telecommut*, distance work*, distance team*

[3] Notes under Figure 1 provide more details.

The co-citation analysis generated five virtual work research clusters. To validate the visual map, we examined representative articles in each cluster. This revealed that the clusters could be best described as: telecommuting, virtual teams, distributed teams, teams and computer-mediated work (CMW). The telecommuting and CMW research clusters were the most easily distinguishable clusters of the five. The telecommuting cluster included articles that used terminology such as telework (e.g., Bailey & Kurland, 2002; Baruch, 2000) and virtual work (e.g., Cascio, 2000) in addition to telecommuting (e.g., Gajendran & Harrison, 2007) to refer to an individual working away from the office. This cluster focused on the implications of working away from the office for urban planning, organizational policies, individual well-being and productivity. The CMW cluster included articles that utilize technology-mediated work (e.g., Daft & Lengel, 1986; Short, Williams, & Christie, 1976). CMW focused on consequences of different communication media characteristics on communication processes, problem solving, decision-making and productivity. In contrast to the clear distinctions between these two clusters, three of the clusters—virtual teams, distributed work and teams—had considerable overlap. Both virtual teams and distributed teams contained articles relating to team dynamics such as conflict, trust, and knowledge sharing between team members in dispersed locations. Nonetheless, these two clusters emerged separately largely due to the keywords used in their constituent articles—e.g., "distributed teams" (e.g. Cramton, 2001; Maznevski & Chudoba, 2000) versus "virtual teams" (e.g. Jarvenpaa & Leidner, 1999; Martins, Gilson, & Maynard, 2004). The teams cluster primarily included articles focused on traditional team dynamics such as emergence of conflict or team diversity (e.g. Cohen & Bailey, 1997; Jehn, Northcraft, & Neale, 1999), in addition to some articles that research virtual teams. These articles provide the theoretical frames for understanding the dynamics of virtual teams and distributed teams

clusters. Given their considerable conceptual overlap, in our subsequent review and analyses, we combined the virtual teams, distributed teams and teams clusters and labeled the combined cluster "virtual teams." Figure 1 shows these three major clusters—telecommuting, virtual teams and CMW. In addition, Table 1 includes a partial list of the articles in each cluster identified by the co-citation analysis to provide a sense of each cluster's intellectual base.

Identifying these clusters was an important step towards understanding areas of distinctiveness that underlie the separation between clusters, including theories and research disciplines upon which they draw, the work context on which they focus, and the work dynamics and outcomes they primarily examine. It is this knowledge of distinctiveness (or lack thereof) that enabled us to take the next step, that is, to identify opportunities to build bridges across the clusters. Leveraging insights from one cluster to advance research in another can help to enhance overall understanding of the dynamics and consequences of virtual work.

Note that the co-citation analysis does not include articles published after 2010 as these did not meet the threshold limit for citations. However, these more recent articles nonetheless provide an updated view of developments in the area of virtual work and so should also be examined to inform our comparative review. For this reason, we used the same list of search terms from the co-citation analysis to search the Web of Science database for articles published since 2010 and focused on those with high citation rates and publication in top tier journals.

COMPARATIVE REVIEW OF VIRTUAL WORK RESEARCH CLUSTERS

We conducted a comparative review and developed a conceptual model for understanding important differences between the research clusters that point to potential opportunities to bridge research across them. In developing the conceptual model, we were guided by several considerations: (1) it should emerge from the comparative review and co-

citation analysis; (2) it should serve the purpose of simultaneously distinguishing research across clusters as well as highlighting opportunities for integration between them; and (3) it should be broad enough to encompass different perspectives across clusters.

Conceptual Model

The organizing framework for our comparative review is based on two underlying dimensions common to how researchers in each cluster conceptualize virtuality: *dispersion* and *technology dependence*. By explicating how the approaches to studying virtuality-related issues differ along these two virtuality dimensions, we provide a conceptual lens for understanding the separation between the clusters and identifying future integration opportunities. Dispersion refers to different forms of distance between participants in virtual work arrangements, including the extent to which virtual workers are distributed across space and time (Baruch, 2000; Hollingshead, McGrath, & O'Connor, 1993; O'Leary & Cummings, 2007). Technology dependence refers to the extent to which individuals rely on communication tools and the types of communication tools (e.g., email, text, social media) they use in their work (e.g., Griffith, Sawyer, & Neale, 2003; Kirkman & Mathieu, 2005; Wiesenfeld, Raghuram, & Garud, 1999). Dispersion and technology dependence can be viewed as two independent dimensions of virtuality, each residing on a continuum from low to high (Gibson & Gibbs, 2006).

We used these dimensions of virtuality as an organizing framework for the conceptual model shown in Table 2. Within this organizing framework, we systematically identified differences and similarities in each cluster's approach to operationalizing and studying the dimensions of dispersion and technology dependence, both together and separately. These differences have resulted in a focus on different types of research questions and problem domains across clusters. Table 2 summarizes the approaches used across clusters to studying

virtuality and shows whether these approaches apply to dispersion, technology dependence, or both. It also shows examples of studies that have applied these different approaches, which are drawn from both our co-citation analysis (represented in Figure 1 and Table 1) as well as more recent literature in each cluster.

The first two approaches to studying virtuality can apply to both dispersion and technology dependence in terms of levels of analysis and features of the locational and technological context in which virtual work occurs. The next two approaches to studying virtuality are more focused on the dispersion dimension of virtuality in the form of temporal and locational dispersion. The final two approaches relate to technology dependence in the form of value of technology and the type of technology in virtual work. In what follows, we briefly review the different approaches shown in the conceptual model in Table 2.

Levels of Analysis

With regard to levels of analysis, the clusters differ in their primary focus on the implications of virtual work for individual employees, teams and groups, or the organization. The telecommuting cluster focuses mostly on the individual level; the virtual teams cluster on the team level; and the CMW cluster on individual, group and organizational levels.

Telecommuting. Telecommuting research focuses on issues relating to individual telecommuters' motivation or ability to telecommute as well as their telecommuting outcomes. These motivators and enablers include individual characteristics such as gender and family orientation (Bailey & Kurland, 2002), self-efficacy and need for affiliation (Raghuram, Wiesenfeld, & Garud, 2003; Shin, 2004; Staples, Hulland, & Higgins, 1999), job characteristics such as interdependence (Raghuram et al., 2001), and organizational practices and policies (Kossek, & Eaton, 2006). Some of the outcomes examined in telecommuting include its impact

on individual work-family balance (Baruch, 2000; Kossek et al., 2006), job stress (Raghuram & Wiesenfeld, 2004), job satisfaction (Fonner & Roloff, 2010; Golden, 2006), isolation (Bartel, Wrzesniewski, & Wiesenfeld, 2012; Cooper & Kurland, 2002) and productivity (Bailey & Kurland, 2002; Gajendran & Harrison, 2007; Golden, Veiga, & Dino, 2008). Other research studies focus on understanding the impact of telecommuting on telecommuters' relationship with their co-workers, supervisors, and organization. In this regard, researchers have examined perceptions of fairness among telecommuters and their co-workers (Golden, 2007; Kurland & Egan, 1999; Lautsch & Kossek, 2011), the quality of communication with managers as well as managerial ability to exert control (Gajendran & Harrison, 2007; Kurland & Cooper, 2002; McCloskey & Igbaria, 2003). Research examining organizational relationships includes telecommuters' organizational commitment (Golden & Veiga, 2008) and organizational identification (Thatcher & Zhu, 2006; Wiesenfeld et al., 1999).

Virtual teams. Virtual teams research primarily focuses on the team level of analysis, with the goal of understanding how dispersion and technology dependence impact team functioning—either directly or by interacting with other factors such as team leadership, team characteristics, and task characteristics (for reviews see Axtell, Fleck, & Turner, 2004; Gilson et al., 2015; Kirkman et al., 2012; Powell, Piccoli, & Ives, 2004). Virtual teams researchers are broadly concerned with the impact on team processes (how team members interact with each other and with their task environment) and emergent states (cognitive, motivational, and affective states: Marks, Mathieu, & Zaccaro, 2001). This includes the implications of team virtuality for team processes and states that have been studied in more traditional face-to-face teams—e.g., communication (Maznevski & Chudoba, 2000), knowledge sharing and team coordination (Kanawattanachai & Yoo, 2007; Pinjani & Palvia, 2013), conflict (Hinds &

Mortensen, 2005; Polzer, Crisp, Jarvenpaa, & Kim, 2006), shared understanding (Cramton, 2001), trust (Crisp & Jarvenpaa, 2013; Jarvenpaa & Leidner, 1999), team identity (O'Leary & Mortensen, 2010), and team empowerment (Kirkman, Rosen, Tesluk, & Gibson, 2004). In addition, emerging research has examined team processes that are particularly germane to a virtual teamwork environment. For example, Hill and Bartol (2016) examined virtual collaborative behaviors, which they defined as behaviors that support geographically dispersed, computer-mediated virtual teamwork. Researchers have also focused on the consequences of virtuality for different aspects of team effectiveness, including team performance behaviors (Maynard, Mathieu, Rapp, & Gibson, 2012), task performance outcome (Hoch & Kozlowski, 2014), innovation (Gajendran & Joshi, 2012; Gibson & Gibbs, 2006; Tzabbar & Vestal, 2015), decision quality (Swaab, Phillips, & Schaerer, 2016), team satisfaction (Stark & Bierly, 2009), and customer satisfaction (Kirkman et al., 2004).

Although the majority of virtual teams research has been at the team level of analysis, there is a some at the individual level. For example, this research has focused on team members' subjective perceptions of proximity to distant teammates (O'Leary, Wilson, & Metiu, 2014; Wilson, O'Leary, Metiu, & Jett, 2008), reactions to and performance in virtual teamwork (de Guinea, Webster, & Staples, 2012; Kirkman et al., 2012; Makarius & Larson, 2017; Schulze & Krumm, 2017), individual collaboration know-how and behaviors (Hill & Bartol, 2016; Majchrzak, Malhotra, & John, 2005), influence on team decision making (Gajendran & Joshi, 2012), socialization (Ahuja & Galvin, 2003) and psychological states (Gibson, Gibbs, Stanko, Tesluk, & Cohen, 2011).

Computer-mediated work. CMW research spans different of levels of analysis, including individual, group and organizational levels. Many articles in this cluster are theoretical in nature,

examining such issues as the nature of social context cues and the ways in which they enable interpersonal processes and task completion. Hence, they may apply to various levels. Of the empirical studies, the most prevalent level of analysis is the work group (Chidambaram & Tung, 2005; Dennis, 1996; Dennis, Wixom, & Vandenberg, 2001; DeSanctis & Poole, 1994; Gallupe, Cooper, Grise, & Bastianutti, 1994; Gersick, 1988; Hollingshead, 1995, 1996; Kiesler, Siegel, & McGuire, 1984; Lea & Spears, 1992; McGrath, 1984, 1991, 1994; Postmes, Spears, & Lee, 1998; Spears & Lea, 1992, 1994; Straus & McGrath, 1994). One stream of research in this area stems from the emergence of collaboration technologies to support group decision making and communication and has mainly focused on examining the factors that affect CMW group outcomes such as decision-making quality (e.g., Chidambaram & Tung, 2005), idea generation (e.g., Gallupe et al., 1994), and communication effectiveness (e.g., Fuller & Dennis, 2009).

More recent research in this domain has focused on the role of collaboration technology in managing diversity in group membership (e.g., Giambatista & Bhappu, 2010; Windeler, Maruping, Robert, & Riemenschneider, 2015) and fostering group creative performance (e.g., Curtis, Dennis, & McNamara, 2017). Another stream of research has examined the effects of computer-mediated communication on group communication and task performance. For example, research has found that the reduced social context cues in computer-mediated groups compared to face-to-face groups led to reduced productivity and satisfaction (Straus & McGrath, 1994), lower task performance (Hollingshead & McGrath, 1995; McGrath & Hollingshead, 1994), and more uninhibited, anti-social behavior (Kiesler et al., 1984; Kiesler & Sproull, 1992). Reduced social cues may also have pro-social effects by strengthening group identity and norms in deindividuated conditions where individuals are anonymous and have little personal information about each other (Lea & Spears, 1992; Postmes et al., 1998; Spears & Lea, 1994).

At the individual level of analysis, research in CMW examines the role of social context cues (Sproull & Kiesler, 1986), media richness (Daft, Lengel, & Trevino, 1987), media selection (Carlson & Zmud, 1999), moral disengagement (Alnuaimi, Robert, & Maruping, 2010), impression formation and interpersonal relationship formation among computer-mediated communication partners (Tidwell & Walther, 2002; Walther, 1992, 1995, 1996, 1997). Here, researchers have tended to focus on individuals' evaluation of communication media (e.g., Carlson & Zmud, 1999; Daft et al., 1987; Dennis, Fuller, & Valacich, 2008) and the behaviors enacted in the context of such media (e.g., Alnuaimi et al., 2010; Tidwell & Walther, 2002). For example, Alnuaimi et al. (2010) examined the social-psychological mechanisms that individuals use to shirk their responsibilities in CMW groups.

Finally, at the organizational level of analysis, a minority of CMW research on topics such as organizational information processing (Daft & Lengel, 1986) and the interaction between technology and organization (Leonardi, 2011; Orlikowski, 1992; 2002) aims to explain the role of technology in processes of organizational structure, change, and innovation. Recent perspectives on sociomateriality, practice theory, and affordances reflect a shift from examining technological features separately from social factors to conceptualizing them as mutually constitutive of one another. A recent research stream in communication examines the affordances of social media for organizational communication practices such as knowledge sharing (Ellison, Gibbs, & Weber, 2015; Fulk & Yuan, 2013; Leonardi, Huysman, & Steinfield, 2013; Treem & Leonardi, 2012).

Context

With regard to context, both telecommuting and virtual teams researchers emphasize differences in the characteristics of the different locations in which virtual work occurs.

Whereas telecommuting researchers primarily emphasize a division between office versus non-office contexts, virtual teams researchers assume that team members work in different types of office contexts (e.g., in different countries). CMW research (much of which is lab-based) primarily focuses on the technological context (i.e., characteristics of the communication media) while de-emphasizing the organizational context. Although technological context has featured less prominently in both telecommuting and virtual teams research, these research clusters differ in their respective focus on individual versus collaborative technologies.

Telecommuting. Telecommuting research emphasizes the in-office contexts versus non-office contexts. Implicit in the non-office context is a home-based location. As a result, many researchers contrast the work environments surrounding a traditional office with a home-based office (Kossek et al., 2006). The traditional office context has been portrayed as a structured environment with supervisors and co-workers who can provide feedback and other forms of support (e.g., Raghuram & Weisenfeld, 2004; Shamir, 1992). The nonwork context is depicted as having ambiguous surroundings, low interaction with colleagues, and lack of telecommuter visibility (Bailey & Kurland, 2002; Cascio, 2000; Cooper & Kurland, 2002). In instances where the nonwork context has been explicitly identified as a home location, the associated cues are specific to the home environment such as presence of a kitchen and children (Kossek, 2016; Raghuram & Wiesenfeld, 2004; Raghuram, et al., 2003). Researchers draw on boundary management theory for understanding how telecommuters can effectively reduce permeability between the work and nonwork domains, which co-exist in place and time (Ashforth, Kreiner, & Fugate, 2000; Edwards & Rothbard, 2000; Kossek, 2016). This has motivated research on telecommuters' ability to reduce work-family conflict (Hill, Hawkins, Ferris & Weitzman, 2001; Olson-Buchanan & Boswell, 2006**)** and lower their job-related stress (Gajendran &

Harrison, 2007; Raghuram & Wiesenfeld, 2004).

With increased reliance on computer-mediated communication, telecommuters experience reduced social presence with colleagues, receive fewer opportunities for impromptu conversations or remain unaware of the tacit norms of the organization (Belanger & Allport, 2008; Golden & Raghuram, 2010). Research identifies such social and professional isolation as a possible hindrance to career advancement (McCloskey & Igbarria, 2003), performance assessments (Golden et al., 2008), and informal learning (Cooper & Kurland, 2002).

Another set of research focuses on how telecommuters' self-perceptions can be shaped by what they believe their colleagues or family think of them. For example, Thatcher and Zhu's (2006) theoretical model suggests that the altered work context impacts telecommuters' organizational identification, self-verification and identity enactment. Similarly, in their study, Bartel et al. (2012) found that isolation endangers telecommuters' perception of their value and influence in the workplace and as a result, they reported that others were less likely to view them as respected organizational members. Perceived respect accorded by others, in turn, was responsible for the effect of physical isolation on organizational identification in this study.

Empirical studies in telecommuting research have in almost all cases utilized field studies, which helps researchers capture contextual influences. Data collected from telecommuters, their co-workers and their managers relate to perceptions of the work environment, their work relationships and outcomes.

Virtual teams. Virtual teams researchers have focused on factors associated with geographically dispersed team members' varied local office work contexts that influence their virtual collaboration with team mates (Axtell et al., 2004; Furst, Reeves, Rosen, & Blackburn, 2004; Hertel, Geister, & Konradt, 2005; O'Leary & Cummings, 2007; Roehling, 2017). Some

emerging research has highlighted the potential for these locational differences to benefit dispersed teams by exposing team members to different knowledge sources that aid team creativity and innovation (Tzabbar & Vestal, 2015). However, most research in this area has examined how differences between distributed team members in work tools, work processes, as well as work schedules and demands hinder team collaboration—e.g., by contributing to increased conflict, coordination and lack of shared understanding (Axtell et al., 2004; Cramton, 2001; Furst et al., 2004; Gibson & Gibbs, 2006; Hinds & Mortensen, 2005; Klein & Kleinhanns, 2003).

Another important consideration in virtual teams research is diversity in team members' cultural values and norms, which influences team member interactions and relationships (Cramton & Hinds, 2014; Daim, Ha, Reutiman, Hughes, Pathak, Bynum, & Bhatla, 2012; Gibson & Gibbs, 2006; Gibson et al., 2014; Klitmoller & Lauring, 2013). Although researchers have primarily focused on national culture differences, there is also research on differences in functional and organizational culture (Daim et al., 2012). Virtual teams research has also considered the team's technological context, with a focus on the team's use of collaborative technologies and the features of those technologies (Kirkman & Mathieu, 2005; Maruping & Agarwal, 2004). Researchers in this area have examined challenges (e.g., less shared understanding, lower team performance) created by differences in access to different technologies and technological support (Cramton, 2001; Furst et al., 2004).

Virtual teams research includes both field and laboratory studies. Field studies allow a richer examination of context and team members' actual experience at work, whereas controlled laboratory settings help to parse out the dynamics of computer-mediated, dispersed interaction.

Computer-mediated work. Much of the research in the CMW domain is theoretical and focuses on the technological context (features of the technology), while downplaying the organizational context. The major theoretical perspectives in CMW include social presence theory (Short et al., 1976); media richness theory (Daft & Lengel, 1984, 1986; Daft, et al., 1987), social influence (Fulk, 1991, 1993), structuration theory (DeSanctis & Poole, 1994; Orlikowski, 1992), the social individuation-deindividuation effects (SIDE) theory (Lea & Spears, 1992; Postmes et al., 1998; Spears & Lea, 1992, 1994), media synchronicity theory (Dennis et al., 2008), social information processing theory (Walther, 1992), and the hyperpersonal perspective (Walther 1996). These theories are concerned with the ability of computer-mediated communication to convey social context cues and its suitability for interpersonal or social relationships in the workplace.

Recent research has started to examine the impact of such technology in masking or divulging surface-level (e.g., age, gender, race) and deep-level (e.g., values, expertise, attitudes) differences in CMW groups. For instance, Carte and Chidambaram (2004) developed a theory suggesting that collaboration technologies that mask surface-level characteristics of members and highlight deep-level characteristics may be more beneficial for group performance. In a lab experiment, Windeler et al. (2015) found CMW groups that perceived greater diversity in deep-level characteristics experienced greater task conflict, lower shared understanding of problems, and lower performance than teams that perceived less deep-level diversity—despite having similar objective levels of such diversity. Many of these theories have been tested through lab studies that deemphasize the organizational context and focus on characteristics or affordances of communication media (often compared to face-to-face communication).

Temporality

In telecommuting research, temporality is conceptualized as temporal flexibility available to employees to structure their work hours. Virtual teams researchers focus on temporal dispersion between team members, which refers to time zone differences among team members. Finally, CMW researchers conceptualize temporality as the extent to which communication occurs in real-time (synchronous) or with a time lag (asynchronous).

Telecommuting. The temporal flexibility surrounding telecommuting is an important consideration for telecommuter productivity because it enables telecommuters to work during their peak performance times and save commuting time (Apgar, 1998; Baruch, 2000). Implicit in the research is that telecommuters divide their time between a central office location and home. Research has discussed how temporal flexibility can provide psychological control to telecommuters with regard to their work time (Gajendran & Harrison, 2007; Hill, Hawkins, Ferris, & Weitzman, 2001) as they apply integration or separation strategies to manage work and nonwork boundaries in a way that works best for them (Kossek, 2016). Telecommuting and related well-being research has also acknowledged the downsides to this temporal flexibility in that telecommuters may work beyond normal work hours simply because it is possible to do so, or because they feel a need to over-compensate for their absence from the office (Raghuram & Wiesenfeld, 2004). Such encroachment of work time into family time is noted to be a cause for work-family conflict (Duxbury, Higgins & Mills, 1992; Hill, Miller, Weiner, & Colihan, 1998), and stress (Gajendran & Harrison, 2007; Raghuram & Wiesenfeld, 2004).

Telecommuting research assumes that telecommuters work within the same time zone with their supervisor, colleagues or customers. With this assumption, it has examined ease of access to the telecommuter as an issue (Golden, 2007; Lautsch, Kossek, & Eaton, 2009), because telecommuters are expected to be available to their office-based counterparts to respond

to their questions or be able to join in meetings during normal work hours.

Virtual teams. Virtual teams researchers have defined temporal dispersion in teams as the extent to which team members' normal work hours overlap, and they have typically assessed temporal dispersion by measuring the extent to which team members are distributed across different time zones (O'Leary & Cummings, 2007). Temporal dispersion is important because it can create communication delays and hinder team coordination (Cummings, Espinosa, & Pickering, 2009). As a result, when examining the impact of geographic dispersion on the collaboration dynamics of virtual teams, researchers have used measures that include a temporal dispersion component (Gajendran & Joshi, 2012; Hinds & Mortensen, 2005; Joshi, Lazarova, & Liao, 2009). This empirical research supports the notion that temporal dispersion in teams hinders collaboration by increasing conflict, making it more difficult for team members to influence team decision making and undermining team member commitment and trust.

Computer-mediated work. CMW literature has primarily conceptualized temporality in terms of use of synchronous versus asynchronous communication media. While media such as telephone and videoconferencing are synchronous—allowing for real-time communication—most text-based computer-mediated communication including email, instant messaging, computer conferencing, and social media is asynchronous, as it occurs with a time lag. Research on electronic brainstorming found that CMW groups performed better at brainstorming (i.e., producing a greater number of unique ideas) compared to face-to-face groups (e.g., Gallupe, Bastianutti, & Cooper, 1991), although they had more trouble reaching consensus (Kiesler et al., 1994). CMW groups enabled members to contribute ideas simultaneously, with no turn taking necessary (Gallupe et al., 1991). This was attributed to the fact that CMW groups reduce production blocking (the kind of turn taking that needs to happen when group members share

ideas in a face-to-face setting) (Valacich, Dennis, & Connolly, 1994). Research on media synchronicity theory has dealt with temporality and media explicitly (Dennis et al., 2008). For instance, Dennis and Kinney (1998) found that groups using communication media that support greater immediacy of feedback perform better than those using communication media with low immediacy of feedback. Fuller and Dennis (2009) compared the performance of groups using a full suite of collaboration tools including audio and video conferencing and synchronous text messaging to groups using only text messaging. They found that the former groups outperformed text-only groups in the short-term, but that these differences eroded over time.

Location

In telecommuting research, locational dispersion focuses on inside or outside the office. In virtual teams research, it is conceptualized as team member spatial separation or the configuration of team member locations (e.g., geographic subgroups, isolates). Finally, in the CMW research cluster, locational dispersion is often limited to studying co-location or distribution in a lab context.

Telecommuting. Telecommuting research has emphasized locational flexibility as its key feature and examined benefits of flex-place rather than flex-time (Allen, Johnson, Kiburz, & Shockley, 2013). In fact, the earliest proponents for telecommuting were researchers from transportation and urban planning who focused on its advantageous outcomes such as reduced pollution, fuel consumption and real estate savings (Mokhtarian, 1991; 1998; Nilles, 1994). Nevertheless, in most instances research has focused on telecommuters' location and rarely on their supervisors' or co-workers' locations (see Golden & Fromen, 2011). Telecommuting, by definition, includes satellite offices, telecenters and client offices (Kurland & Bailey, 1999), but research in this area predominantly focuses on two locations: in-office versus non-office. Non-

office implicitly (or explicitly) refers to a home location in most studies (Gajendran & Harrison, 2007; Lautsch et al., 2009; Siha & Monroe, 2006). A few studies have examined outcomes related to multiple locations such as traditional office, home office and virtual office from which a telecommuter works (Hill, Ferris, & Martinson, 2003: Mokhtarian & Bagley, 2000).

Adding nuance to dual locations is the operationalization of the extent or intensity of telecommuting, which varies from a few hours per week to the entire work week (e.g., Gajendran & Harrison, 2007; Wiesenfeld et al., 1999). The measurement strategy for identifying locational dispersion has been to ask the telecommuters to self-report their 'on-average' work location in a week such that one location refers to standard office and the other refers to any location outside of the standard office. Research has frequently used extent (or intensity) of telecommuting as a moderating variable to examine subgroup differences in the advantages and the disadvantages of office locations or non-office locations. Important consequences of locational flexibility identified in this research are increased autonomy and perception of control among telecommuters (Raghuram et al., 2001; Shamir & Salomon, 1985).

Virtual teams. From a locational dispersion perspective, virtual teams research focuses on spatial distance between team members as well as their configural dispersion (the pattern of team member distribution across locations in the team: O'Leary & Cummings, 2007). Patterns of configural dispersion that have received particular attention include geographic subgroups (clusters of team members in different locations) as well as isolates (those who work alone relative to other team members). As with temporal dispersion, researchers have included spatial or configural dispersion in their overall measure of geographic dispersion and found these composite dispersion measures to be detrimental to team functioning and performance (Gajendran & Joshi, 2012; Hill & Bartol, 2016; Hinds & Mortensen, 2005; Joshi et al., 2009; Magni, Ahuja, & Maruping, 2018;

Schweitzer & Duxbury, 2010). However, other researchers have investigated the separate effects of spatial dispersion (Magni, Maruping, Hoegl, & Proserpio, 2013; O'Leary et al., 2014) or different components of configural dispersion (Cramton & Hinds, 2005; Ocker, Huang, Benbunan-Fich, & Hiltz, 2011; O'Leary & Mortensen, 2010; Polzer et al., 2006), because of their potential to impact team functioning through distinctly different mechanisms (O'Leary & Cummings, 2007). More recently, researchers have moved beyond studying objective distance to study team member's subjective perceptions of distance from another team member—perceived proximity (O'Leary et al., 2014; Wilson et al., 2008).

Computer-mediated work. Most CMW research has been conducted in lab settings and mainly incorporated location through examining co-located versus distributed groups or collaborators. Research on idea generation tasks has found that distributed CMW groups generate fewer ideas than co-located ones (e.g., Alnuaimi et al., 2010; Chidambaram & Tung, 2005; Valacich, George, Nunamaker, & Vogel, 1994). Chidambaram and Tung (2005) argue that members of distributed CMW groups feel more isolated and, therefore, contribute less to the task. Interestingly, Chidambaram and Tung (2005) find no difference in the quality of decisions produced by co-located versus distributed CMW groups. Alnuaimi et al. (2010) found members of distributed CMW groups to be able to psychologically dehumanize their teammates, reducing their obligation to contribute to the group effort. In other words, co-location may foster social pressure to contribute, whereas distribution of group members may be conducive to shirking.

Value of Technology

In both telecommuting and virtual teams research, technology dependence tends to take on a negative valence and is considered as a hindrance rather than an asset relative to face-to-face communication. In contrast, CMW researchers have shifted to a more positive view of

technology dependence that includes technology as offering affordances to enhance communication and collaboration relative to face-to-face.

Telecommuting. The telecommuting literature acknowledges the role of technology dependence for remote work and the need for a supportive infrastructure (Golden & Raghuram, 2010; Nilles, 1997; Watad & DiSanzo, 2000), but does not empirically examine the underlying processes by which technology components play this role. In their 2006 review, Siha and Monroe found that only 12.8% of the articles focused on technological issues related to telecommuting. Much of the research has considered technology as an obstacle to be overcome, because in comparison to face-to-face, it leads to ambiguity and uncertainty (Daft, 1986; 1987). Researchers argue that because of a reduced ability to have meaningful exchanges through lean communication media, telecommuters find it difficult to develop strong bonds with their colleagues or supervisors (Golden, 2006; Handy, 1995), share tacit knowledge (Golden & Raghuram, 2010; Raghuram, 1996), and collaborate (Kraut, Fussell, Brennan, & Seigel, 2002). They suggest that providing technological tools is an important and necessary condition for telecommuting (Golden et al., 2008; Golden & Raghuram, 2010). Research in a related area of well-being that has utilized telecommuters as the sample and implicitly assumed the context of telecommuting, addresses the deleterious effects of mobile technology when it is utilized after normal working hours (Derks, Bakker, Peters, & Wingerden, 2016). Individuals may not find the time to recover from work induced stress (Sonnentag, 2001). Increased stress, burnout, spousal resentment and work family conflict are some of the other consequences of mobile technology (Butts, Becker, & Boswell, 2015; Ferguson, Carlson, Boswell, Whitten, & Butts, 2016).

Virtual teams. Theorizing in virtual teams research related to the impact of technology dependence in teams is typically based on a cues-filtered-out perspective (Culnan & Markus,

1987) such as social presence theory (Short et al., 1976) and media richness theory (Daft & Lengel, 1984, 1986). According to this perspective, electronic communication media provide fewer social cues relative to face-to-face, resulting in less awareness of others in interactions. As a result, technology dependence is mostly compared unfavorably to face-to-face interaction and is shown to have negative implications for conflict (Hinds & Bailey, 2003), shared understanding with communication partners (Cramton, 2001; Hinds & Weisband, 2003), giving and interpreting feedback (Gibson et al., 2011), affect management (Maruping & Agarwal, 2004), building trust (Hill et al., 2009; Wilson, Straus, & McEvily, 2006), and leadership (Bell & Kozlowski, 2002; Purvanova & Bono, 2009). Consequently, it can harm team innovation (Gibson & Gibbs, 2006), performance, and satisfaction (Schweitzer & Duxbury, 2010) and increase the importance of factors that help teams overcome the challenges of a more impoverished communication environment, including leadership (Huang, Kahai, & Jestice, 2012; Purvanova & Bono, 2009), team empowerment (Kirkman et al., 2004), and trust (Muethel, Siebdrat, & Hoegl, 2012).

Several researchers have argued that degree of virtuality not only depends on a team's extent of reliance on computer-mediated communication but also the characteristics of the technology used. For example, Kirkman and Mathieu (2005) proposed that teams are more highly virtual when they depend on virtual tools that have greater synchronicity and lower informational value (extent to which virtual tools send or receive communication or data that are valuable for team effectiveness). However, such a nuanced approach to measuring virtuality is still rare in empirical virtual teams research.

Although virtual teams research typically portrays computer-mediated communication as less effective compared to face-to-face communication, some researchers have theorized that it might not always be detrimental to team functioning, and that its impact will depend on the

specific characteristics of the technology used, the team, and its task (Driskell, Radtke, & Salas, 2003; Griffith et al., 2003; Kirkman & Mathieu, 2005; Maruping & Agarwal, 2004; Suh, Shin, Ahuja, & Kim, 2011). For example, Driskell et al. (2003) proposed that although the limited contextual cues in electronic communication might reduce a team's ability to develop cohesion, they might also be helpful in blocking the transmission of social status cues that can lead to bias against lower status team members. Others have focused on a task-technology fit perspective (Goodhue & Thompson, 1995) that is concerned with selecting the appropriate types of technology for accomplishing the team's collaborative task based on the task characteristics. For example, Maruping and Agarwal (2004) applied this perspective to propose technologies that are the best fit for different types of interpersonal interactions in virtual teams. Finally, research has shown that team members' communication behaviors when using collaborative technologies impact team functioning and performance (Cramton, 2001; Hill & Bartol, 2016; Jarvenpaa & Leidner, 1999). For example, Jarvenpaa and Leidner (1999) showed that despite heavy reliance on leaner technology such as email, teams had higher levels of trust when team members used this technology to communicate in a proactive, predictable, and timely manner.

Computer-mediated work. While early cues-filtered-out theories such as social presence (Short et al., 1976) and media richness theory (Daft & Lengel, 1984; 1986) regarded computer-mediated communication as deficient and impersonal compared to face-to-face communication due to its lean nature and reduced cues, subsequent theory and research has focused on the ways in which computer-mediated communication conveys social context cues (Sproull & Kiesler, 1986) and socioemotional content (Rice & Love, 1987). Kiesler et al. (1984) found in several experiments that compared to face-to-face, computer-mediated communication makes it harder to reach consensus, although it tends to promote more equal and uninhibited participation. A

series of studies on the social identity model of deindividuation effects (SIDE) found that the anonymity and deindividuation of CMW activates group norms, identity, and social influence (Lea & Spears, 1992; Postmes et al., 1998). Other research found that power relations could be reinforced in CMW, rather than status being equalized or reduced (Spears & Lea, 1994).

Re-analyses of cues-filtered-out studies confirmed that users of computer-mediated communication are socially oriented even in reduced-cues environments (Walther, 1992), and that reduced cues may even lead to greater intimacy as users tend to over-attribute the few cues available and idealize their conversation partners (Walther, 1996). This research implies that rather than being detrimental or deficient, computer-mediated communication conveys social influence and cues, and that it may provide unique benefits to workplace communication and relationship formation. Further, recent approaches to thinking about technology in the CMW literature suggest that it affords groups an opportunity to shape the specific cues that are communicated, enabling them to have more productive collaborations (Carte & Chidambaram, 2004; Giambatista & Bhappu, 2010; Windeler et al., 2015). The affordances view (Treem & Leonardi, 2012) posits that technologies such as social media offer unique affordances (or "possibilities for action") that transform organizational communication. For instance, social media makes it easier for individuals to form transactive memory of who knows what and who knows whom (Leonardi, 2015). While not negating challenges of CMW, the language of affordances shifts the focus from the constraints and downsides of CMW to its benefits and opportunities.

Type of Technology

With regard to type of technology studied, telecommuting and virtual teams studies encompass a limited range of older technologies, although as mentioned earlier, they differ in

their focus on individual versus collaborative technologies. On the other hand, CMW studies include a much wider range of technologies—both older and newer (e.g., social media).

Telecommuting: Telecommuting literature has not differentiated extensively between the types of technology used for work, although email and telephone have been cited as the typical modes for remote communication (Scott & Timmerman, 1999). Most of the research combines different types of technology as electronic means of communication (e.g., Golden & Raghuram, 2010) and then compares its effects with face-to-face communication. There are, however, some exceptions. Wiesenfeld et al. (1999) examined the differential impact of communication media, including paper documents, electronic, face to face and telephone on telecommuters' organizational identification. They found that electronic communication was a stronger predictor of organizational identification among high intensity telecommuters compared to low intensity telecommuters. Venkatesh and Johnson (2002) examined acceptance and sustained use of the traditional technology (a design representing workspace as a physical desktop containing folders and files) versus a virtual reality-based technology (that offers visual and auditory rendering of an office space) to conduct business. They found telecommuters who used virtual reality design-based technology to be more motivated because of higher telepresence and social presence compared to a standard desktop workspace. Watson-Manheim and Belanger (2007) found remote workers more likely to use email than face-to-face and phone for coordination, knowledge sharing, information gathering, relationship development and conflict resolution.

Virtual teams. Similar to telecommuting researchers, virtual teams researchers tend to study a relatively narrow range of technologies, predominantly focused on older, more conventional collaborative technologies such as email, text messaging, computer conferencing and videoconferencing (Crisp & Jarvenpaa, 2013; Gibson & Gibbs, 2006; Montoya-Weiss,

Massey, & Song, 2001; Suh et al., 2011). As noted by Gilson et al. (2015) in their review of virtual teams research, despite an "extensive list of computer-mediated communication tools being leveraged in practice, within research, the norm remains to examine conventional computer-mediated communication tools" (p. 14). They concluded that research is not keeping pace with practice in this area and advocated for a greater focus on tools such as 3D virtual environments, social media tools, and mobile technologies. Emergent research related to teams' use of 3D virtual environments (Montoya, Massey, & Lockwood, 2011) and social media (McFarland & Ployhart, 2015) shows that these newer technologies can significantly improve virtual team dynamics, but also potentially pose some challenges.

Computer-mediated work. CMW scholars have studied a wide array of technologies. Many articles in our co-citation analysis were published earlier and examine older technologies such as email (Fulk, 1993; Lea & Spears, 1992; Sproull & Kiesler, 1986), computer conferencing (Kiesler et al., 1984; Rice & Love, 1987; Straus & McGrath, 1994), group decision support systems (GDSS) (DeSanctis & Poole, 1994), or other collaborative tools such as Lotus Notes (Orlikowski, 2000) or computer-aided software engineering tools (Orlikowski, 2002). The emphasis in this prior research was on understanding how specific collaborative tools (e.g., GDSS) affect execution of particular tasks (e.g., group decision making).

While the studies referenced above focused on a specific tool, other research has examined text-based CMW more broadly (Postmes, Spears, & Lea, 2000; Walther, 1992; 1996) or compared lean and rich media (Daft & Lengel, 1986; Daft et al., 1987). For example, Hambley, O'Neill, and Kline (2007) compared how groups using chat-based, video conferencing and face-to-face communication enable leadership styles and group interaction styles to promote task performance. Dennis and Kinney (1998) compared the communication

effectiveness of groups using video conferencing versus chat-based tools across different types of tasks. The focus of this research has mainly been on comparing the performance of different tools in supporting CMW group communication.

More recent CMW research has expanded and updated the technologies studied to include 3D virtual environments (Curtis et al., 2017; Sivunen & Nordback, 2015), social media tools (Gibbs, Rozaidi, & Eisenberg, 2013; Majchrzak, Faraj, Kane, & Azad, 2013; Treem & Leonardi, 2012), and mobile technologies (Mazmanian, 2013; Mazmanian, Orlikowski, & Yates, 2013). The emphasis in this body of work has expanded beyond communication to other important considerations such as creativity (Bhagwatwar, Massey, & Dennis, 2017) and learning about where expertise resides within the organization (Leonardi, 2015).

Summary

In summary, our review of research in the telecommuting, virtual teams, and CMW clusters indicates that each has considered the role of dispersion and technology dependence in examining phenomena of interest. Our review also reveals that each cluster demonstrates clear differences in the main levels of analyses considered, the degree to which context is explicitly incorporated, and how dispersion and technology dependence are conceptualized. These differences have illuminated opportunities to leverage the accumulated knowledge in one cluster to generate insights and inform theory in other clusters. In the next section, we highlight opportunities to bridge research across these clusters.

BRIDGING RESEARCH ACROSS VIRTUAL WORK RESEARCH CLUSTERS

Our conceptual model not only provides a means for understanding key differences across clusters; importantly, it also offers a path to bridge research among them. Researchers can bridge research across virtual work clusters by considering how different approaches to

studying the dispersion and technology dependence dimensions of virtuality and the ensuing problem domains addressed in one cluster might help to advance research in another cluster.

Strategies for Bridging Research Across Clusters

Table 3 shows specific examples of research bridges between different virtual work clusters that result from leveraging differences in approaches to studying dispersion and technology dependence across the three clusters highlighted in Table 2. Each bridge is motivated by a research question derived from theories and research findings in one cluster that can help to inform important underexplored research questions in another cluster.

To illustrate how the research questions in Table 3 relate to the different approaches highlighted in Table 2, we provide the cell numbers from Table 2 that motivate each research question. For example, the first cell of Table 3 shows two research questions that are motivated by the dispersion dimension of virtuality. The first question describes how telecommuting (TC) research might inform virtual teams (VT) research (TC→VT) by examining how the extent to which a team member works in or out of the office (cell 10 of Table 2) influences team outcomes in geographically dispersed teams (cell 11 of Table 2). The second question relates to bridging in the opposite direction—i.e., virtual teams research into the telecommuting cluster (VT →TC)—by borrowing from virtual team research regarding how locational configurations (cell 11 of Table 2) of and between telecommuters and other co-workers in a work unit impact the unit's outcomes (cells 1 and 4 of Table 2).

In Table 3, we classify research questions under dispersion or technology dependence based on the cell that acts as the resource for bridging. Hence, within a research bridge, developments in one cluster can be informative for the other and vice versa, as shown by the directional arrows in Table 3. However, whether bridging primarily occurs in one direction or

both will ultimately depend on the state of the literature in a cluster (as presented in Table 2). For instance, since CMW research tends to emphasize technological over locational context, there are likely more opportunities to leverage research related to technology dependence from CMW research into other clusters, but less opportunity to borrow from CMW research when it comes to questions related to dispersion. The "Telecommuting⇔CMW" column in Table 3 illustrates this point. When it comes to questions related to dispersion, both sample questions show CMW leveraging insights from telecommuting research (TC→CMW), but for questions related to technology dependence both sample questions leverage CMW into telecommuting research (CMW→TC).

The research questions in Table 3 are merely representative of the possibilities that exist. For example, in addition to bridging research across two clusters, within a virtuality dimension, it is possible to simultaneously integrate across multiple clusters or dimensions. Also, rather than considering how research in one cluster is informative for another, researchers might identify research gaps that have not yet been examined in any of the clusters and seek opportunities for integration. Given the numerous permutations possible with this approach, researchers should find ample opportunities to focus on bridges and related research questions that are most relevant to their specific research interests.

Bridging Examples

Dispersion dimension: telecommuting→ virtual teams. We consider the possibility that members of geographically dispersed virtual teams reporting to supervisors in different local organizations may also be telecommuters primarily working from home. This raises the question: *How do virtual team outcomes in geographically dispersed teams differ based on the extent to which virtual team members work in or out of the home?*

Virtual teams researchers have suggested that team members in geographically dispersed teams who are not co-located with other team members might experience feelings of isolation and stress leading to lower participation in the team (Kirkman, Rosen, Gibson, Tesluk, & McPherson, 2002; Nurmi, 2011). However, they have devoted little attention to understanding the dynamics of physical isolation. In contrast, telecommuting researchers have shown that physical isolation results in professional isolation, weak work relationships and impeded coworker interactions (e.g., Cooper & Kurland, 2002). This can in turn reduce access to knowledge and support and harm employee job performance (Golden et al., 2008; Golden & Raghuram, 2010). These findings can be used to explain how virtual team members' isolation may impact team performance. It suggests that virtual team members who also telecommute may experience even greater isolation due to the dual effects of being physically isolated from their team members who may be in a different geographic location, as well as from co-workers in their local office. Compared to team members who also telecommute, virtual team members who work out of a local office have the opportunity to interact with their local supervisor and co-workers who are not part of their virtual teams. This may help to offset some of the negative effects on the team resulting from team members' feeling of isolation. For example, they may be better able to seek local support for problems encountered in executing their assigned tasks in their virtual teams.

Dispersion dimension: virtual teams → telecommuting. Virtual team researchers have examined different patterns of dispersion between team members and their distinct effects on team functioning and outcomes (Armstrong & Cole, 2002; O'Leary & Cummings, 2007; O'Leary & Mortensen, 2010). This research identifies three types of configurations: (1) the isolation of individual members, (2) the number of sites represented on a team, and (3) the imbalance between geographically defined subgroups. These different types/dimensions of

dispersion have distinct effects on team outcomes. For example, in virtual teams, strong geographic subgroups can trigger social categorization effects that negatively impact the team (O'Leary & Mortensen, 2010) through weaker identification with the team, less effective transactive memory, more conflict, and more coordination problems. Further, these negative effects are worse for teams with imbalanced subgroups (O'Leary & Mortensen, 2010).

Telecommuting research tends to adopt an individual level of analysis and, therefore, does not acknowledge the impact of telecommuting at a work group level. In this regard, Belanger, Watson-Mannheim and Swan (2013) identified a need to examine the impact of telecommuting on group- or organization-level performance. Borrowing from the virtual teams literature, we propose the following research question: *How do locational configurations of and between telecommuters and other co-workers in a work unit impact the unit's outcomes?* These configurations may take the form of isolation of individual telecommuters, the number of sites represented by telecommuters, and imbalance among subgroups of telecommuters. While we have some understanding of the possible effects of isolation of individual telecommuters at the individual level (e.g., Cooper & Kurland, 2002), we have less of an understanding of the dynamics of the other two configurations. As an example, telecommuters may be configured such that in one work unit they are split across four geographic sites: two clusters work out of two satellite offices, one from a client site and the fourth from a central office. In another unit, the telecommuters are split across two geographic sites: the client site and the central office. Such differences in patterns of dispersion among telecommuters and office-based coworkers across units can lead to varying levels of challenges similar to those found in virtual teams in terms of coordination of information, unit level identification or unit performance.

Dispersion dimension: telecommuting → CMW. Telecommuting research tends to utilize field methods that take advantage of the locational context. These methods can situate the study sample, task type, and technology used. For example, telecommuters do not always have reliable access to online communication when they are working out of the office (Staples et al., 1999). They may combine different communication media to perform different types of tasks such that when in the office, telecommuters may choose to discuss complex problems face-to-face and when they are working remotely they may use electronic means for coordination of interdependent tasks (Raghuram et al., 2001).

Much of CMW research, on the other hand, utilizes controlled lab studies to address questions such as whether synchronous or asynchronous communication is better for supporting collaborative problem-solving (Dennis et al., 2008; Fuller & Dennis, 2009; Gallupe et al., 1991), or whether face-to-face or CMW settings are better suited for creative tasks (Hollingshead, et al., 1993; Straus & McGrath, 1994). These controlled lab studies often involve tasks of short duration with subjects who possess no shared history. Although they afford a higher degree of precision in inferring causal relationships, they miss the nuances and complexities of particular workplace contexts. For instance, research on CMW groups has been critiqued for ignoring member characteristics (often conflating student samples with management or other organizational samples); lack of systematic comparison of task type, technology used, and research design; and using short-term designs (Hollingshead & McGrath, 1995).

Thus, an interesting research question emerging from bridging across telecommuting to CMW is: *How do characteristics of locational context influence the effectiveness of task-media combinations?* As already noted, the CMW domain's traditional emphasis on controlled lab studies misses important field-based nuances that could alter or inform accumulated knowledge.

For instance, by allowing participants in lab studies to engage in both face-to-face and computer-mediated communication through different phases of task execution, researchers may be able to develop a more holistic understanding of particular task-media combinations. Suitable communication media for a group ideation versus task coordination phase may differ. Further, adopting the approach from telecommuting research of focusing on characteristics of the locational context in which virtual work occurs allows for richer examination of the ways in which contextual features (e.g., office layouts, organizational policies, virtual worker characteristics, and task type) influence the ways in which technologies are used and their effects on performance and other outcomes.

Dispersion dimension: telecommuting → CMW (example 2). The rise of mobile and digital media in the workplace has led to increased multi-tasking and distractions (Kurzberg & Gibbs, 2017). The lack of control over connectivity and increased intrusions from colleagues and the organization can be a source of stress and lack of productivity (Leonardi, Treem, & Jackson, 2010; Mazmanian, Orlikowski, & Yates, 2013). One solution to the stress of constant connectivity that CMW researchers have proposed is for telecommuters to be proactive in exercising control regarding when they want to be accessible, for example, not responding to emails, or telephone calls immediately or turning off text notifications (Leonardi et al., 2010; Wajcman & Rose, 2011). On the other hand, CMW researchers have also discussed the benefits of informal communication enabled by ESM for ambient organizational awareness, knowledge sharing or collaboration (Leonardi & Neeley, 2017), which seems to recommend constant connectivity. Such a paradoxical approach to technology connectivity suggests a need to identify contextual factors that can help telecommuters take a more strategic approach to determining the appropriate level and type of technology control. CMW researchers have largely failed to

account for contextual factors in fully understanding the consequences of control, for example, the expectations of their roles during work hours and during nonwork hours (e.g. Derks et al., 2016). This leads us to ask the following research question: *What contextual factors influence the effectiveness of exercising technology control during work hours and nonwork hours?*

Drawing upon telecommuting research can help to address this question. Telecommuters work out of different office locations (in a coffee shop, a coworking space or their home) and choose to do so with a plan to be more focused and productive. However, a number of factors create an expectation for connectivity during their normal work hours. For example, non-telecommuting coworkers feel unfairly treated because they have to cover additional and unexpected work for the inaccessible telecommuters (Cascio, 2000; Golden, 2007; Lautsch & Kossek, 2011); managers perceive a lower ability to exert control over the activities of telecommuters (Handy, 1995; Kurland & Cooper, 2002; Kurland & Egan, 1999) and telecommuters perceive a need to maintain visibility in the organization (Bartel et al., 2012; Cooper & Kurland, 2002). The constant connectivity during nonwork hours is also a dilemma because on the one hand, telecommuting offers the ability to attend to nonwork needs (Hill et al., 2001), and on the other, telecommuters may be unable to fulfill all their nonwork role expectations during nonwork hours because of technology-based interruptions (Ferguson et al., 2015; Fonner, 2012). This impedes their ability to maintain work nonwork boundaries (Duxbury et al., 1992; Hill et al, 1998; Kossek, 2016), and well-being (Butts et al., 2015; Ferguson et al., 2015). These contextual factors are important in determining the conditions under which these controls ought to be exercised or how. In this regard, job type, co-worker and family needs, and organizational norms all play a role in boundary maintenance decisions. Hence, telecommuting

research can help inform CMW research related to the technology connectivity control paradox and add to contemporary debates about work-life balance and worker well-being.

Dispersion dimension: virtual teams → CMW. Empirical findings in the CMW literature suggest that members of computer-mediated groups contribute less to the task due to feelings of isolation (e.g., Alnuaimi et al., 2010; Chidambaram & Tung, 2005; Valacich et al., 1994) and participate less using text-based communication technologies due to reduced cues (Kiesler et al., 1984). A possible reason for withholding effort toward accomplishing the group's objectives may be that text-based communications affords group members an opportunity to psychologically dehumanize their teammates (Alnuaimi et al., 2010). Such behaviors hinder group processes by creating conflict and by making it difficult to reach consensus. VT scholars, on the other hand, have begun to examine how subjective perceptions and psychological experiences such as "perceived proximity" (Wilson et al., 2008) and "psychologically safe communication climate" (Gibson & Gibbs, 2006) influence both individual- and team-level outcomes such as satisfaction of working with, learning from, and desire to work with distant teammates (O'Leary et al., 2014; Wilson et al., 2008). Furthermore, VT researchers have theorized that the relationship between objective and perceived proximity depends on individual characteristics (e.g., openness to experience and experience with dispersed work), as well as socio-organizational factors (e.g., network density in the team, strict organizational hiring standards that increase perceptions of competence of distant teammates).

The preceding discussion raises an interesting research question: *How do subjective perceptions of distance and different communication media interactively influence participation level, decision-making quality or idea generation?* By leveraging research related to perceived distance CMW researchers could gain a better understanding of influences on outcomes such as

participation, decision-making or idea generation. The communication tools may act as boundary conditions in the relationship between perceived proximity and its outcomes.

CMW research may provide deeper insights into how various technologies might be instrumental in providing psychological closeness as well as the conditions under which particular types of communication tools may be better suited to specific tasks. For instance, tasks that require a strong sense of perceived proximity—perhaps to facilitate greater knowledge integration—could benefit more from communication tools that provide a broader range of cues (e.g., 3D virtual environments). Recent research finds that text-based communication tools are effective at supporting knowledge sharing and knowledge integration in racially diverse CMW groups but less effective in supporting the same activities in gender diverse CMW groups (Robert, Dennis, & Ahuja, 2018). One explanation may very well be that the composition of the groups necessitates different degrees of perceived proximity.

Dispersion dimension: virtual teams → CMW (example 2). Another potentially fruitful avenue for CMW research is to explicitly theorize the implications of a more nuanced view of geographic dispersion. Although the CMW literature has made tremendous strides in its consideration of media features and affordances, the treatment of geographic dispersion as an informing contextual consideration has not advanced to the same degree. In contrast, as noted earlier, the virtual teams literature has advanced nuanced conceptualizations of the varied ways in which such teams can be geographically distributed across physical locations (O'Leary and Cummings 2007). The CMW literature could benefit from this more nuanced understanding of geographic dispersion when researching media features and affordances. A key research question is: *How do different virtual team configurations inform the communication media affordances necessary to achieve high performance?*

The virtual teams literature has shown that different configurations of geographic distribution result in different ways of interrelating among team members (Maznevski & Chudoba, 2000; Mortensen & O'Leary, 2010). For example, virtual teams that have greater imbalance in their distribution across physical sites may have a subset of members who have sufficient shared experience and contextual information that they can communicate through media with fewer affordances compared to virtual teams where members are equally distributed across sites (Cramton, 2000; Maznevski & Chudoba, 2000). Similarly, even on the same task, virtual teams with a high site index may require communication media with greater coordination affordances than virtual teams with a lower site index given the differences in the coordination needs across sites. Here, the configuration of geographic dispersion may inform the necessary communication media affordances to support high performance. CMW literature has tended to place significant emphasis on task characteristics as the salient contextual factor that shapes the necessary communication media affordances. By augmenting this orientation to also include consideration of the configuration of the team performing the task, CMW researchers can develop a more holistic appreciation of communication media affordances.

Technology dimension: virtual teams→ telecommuting. Telecommuting researchers identify the importance of trust for telecommuting program success (Cascio, 2000; Handy, 1995; Raghuram et al., 2001). In particular, telecommuters' trust of coworkers and supervisors can be a key mechanism underlying their performance (Gajendran & Harrison, 2008). However, this research does not look into the process by which this trust develops. Virtual teams research might be informative in this area because of its focus on understanding how technology dependence influences interactions between team members and with team leaders.

Relevant research from the virtual teams area includes theory and findings related to the

impact of technology dependence on team processes as well as emergent states. Virtual teams researchers have studied the implications of technology dependence for a range of task and relational team processes (e.g., knowledge sharing, coordination, and conflict management) as well as emergent states (e.g., shared understanding, trust, and cohesion) (for reviews, see Martins et al., 2004; Kirkman et al., 2012). This research sheds light on important mechanisms through which technology dependence influences these dynamics in teams, which can also be applied to understand similar dynamics in the interactions that occur between telecommuters and their co-workers. Hence, virtual teams research can help to inform the following telecommuting research question: *How does technology dependence influence processes and emergent states between telecommuters and their coworkers?*

Virtual teams research has found that the lack of contextual cues in computer-mediated communication environments makes it more difficult to form an impression of others and accurately assess their intentions (Cramton, 2001; Hill et al., 2009; Wilson et al., 2006). This research has also highlighted behaviors that aid the development of trust such as proactive and responsive communications, showing initiative, and maintaining a positive tone when communicating virtually (Jarvenpaa & Leidner, 1999). These insights from virtual teams research are relevant to understanding how technology dependence might serve as a barrier to building trust between telecommuters and other workgroup members while also pointing to potential strategies for building trust. Another area of virtual teams research relevant to understanding telecommuter-coworker interactions shows that the reduced nonverbal and contextual cues can increase the potential for misunderstandings and conflict due to the greater uncertainty and ambiguity about intentions and information shared (Hinds & Bailey, 2003; Hinds & Weisband, 2003).

Technology dimension: telecommuting → virtual teams. Recent research has examined the impact of mobile technology when employees are working from home, especially after normal business hours (e.g. Butts et al., 2015; Derks, et al., 2016). Because of constant connectivity to mobile technology, many employees are accessible to their colleagues outside of normal working hours and they continue to confront work-related matters even when they are at home (Duxbury et al, 1994). When individuals are unable to separate themselves from work, physically or mentally, then they are unable to detach psychologically from their work. Such psychological detachment is necessary for recovery, i.e., to overcome work fatigue and stress (Derks & Bakker, 2014; Sonnentag, 2001). As a result, individuals using mobile devices from home locations are more likely to experience work-related exhaustion, burnout and work-family conflict (Derks et al., 2016). Mobile technology use can also lead to spousal resentment, loss of commitment to their work units and turnover intentions (Ferguson et al., 2016). This research also identifies the moderating influence of individual preference to integrate work and nonwork domains versus a segmentation preference to separate the two domains (Butts et al., 2015; Derks et al., 2016; Powell & Greenhaus, 2010). Hence, integrators are better able to manage technology demands in the work and nonwork domains than segmenters.

In globally distributed virtual teams, team members often use mobile technology during non-traditional work hours for early morning or late-night meetings or to provide timely responses to team mates in different time zones. This engagement with technology is likely to interfere with the normal family routines and reduce their recovery from work-related stress, leading to experience of negative well-being that has been found in telecommuting research. With this, over time, individual members may become disengaged due to depletion of psychological resources and eventually decide to quit the team or the organization. This raises

the following research question*: How does use of mobile technology among home-based virtual team members lead to diminished commitment to continue to work in their team and/or the organization?* Researchers might also examine how individual differences such as integration and segmentation preferences moderate these effects. Such differences among team members might create tension and a lack of common understanding between the integrators and segmenters for when technology use for work is acceptable or expected.

Technology dimension: CMW → telecommuting. A concern identified by the telecommuting literature is that lack of physical presence in the office is associated with isolation and lack of visibility. Such lack of visibility can lead to slower career progression, job dissatisfaction and reduced organizational identification (McCloskey & Igbaria, 1998). Physical isolation is also linked with lower interpersonal networking, informal learning, and mentoring opportunities (Cooper & Kurland, 2002), lower performance (Golden et al., 2008), and lower perceived respect and status (Bartel et al., 2012). To mitigate these isolation effects, some organizations encourage their telecommuting employees to come into the office for at least part of the week to interact with their colleagues (Raghuram et al., 2001). However, with social media becoming increasingly mainstream, organizations are now using ESM in the workplace to facilitate social networking among office colleagues with tools such as Yammer, Jive, and Slack. ESM affords the ability to not only share knowledge (Fulk & Yuan, 2013; Leonardi et al., 2013) but also to build identification among remote workers (Ellison et al., 2015). ESM can facilitate networking and socializing with colleagues in a more uninhibited and spontaneous manner, almost mimicking water-cooler chats (Brzozowski, 2009). It can enable formation of interest groups ranging from work to nonwork interests and can help employees garner support

for ideas and projects (DiMicco et al., 2008). With this, telecommuters may find it easier to gain visibility as well as form, expand and maintain virtual communities.

This prompts a research question: *How can social media (for enhanced social network connections) attenuate negative effects of a non-office location (such as lower organizational visibility)?* The telecommuting literature tends to take a passive view of technology. However, research in CMW demonstrates that recent technologies can help foster social presence and visibility. For instance, ESM provides the affordance of visibility, by making people's expertise, behavior, preferences, and social network connections more visible (Treem & Leonardi, 2012). Visibility has been linked with greater knowledge sharing and expertise recognition among distributed workers—e.g., Leonardi (2014) found that ESM enabled third parties to gain a better understanding of an employee's knowledge and an appreciation for how active they were in communicating with other organizational members. Another empirical study found that ESM was associated with increased cross-boundary communication across regional locations (Gibbs, Eisenberg, Rozaidi, & Griaznova, 2015). These findings suggest that the use of ESM may help telecommuters overcome the "out of sight, out of mind" phenomenon by making their expertise and contributions more visible to their on-site colleagues as well as to other remote workers and help them develop stronger attachments to their work sites.

The true power of such ESM to minimize telecommuter isolation can only be realized under certain conditions which are worthy of examining. These conditions include a large proportion of office colleagues using it, especially supervisors and other significant organizational members (Gibbs et al., 2015). Moreover, a number of studies have documented resistance to using ESM due to its excessive openness (Gibbs et al., 2013), or its perceived incompatibility with professional workplace communication norms (Treem, Dailey, Pierce, &

Leonardi, 2015). At a higher level of analysis all of these conditions may be constituted by organization norms and culture.

Technology dimension: CMW → telecommuting (example 2). Telecommuting research finds that as a result of working from remote locations, telecommuters have altered relationships with their co-workers and supervisors. Co-workers perceive a lack of fairness (Golden, 2007; Kurland & Egan, 1999), managers fear loss of control of telecommuting subordinates (Kurland & Cooper, 2002; McCloskey & Igbaria, 2003), and telecommuters perceive a loss of respect (Bartel et al., 2012). This leaves unanswered questions surrounding the process by which this might occur and more specifically the role of computer-mediated communication.

Some of the CMW research suggests that electronic communication has an equalizing or democratizing effect because of the reduced social cues (Short et al., 1976). As a result, those who occupy a higher status in the organization are less likely to dominate a discussion (Kiesler & Sproull, 1992). And yet, other research suggests that rather than status being equalized or reduced (Spears & Lea, 1994), power relations could be reinforced in CMW and that social influence is not eliminated because the social identities are triggered and can become salient (Postmes et al., 1998). Similarly, in a different study, Hambley et al., (2007) do not find any effect of the richness of communication media on leadership effectiveness or team performance.

Given these results, CMW literature can help to uncover the mechanisms, and the conditions under which these operate, for maintenance of social relationships with telecommuters. A relevant research question here is: *How does CMW impact the social influence of telecommuters on co-workers, supervisors or subordinates?* Telecommuters (including telecommuting supervisors) may or may not lose their social influence as a result of reduced cues that are a consequence of remote work. Their social influence could depend on a number of

factors such as how social identities are triggered online (Postmes et al., 1998), the task structure and duration (Hambley et al., 2007), task complexity, and the combinations of media used (Chidambaram & Jones, 1993). Since some of this research evidence is based on the study of groups, the effects may also vary depending on individual versus group interactions of the telecommuters with their supervisor, subordinates or co-workers. For example, telecommuting supervisors may continue to earn respect from their subordinates if they structure the tasks of their subordinates, send motivating messages and ensure a high level of performance in their work group.

Technology dimension: CMW → virtual teams. Research on the technology that enables virtual teams to function has often been relegated to the background. A recent review of the virtual teams literature found that only just over half (53.6%) of the empirical studies addressed impacts of technology use, and did so in aggregate terms such as electronic dependence rather than considering features of specific technologies (Gibbs, Sivunen, & Boyraz, 2017). Further, much of the virtual teams literature has focused on the challenges of technology use (often based on studies of "older" technologies such as email), assuming a deficiency model in which interpersonal processes are limited by reduced socioemotional cues, rather than examining ways in which technology can facilitate virtual collaboration (Gibbs, Nekrassova, Grushina, & Abdul Wahab, 2008).

This provides significant opportunities for virtual teams researchers to incorporate theoretical and practical insights from the CMW literature. The CMW literature has identified features of technology that are well-suited to particular task conditions (Dennis et al., 2008). Recent literature in this domain has focused on conceptualizing different affordances—action possibilities that are generated by an environment—that are offered by newer communication

technologies such as ESM (e.g., Treem & Leonardi, 2012). Utilizing these theoretical developments in CMW, we are motivated to ask the following research question: *How can we better theorize the affordances of various communication technologies in distributed team collaboration?*

Such an inquiry would shift our orientation from one of barriers or challenges to overcome to one of opportunities for virtual teams research. For instance, communication technologies such as social media afford virtual team members greater visibility of the social connections and communications between their teammates than would be common in face-to-face teams. They also enable persistence of communications and artifacts that are created beyond the actual time of presentation (Treem & Leonardi, 2012). This creates possibilities that would not otherwise exist without the technology. For example, persistence of communications and artifacts can potentially generate affordances in extending the workday for teams that are distributed across time zones. This would enhance the effectiveness with which virtual teams enact follow-the-sun work schedules by actualizing affordances that provide team members in different time zones with adequate task status and background communication without requiring the co-presence of the team members who created them. Further, rather than detracting from interpersonal dynamics within virtual teams, social media tools (e.g., Slack, Yammer) may enhance them by acting as a social lubricant to form relationships with remote team members and foster identification at the team level (Ellison et al., 2015).

Technology dimension: CMW→ virtual teams (example 2). A growing body of CMW literature studies how ESM can be used to facilitate knowledge sharing in organizations (e.g., Ellison et al., 2015; Fulk & Yuan, 2013; Leonardi & Meyer, 2015). This research has identified both benefits and drawbacks of social media for knowledge sharing in organizations. Internal

social tools can help global organizations share knowledge by making employees aware of projects, innovations, and best practices at other locations, helping prevent duplication of work, and providing a window into broader organizational discourse (Leonardi & Neeley, 2017). ESM is theorized to facilitate knowledge sharing by helping organizations to identify where expertise is located, increasing motivation to share knowledge through lower costs to contribution, and helping to create and sustain social capital that strengthens connections (Fulk & Yuan, 2013). While much of the literature has identified benefits, research has also found that ESM tools may inhibit knowledge sharing because the excessive openness of social media may create concerns about sharing private or proprietary information in a public forum, maintaining positive impressions, or protecting one's time and attention (Gibbs et al., 2013). These developments in CMW research prompt the following question: *How can social media applications be both an asset and a hindrance to knowledge sharing in virtual teams*?

Popular ESM applications such as Slack may provide unique affordances for team knowledge sharing. ESM can help to develop shared cognition (Leonardi, 2018), which may help virtual teams overcome their contextual differences and develop shared understanding. Further, the lightweight status updates in tools such as social network sites can help increase informal and serendipitous conversations (Ellison et al., 2015), which are often lacking in virtual teams, as well as enable passive monitoring of conversations in which one is not directly involved without the need to interact directly with others (Leonardi & Meyer, 2015).

IMPLICATIONS FOR RESEARCH

The purpose of this review was to assess the extent to which virtual work research has evolved as disparate research clusters and identify opportunities to bridge research across different clusters. We conducted a co-citation analysis to identify different clusters of virtual

work research and the degree of integration between them. This analysis confirmed the existence of three distinct clusters related to telecommuting, virtual teams and computer-mediated work. We subsequently conducted a comparative review of research across these research clusters. This review culminated in a conceptual model that distinguishes differences and similarities in approaches to studying virtual work along two primary dimensions of virtuality—geographic dispersion and technology dependence—that underlie all three clusters. We used the conceptual model to identify important opportunities to build research bridges by integrating research across virtual work clusters. Our co-citation analysis, comparative review, conceptual model, and bridging examples have several important implications for virtual work research.

First, our review provides an important resource that increases researchers' awareness of the larger body of virtual work research that might help to inform their work. Given that research siloes exist, there is a risk that researchers in one cluster may fail to recognize existing virtual work research from another cluster that is relevant to their inquiry. Such segmentation of the field of virtual work research may unfold as researchers from disparate domains with different interests make sense of new phenomena and target journals in their primary disciplines. Our co-citation analysis results also suggest that it may be exacerbated by how we conduct and disseminate research. For example, the keywords that researchers use to describe their research article can categorize the article into one or the other cluster. We noticed that this occurred in the case of using keywords such as 'distributed' versus 'virtual' to describe virtual teams. Our review helps scholars understand how their individual research interests fit within the broader landscape of virtual work research as well as increasing the potential impact of any one study.

Second, our conceptual model provides a framework to systematically identify bridging opportunities across segmented clusters and relevant research questions. Utilizing such a

structured approach should increase the potential for researchers to uncover interesting research questions that advance the field of virtual work research in significant ways. We demonstrated how researchers can use this approach to leverage research from one cluster to address gaps in another, which helps to maximize their use of the existing research base in the field of virtual work. Over time, this should result in researchers co-citing literature from more than one cluster, resulting in even greater integration between them. This integration should also result in less research focus on specific types of virtual work arrangements (e.g., virtual team, telecommuting) and more research attention to examining the underlying dimensions of virtuality and their characteristics that are relevant to a particular research investigation. For example, studying causes and consequences of isolation (associated with location dispersion) as well as interventions to mitigate isolation in virtual work is critical regardless of whether the isolation results from being a telecommuter or a member of a dispersed virtual team. This approach will likely become more important as employees in organizations simultaneously engage in multiple different virtual work arrangements that combine to uniquely influence different aspects of their work environment—for example, a virtual team member who also telecommutes. In addition, Makarius and Larson (2017, p. 159) explained that a "more organic type of virtual work is quickly becoming the norm for many employees," where they engage in one-on-one virtual interactions on an ad hoc basis outside of formal telecommuting or virtual team structure. These changes in how virtual work is enacted in organizations call for a more fluid approach to studying virtuality that focuses on the underlying dimensions that shape employees' experience of virtual work. Our conceptual model provides an important point of departure for this critical new approach to studying virtual work.

Third, our review and integrative conceptual model highlight ruptures—e.g., in topic of focus, research design, and level of analysis—that may help to explain conflicting findings in virtual work research. For instance, the domains of telecommuting and virtual teams have relied heavily on older views of computer-mediated communication that regard lean or reduced-cues environments as deficient or problematic. Meanwhile, the CMW domain has expanded its conceptions of technology to emphasize its affordances for knowledge sharing, collaboration, identification, etc. It has also kept pace with recent technological developments and this updated theorizing can inform work in the other two domains, which often does not theorize technology specifically. Failure to adequately account for technological features might lead to conflicting findings in virtual teams research regarding the impact of technology in virtual collaboration. In contrast, the telecommuting and virtual teams domains have carefully theorized organizational context through field-based studies and can help to inform the CMW domain, which tends to focus on lab studies, potentially missing important interaction effects between technology characteristics and the context in which the technology is used.

Fourth, from a methodological perspective, the use of co-citation analysis to review virtual work research has utility in other fields of research as illustrated in the introduction to this review. Co-citation analysis is an approach to reviewing research that takes advantage of the large repositories of accumulated knowledge residing in bibliographic records of databases such as Social Science Citation Index. These repositories are only growing in size and importance as the available technology to retrieve and store publication related information is becoming increasingly refined. The use of co-citation software provides a method for reviewing a body of literature and identify its underlying intellectual base that is accessible to most researchers.

Finally, our review has important implications for how virtual work researchers disseminate knowledge and collaborate. Providing a more holistic view of the field of virtual work is important for developing new virtual work scholars (e.g., doctoral students). Indeed, research from different domains of virtual work is often studied in separate doctoral seminars. However, our review shows the utility of studying them in the context of a combined virtual work seminar to enable a more integrated approach. Our approach can serve as a model for researchers collaborating across different virtual work clusters and can help provide a common language that facilitates more effective interdisciplinary communication. As an example, writing this review, developing our integrative conceptual model and bridging research required integration of knowledge from all members of the research team, all of whom have research backgrounds from different disciplines and focused on different domains of virtual work. We made a conscious effort to include researchers across disciplines and domains in our team to ensure that we had expertise across each of the virtual work domains. We also explicitly paired up researchers from each domain to brainstorm and craft our bridging clusters to ensure a cross-fertilization of ideas across domains and disciplines. Hence, this project exemplifies the very type of interdisciplinary dialogue and collaboration we hope this review will promote. This will further contribute to integration and expansion of the virtual work research field.

In conclusion, by providing a framework and approach to bridge research across virtual work clusters, we identify an innovative new research agenda to invigorate the area of virtual work and suggest new forward-looking research directions. This encourages researchers from different disciplines and different epistemological approaches to carry out a dialogue with one another to enrich and inform the broader conversations around virtual work.

REFERENCES

Ahuja, M. K., & Galvin, J. E. 2003. Socialization in virtual groups. ***Journal of Management***, 29(2), 161.

Allen, T. D., Johnson, R. C., Kiburz, K. M., & Shockley, K. M. 2013. Work–family conflict and flexible work arrangements: Deconstructing flexibility. ***Personnel Psychology***, 66(2), 345-376.

Alnuaimi, O., Robert Jr., L. P., & Maruping, L. M. 2010. Team size, dispersion, and social loafing in technology-supported teams: A perspective on the theory of moral disengagement. ***Journal of Management Information Systems***, 27(1), 203-230.

Apgar, M. 1998. The alternative workplace: Changing where and how people work. ***Harvard Business Review***, 76(3), 121-130.

Armstrong, D. J., & Cole, P. 2002. Managing distances and differences in geographically distributed work groups. ***Distributed work***, 167-186. The MIT Press.

Ashforth, B. E., Kreiner, G. E., & Fugate, M. 2000. All in a day's work: Boundaries and micro role transitions. ***Academy of Management Review***, 25(3), 472-491.

Avolio, B. J., Kahai, S., & Dodge, G. E. 2000. E-leadership: Implications for theory, research, and practice. ***Leadership Quarterly***, 11(4), 615-668.

Axtell, C. M., Fleck, S. J., & Turner, N. 2004. Virtual teams: Collaborating across distance. ***International Review of Industrial and Organizational Psychology***, 19, 205-248.

Bailey, D. E., & Kurland, N. B. 2002. A review of telework research: Findings, new directions, and lessons for the study of modern work. ***Journal of Organizational Behavior***, 23(4), 383-400.

Bartel, C. A., Wrzesniewski, A., & Wiesenfeld, B. M. 2012. Knowing where you stand: Physical isolation, perceived respect, and organizational identification among virtual employees. ***Organization Science***, 23(3), 743–757.

Baron, R. M., & Kenny, D. A. 1986. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. ***Journal of Personality and Social Psychology***, 51(6), 1173.

Baruch, Y. 2000. Teleworking: benefits and pitfalls as perceived by professionals and managers. ***New Technology, Work and Employment***, 15(1), 34-49.

Baruch, Y., & Nicholson, N. 1997. Home, sweet work: Requirements for effective home working. ***Journal of General Management***, 23(2), 15-30.

Belanger, F. 1999. Workers' propensity to telecommute: An empirical study. ***Information & Management***, 35(3), 139-153.

Belanger, F., & Allport, C. D. 2008. Collaborative technologies in knowledge telework: An exploratory study. ***Information Systems Journal***, 18(1), 101-121.

Bell, B. S., & Kozlowski, S. W. 2002. A typology of virtual teams: Implications for effective leadership. ***Group & Organization Management***, 27(1), 14-49.

Bhagwatwar, A., Massey, A. and Dennis, A. 2017. Contextual Priming and the Design of 3D Virtual Environments to Improve Group Ideation. ***Information Systems Research***, 29(1), 169-185.

Boyack, K. W., & Klavans, R. 2010. Co-citation analysis, bibliographic coupling, and direct citation: Which citation approach represents the research front most accurately? ***Journal of the American Society for Information Science and Technology***, 61(12), 2389-2404.

Brooks, C. 2015, April 23. Are remote workers better workers? ***Business News Daily***. Retrieved from http://www.businessnewsdaily.com/8311-remote-work-iscommonplace. html.

Brzozowski, M. J. 2009. Water Cooler: Exploring an organization through enterprise social media. ***Proceedings of the ACM 2009 International Conference on Supporting Group Work***, 219–228. New York, NY: ACM Press.

Butts, M. M., Becker, W. J., & Boswell, W. R. (2015). Hot buttons and time sinks: The effects of electronic communication during nonwork time on emotions and work-nonwork conflict. ***Academy of Management Journal***, 58(3), 763-788.

Carlson, J. R., & Zmud, R. W. 1999. Channel expansion theory and the experiential nature of media richness perceptions. ***Academy of Management Journal***, 42(2), 153-170.

Carte, T., & Chidambaram, L. 2004. A capabilities-based theory of technology deployment in diverse teams: Leapfrogging the pitfalls of diversity and leveraging its potential with collaborative technology. ***Journal of the Association for Information Systems***, 5(11-12), 448-471.

Cascio, W. F. 2000. Managing a virtual workplace. ***The Academy of Management Executive***, 14(3), 81-90.

Chidambaram, L. 1996. Relational development in computer-supported groups. ***MIS Quarterly***, 143-165.

Chidambaram, L., & Tung, L. L. 2005. Is out of sight, out of mind? An empirical study of social loafing in technology-supported groups. ***Information Systems Research***, 16(2), 149-168.

Chokshi, N. 2017. Out of the Office: More people are working remotely, survey finds. ***New York Times,*** Feb 5. Retrieved from https://www.nytimes.com/2017/02/15/us/remote-workers-work-from-home.html.

Cohen, S. G., & Bailey, D. E. 1997. What makes teams work: Group effectiveness research from the shop floor to the executive suite. ***Journal of Management***, 23(3), 239-290.

ComputerWorld. 2016. Microsoft will give Yammer to all Office 365 users. ***ComputerWorld***. Retrieved from https://www.cw.com.hk/digital-transformation/microsoft-will-give-yammer-to-all-office-365-users.

Cooper, C. D., & Kurland, N. B. 2002. Telecommuting, professional isolation, and employee development in public and private organizations. ***Journal of Organizational Behavior***, 23(4), 511-532.

Cramton, C. D. 2001. The mutual knowledge problem and its consequences for dispersed collaboration. ***Organization Science***, 12(3), 346-371.

Cramton, C. D., & Hinds, P. J. 2005. Subgroup dynamics in internationally distributed teams: Ethnocentrism or cross-national learning? ***Research in Organizational Behavior***, 26, 231-263.

Cramton, C. D., & Hinds, P. J. 2014. An embedded model of cultural adaptation in global teams. ***Organization Science***, 25(4), 1056-1081.

Crisp, C. B., & Jarvenpaa, S. L. 2013. Swift trust in global virtual teams: Trusting beliefs and normative actions. ***Journal of Personnel Psychology***, 12(1), 45-56.

Culnan, M. J., & Markus, M. L. 1987. Information technologies. ***Handbook of Organizational Communication: An Interdisciplinary Perspective***, 420-444. Sage, Thousand Oaks, CA.

Cummings, J. N., Espinosa, J. A., and Pickering, C. K. 2009. Crossing spatial and temporal boundaries in globally distributed projects: A relational model of coordination delay. ***Information Systems Research***, 20(3), 420-439.

Curtis, A. M., Dennis, A. R., & McNamara, K. O. 2017. From monologue to dialogue: Using performative objects to promote collective mindfulness in computer-mediated team discussions. ***MIS Quarterly***, 41(2), 559-581.

Daft, R. L. & Lengel, R. H. 1984. Information richness: A new approach to managerial behavior and organization design. ***Research in Organizational Behavior***, 6, 191-233.

Daft, R. L., & Lengel, R. H. 1986. Organizational information requirements, media richness and structural design. ***Management Science***, 32(5), 554-571.

Daft, R. L., Lengel, R. H., & Trevino, L. K. 1987. Message equivocality, media selection, and manager performance: Implications for information systems. ***MIS Quarterly***, 11(3) 355-366.

Daim, T. U., Ha, A., Reutiman, S., Hughes, B., Pathak, U., Bynum, W., & Bhatla, A. 2012. Exploring the communication breakdown in global virtual teams. ***International Journal of Project Management***, 30(2), 199-212.

De Guinea, A. O., Webster, J., & Staples, D. S. 2012. A meta-analysis of the consequences of virtualness on team functioning. ***Information & Management***, 49(6), 301-308.

Dennis, A. R. 1996. Information exchange and use in small group decision making. ***Small Group Research***, 27(4), 532-550.

Dennis, A. R., & Fuller, R. M. 2009. Does fit matter? The impact of task-technology fit and appropriation on team performance in repeated tasks. ***Information Systems Research***, 20(1), 2-17.

Dennis, A. R., Fuller, R. M., & Valacich, J. S. 2008. Media, tasks, and communication processes: A theory of media synchronicity. ***MIS Quarterly***, 32(3), 575-600.

Dennis, A. R., & Kinney, S. T. 1998. Testing media richness theory in the new media: The effects of cues, feedback and task equivocality. ***Information Systems Research***, 9(3), 256-274.

Dennis, A. R., Wixom, B. H., & Vandenberg, R. J. 2001. Understanding fit and appropriation effects in group support systems via meta-analysis. ***MIS Quarterly***, 25(2), 167-197.

Derks, D., & Bakker, A. B. 2014. Smartphone use, work–home interference, and burnout: A diary study on the role of recovery. ***Applied Psychology***, *63*(3), 411-440.

Derks, D., Bakker, A. B., Peters, P., & van Wingerden, P. 2016. Work-related smartphone use, work–family conflict and family role performance: The role of segmentation preference. ***Human Relations***, *69*(5), 1045-1068.

DeSanctis, G., & Poole, M. S. 1994. Capturing the complexity in advanced technology use: Adaptive structuration theory. ***Organization Science***, 5(2), 121-147.

DiMicco, J., Millen, D. R., Geyer, W., Dugan, C., Brownholtz, B., & Muller, M. 2008. Motivations for social networking at work. ***Proceedings of the ACM 2008 Conference on Computer Supported Cooperative Work***, 711-720.

Driskell, J. E., Radtke, P. H., & Salas, E. 2003. Virtual teams: Effects of technological mediation on team performance. ***Group Dynamics***, 7(4), 297-323.

Drouin, N., Bourgault, M., & Gervais, C. 2010. Effects of organizational support on components of virtual project teams. ***International Journal of Managing Projects in Business***, 3(4), 625-641.

Duxbury, L. E., Higgins, C. A., & Mills, S. 1992. After-hours telecommuting and work-family conflict: A comparative analysis. ***Information Systems Research***, 3(2), 173-190.

Edwards, J. R., & Rothbard, N. P. 2000. Mechanisms linking work and family: Clarifying the relationship between work and family constructs. ***Academy of Management Review***, 25(1), 178-199.

Eisenhardt, K. M. 1989. Building theories from case study research. ***Academy of Management Review***, 14(4), 532-550.

Eissa, G., Fox, C., Webster, B. D., & Kim, J. 2012. A framework for leader effectiveness in virtual teams. ***Journal of Leadership, Accountability and Ethics***, 9(2), 11.

Ellison, N. B., Gibbs, J. L., & Weber, M. S. 2015. The use of enterprise social network sites for knowledge sharing in distributed organizations: The role of organizational affordances. ***American Behavioral Scientist***, 59(1), 103-123.

Ferguson, M., Carlson, D., Boswell, W., Whitten, D., Butts, M. M., & Kacmar, K. M. (2016). Tethered to work: A family systems approach linking mobile device use to turnover intentions. ***Journal of Applied Psychology***, *101*(4), 520.

Fonner, K. L., & Roloff, M. E. 2010. Why teleworkers are more satisfied with their jobs than are office-based workers: When less contact is beneficial. ***Journal of Applied Communication Research***, 38(4), 336-361.

Fonner, K. L., & Roloff, M. E. 2012. Testing the connectivity paradox: Linking teleworkers' communication media use to social presence, stress from interruptions, and organizational identification. ***Communication Monographs***, *79*(2), 205-231.

Fulk, J. 1993. Social construction of communication technology. ***Academy of Management Journal***, 36(5), 921-950.

Fulk, J., & Yuan, Y. C. 2013. Location, motivation, and social capitalization via enterprise social networking. ***Journal of Computer-Mediated Communication***, 19(1), 20-37.

Fuller, R. M., & Dennis, A. R. 2009. Does fit matter? The impact of task-technology fit and appropriation on team performance in repeated tasks. ***Information Systems Research***, 20(1), 2-17.

Furst, S. A., Reeves, M., Rosen, B., & Blackburn, R. S. 2004. Managing the life cycle of virtual teams. ***Academy of Management Executive***, 18(2), 6-20.

Gajendran, R. S., & Harrison, D. A. 2007. The good, the bad, and the unknown about telecommuting: Meta-analysis of psychological mediators and individual consequences. ***Journal of Applied Psychology***, 92(6), 1524-1541.

Gajendran, R. S., & Joshi, A. 2012. Innovation in globally distributed teams: The role of LMX, communication frequency, and member influence on team decisions. ***Journal of Applied Psychology***, 97(6), 1252.

Gallupe, R. B., Bastianutti, L. M., & Cooper, W. H. 1991. Unblocking brainstorms. ***Journal of Applied Psychology***, 76(1), 137-142.

Gallupe, R. B., Cooper, W. H., Grise, M.-L., & Bastianutti, L. M. 1994. Blocking electronic brainstorms. ***Journal of Applied Psychology***, 79(1), 77-86.

Gaudin, S. 2015. Facebook takes on the enterprise with new social network. ***ComputerWorld***. Retrieved from https://www.computerworld.com/article/2870777/facebook-takes-on-the-enterprise-with-new-social-network.html accessed 02/23/2018.

Gersick, C. J. 1988. Time and transition in work teams: Toward a new model of group development. ***Academy of Management Journal***, 31(1), 9-41.

Giambatista, R. C., & Bhappu, A. D. 2010. Diversity's harvest: Interactions of diversity sources and communication technology on creative group performance. ***Organizational Behavior and Human Decision Processes***, 111(2), 116-126.

Gibbs, J. L., Eisenberg, J., Rozaidi, N. A., & Griaznova, A. 2015. The "megapozitiv" role of enterprise social media in enabling cross-boundary communication in a distributed Russian organization. ***American Behavioral Scientist***, 59(1), 75-102.

Gibbs, J. L., Nekrassova, D., Grushina, Y., & Abdul Wahab, S. 2008. Reconceptualizing virtual teaming from a constitutive perspective: Review, redirection, and research agenda. ***Communication Yearbook***, 32(1), 187-229. Routledge: New York.

Gibbs, J. L., Rozaidi, N. A., & Eisenberg, J. 2013. Overcoming the "ideology of openness": Probing the affordances of social media for organizational knowledge sharing. ***Journal of Computer-Mediated Communication***, 19(1), 102-120.

Gibbs, J. L., Sivunen, A., & Boyraz, M. 2017. Investigating the impacts of team type and design on virtual team processes. ***Human Resource Management Review***, 27(4), 590-603.

Gibson, C. B., & Gibbs, J. L. 2006. Unpacking the concept of virtuality: The effects of geographic dispersion, electronic dependence, dynamic structure, and national diversity on team innovation. ***Administrative Science Quarterly***, 51(3), 451-495.

Gibson, C. B., Gibbs, J. L., Stanko, T. L., Tesluk, P., & Cohen, S. G. 2011. Including the "I" in virtuality and modern job design: Extending the job characteristics model to include the moderating effect of individual experiences of electronic dependence and copresence. ***Organization Science***, 22(6), 1481-1499.

Gibson, C. B., Huang, L., Kirkman, B. L., & Shapiro, D. L. 2014. Where global and virtual meet: The value of examining the intersection of these elements in twenty-first-century teams. ***Annual Review of Organizational Psychology and Organization Behavior***, 1(1), 217-244.

Gilson, L. L., Maynard, M. T., Jones Young, N. C., Vartiainen, M., & Hakonen, M. 2015. Virtual teams research: 10 years, 10 themes, and 10 opportunities. ***Journal of Management***, 41(5), 1313-1337.

Golden, T. D. 2006. The role of relationships in understanding telecommuter satisfaction. ***Journal of Organizational Behavior***, 27(3), 319-340.

Golden, T. 2007. Co-workers who telework and the impact on those in the office: Understanding the implications of virtual work for co-worker satisfaction and turnover intentions. ***Human Relations***, 60(11), 1641-1667.

Golden, T. D., & Fromen, A. 2011. Does it matter where your manager works? Comparing managerial work mode (traditional, telework, virtual) across subordinate work experiences and outcomes. ***Human Relations***, 64(11), 1451-1475.

Golden, T.D. & Gajendran, R.S. Forthcoming. Unpacking the role of a telecommuter's job in their performance: examining job complexity, problem solving, interdependence, and social support. ***Journal of Business and Psychology*****.** https://link.springer.com/article/10.1007/s10869-018-9530-4#citeas

Golden, T. D., & Raghuram, S. 2010. Teleworker knowledge sharing and the role of altered relational and technological interactions. ***Journal of Organizational Behavior***, 31(8), 1061-1085.

Golden, T. D., Veiga, J. F., & Dino, R. N. 2008. The impact of professional isolation on teleworker job performance and turnover intentions: Does time spent teleworking, interacting face-to-face, or having access to communication-enhancing technology matter? ***Journal of Applied Psychology***, 93(6), 1412-1421.

Golden, T.D. and Veiga, J.F. 2008. The impact of superior–subordinate relationships on the commitment, job satisfaction, and performance of virtual workers. ***The Leadership Quarterly***, *19*(1), pp.77-88.

Goodhue, D. L., & Thompson, R. L. 1995. Task-technology fit and individual performance. ***MIS Quarterly***, 19(2), 213-236.

Griffith, T. L., Sawyer, J. E., & Neale, M. A. 2003. Virtualness and knowledge in teams: Managing the love triangle of organizations, individuals, and information technology. ***MIS Quarterly***, 27(2), 265-287.

Hambley, L. A., O'Neill, T. A., & Kline, T. J. 2007. Virtual team leadership: The effects of leadership style and communication medium on team interaction styles and outcomes. ***Organizational Behavior and Human Decision Processes***, 103(1), 1-20.

Handy, C. 1995. Trust and the virtual organization. ***Harvard Business Review***, 73(3), 40-51.

Handy, S. L., & Mokhtarian, P. L. 1995. Planning for telecommuting measurement and policy issues. ***Journal of the American Planning Association***, 61(1), 99-111.

Harter, J., Agrawal, S., & Sorenson, S. 2014. Most U.S. workers see upside to staying connected to work. ***Gallup Inc***. Retrieved from http://www.gallup.com/poll/168794/workers-upside-stayingconnected-work.asp.

Hertel, G., Geister, S., & Konradt, U. 2005. Managing virtual teams: A review of current empirical research. ***Human Resource Management Review***, 15(1), 69-95.

Hill, E. J., Ferris, M., & Märtinson, V. 2003. Does it matter where you work? A comparison of how three work venues (traditional office, virtual office, and home office) influence aspects of work and personal/family life. ***Journal of Vocational Behavior***, 63(2), 220-241.

Hill, E. J., Hawkins, A. J., Ferris, M., & Weitzman, M. 2001. Finding an extra day a week: The positive influence of perceived job flexibility on work and family life balance. ***Family Relations***, 50(1), 49-58.

Hill, E. J., Miller, B. C., Weiner, S. P., & Colihan, J. 1998. Influences of the virtual office on aspects of work and work/life balance. ***Personnel Psychology***, 51(3), 667-683.

Hill, N. S., & Bartol, K. M. 2016. Empowering leadership and effective collaboration in geographically dispersed teams. ***Personnel Psychology***, 69(1), 159-198.

Hill, N. S., Bartol, K. M., Tesluk, P. E., & Langa, G. A. 2009. Organizational context and face-to-face interaction: Influences on the development of trust and collaborative behaviors in computer-mediated groups. ***Organizational Behavior and Human Decision Processes***, 108(2), 187-201.

Hill, N. S., Kang, J. H., & Seo, M. G. 2014. The interactive effect of leader–member exchange and electronic communication on employee psychological empowerment and work outcomes. ***The Leadership Quarterly***, 25(4), 772-783.

Hiltz, S. R., Johnson, K., & Turoff, M. 1986. Experiments in group decision making: Communication process and outcome in face-to-face versus computerized conferences. ***Human Communication Research***, 13(2), 225-252.

Hinds, P. J., & Bailey, D. E. 2003. Out of sight, out of sync: Understanding conflict in distributed teams. ***Organization Science***, 14(6), 615-632.

Hinds, P. J., and Mortensen, M. 2005. Understanding conflict in geographically distributed teams: The moderating effects of shared identity, shared context, and spontaneous communication. ***Organization Science***, 16(3), 290-307.

Hinds, P. J., & Weisband, S. P. 2003. Knowledge sharing and shared understanding. ***Virtual Teams That Work***, 21-36. San Francisco: Jossey-Bass.

Hoch, J. E., & Kozlowski, S. W. 2014. Leading virtual teams: Hierarchical leadership, structural supports, and shared team leadership. ***Journal of Applied Psychology***, 99(3), 390.

Hollingshead, A. B. 1996. Information suppression and status persistence in group decision making: The effects of communication media. ***Human Communication Research***, 23(2), 193-219.

Hollingshead, A. B., & McGrath, J. E. 1995. Computer-assisted groups: A critical review of the empirical research. ***Team Effectiveness and Decision Making in Organizations***, 46-78.

Hollingshead, A. B., McGrath, J. E., & O'Connor, K. M. 1993. Group task performance and communication technology: A longitudinal study of computer-mediated versus face-to-face work groups. ***Small Group Research***, 24(3), 307-333.

Huang, R., Kahai, S., & Jestice, R. 2010. The contingent effects of leadership on team collaboration in virtual teams. ***Computers in Human Behavior***, 26(5), 1098-1110.

Huws, U., Korte, W. B., & Robinson, S. 1990. ***Telework: towards the elusive office***. John Wiley & Sons: Chichester.

Jarvenpaa, S. L., Knoll, K., & Leidner, D. E. 1998. Is anybody out there? Antecedents of trust in global virtual teams. ***Journal of Management Information Systems***, 14(4), 29-64.

Jarvenpaa, S. L., & Leidner, D. E., 1999. Communication and trust in global virtual teams. ***Organization Science***, 10(6), 791-815.

Jehn, K. A., Northcraft, G. B., & Neale, M. A. 1999. Why differences make a difference: A field study of diversity, conflict and performance in workgroups. ***Administrative Science Quarterly***, 44(4), 741-763.

Joshi, A., Lazarova, M. B., & Liao, H. 2009. Getting everyone on board: The role of inspirational leadership in geographically dispersed teams. ***Organization Science***, 20(1), 240-252.

Kanawattanachai, P., & Yoo, Y. 2007. The impact of knowledge coordination on virtual team performance over time. ***MIS Quarterly***, 31(4), 783-808.

Kiesler, S., Siegel, J., & McGuire, T. W. 1984. Social psychological aspects of computer-mediated communication. ***American Psychologist***, 39(10), 1123.

Kirkman, B. L., Gibson, C. B., & Kim, K. 2012. Across borders and technologies: Advancements in virtual teams research. ***Oxford Handbook of Organizational Psychology,*** 789-858. Oxford: Oxford University Press.

Kirkman, B. L., & Mathieu, J. E. 2005. The dimensions and antecedents of team virtuality. ***Journal of Management***, 31(5), 700-718.

Kirkman, B. L., Rosen, B., Gibson, C. B., Tesluk, P. E., & McPherson, S. O. 2002. Five challenges to virtual team success: Lessons from Sabre, Inc. ***Academy of Management Executive***, 16(3), 67-79.

Kirkman, B. L., Rosen, B., Tesluk, P. E., & Gibson, C. B. 2004. The impact of team empowerment on virtual team performance: The moderating role of face-to-face interaction. ***Academy of Management Journal***, 47(2), 175-192.

Kiesler, S., & Cummings, J. N. 2002. What do we know about proximity and distance in work groups? A legacy of research. In P. J. Hinds & S. Kiesler (Eds.), ***Distributed Work***, 57-80. Cambridge, MA: MIT Press.

Kiesler, S., Siegel, J., & McGuire, T. W. 1984. Social psychological aspects of computer-mediated communication. ***American Psychologist***, 39(10), 1123.

Kiesler, S., & Sproull, L. 1992. Group decision making and communication technology. ***Organizational Behavior and Human Decision Processes***, 52(1), 96-123.

Kiesler, S., Wholey, D., & Carley, K. 1994. Coordination as linkage: The case of software development teams. In D.J. Harris (Ed). ***Organizational Linkages: Understanding the Productivity Paradox***, 214-240. Washington D.C.: National Academy Press.

Klein, J. A., & Kleinhanns, A. 2003. Closing the time gap in virtual teams. In C.B. Gibson & P.J. Hinds (Eds.), ***Virtual Teams that Work: Creating Conditions for Virtual Team Effectiveness***, 381–400. San Francisco: Jossey-Bass.

Klitmoller, A., & Lauring, J. 2013. When global virtual teams share knowledge: Media richness, cultural difference and language commonality. ***Journal of World Business***, 48(3), 398.

Kossek, E. E., 2016. Managing work life boundaries in the digital age. ***Organizational Dynamics***, 45(3), 258-270.

Kossek, E. E., Lautsch, B. A., & Eaton, S. C. 2006. Telecommuting, control, and boundary management: Correlates of policy use and practice, job control, and work–family effectiveness. ***Journal of Vocational Behavior***, 68(2), 347-367.

Kraut, R. E., Fussell, S. R., Brennan, S. E., & Siegel, J. 2002. Understanding effects of proximity on collaboration: Implications for technologies to support remote collaborative work. In P. J. Hinds & S. Kiesler (Eds.), ***Distributed Work,*** 137-162. Cambridge, MA: MIT Press.

Kurland, N. B., & Bailey, D. E. 1999. When workers are here, there, and everywhere: A discussion of the advantages and challenges of telework. ***Organizational Dynamics***, 28(2), 53-58.

Kurland, N. B., & Cooper, C. D. 2002. Manager control and employee isolation in telecommuting environments. ***The Journal of High Technology Management Research***, 13(1), 107-126.

Kurland, N. B., & Egan, T. D. 1999. Telecommuting: Justice and control in the virtual organization. ***Organization Science***, 10(4), 500-513.

Kurzberg, T. & Gibbs, J. L. 2017. ***Distracted: Staying connected without losing focus***. Santa Barbara, CA: Praeger Press.

Lau, D. C., & Murnighan, J. K. 1998. Demographic diversity and faultlines: The compositional dynamics of organizational groups. ***Academy of Management Review***, 23(2), 325-340.

Lautsch, B. A., & Kossek, E. E. 2011. Managing a blended workforce: Telecommuters and non-telecommuters. ***Organizational Dynamics***, 40(1), 10-17.

Lautsch, B. A., Kossek, E. E., & Eaton, S. C. 2009. Supervisory approaches and paradoxes in managing telecommuting implementation. ***Human Relations***, 62(6), 795-827.

Lea, M., & Spears, R. 1992. Paralanguage and social perception in computer-mediated communication. ***Journal of Organizational Computing and Electronic Commerce***, 2(3-4), 321-341.

Leonardi, P. M. 2018. Social media and the development of shared cognition: The roles of network expansion, content integration, and triggered recalling. ***Organization Science.*** *Online: https://pubsonline.informs.org/doi/abs/10.1287/orsc.2017.1200*

Leonardi, P. M. 2011. When flexible routines meet flexible technologies: Affordance, constraint, and the imbrication of human and material agencies. ***MIS Quarterly***, 35(1), 147-167.

Leonardi, P. M. 2014. Social media, knowledge sharing, and innovation: Toward a theory of communication visibility. ***Information Systems Research***, 25(4), 796-816.

Leonardi, P. M. 2015. Ambient awareness and knowledge acquisition: Using social media to learn "who knows what" and "who knows whom". ***MIS Quarterly***, 39(4), 747-762.

Leonardi, P. M., Huysman, M., & Steinfield, C. 2013. Enterprise social media: Definition, history, and prospects for the study of social technologies in organizations. ***Journal of Computer-Mediated Communication***, 19(1), 1-19.

Leonardi, P. M., & Meyer, S. R. 2015. Social media as social lubricant: How ambient awareness eases knowledge transfer. ***American Behavioral Scientist***, 59(1), 10-34.

Leonardi, P., & Neeley, T. (2017, Nov-Dec). What managers need to know about social tools. ***Harvard Business Review***, 118-126.

Leonardi, P. M., Treem, J. W., & Jackson, M. H. (2010). The connectivity paradox: Using technology to both decrease and increase perceptions of distance in distributed work arrangements. ***Journal of Applied Communication Research,*** 38, 85-105.

Lipnack, J. & Stamps, J. 1997. ***Virtual Teams: Working Across space, time and organizations with Technology***. John Wiley & Sons: New York, NY.

MacDuffie, J. P. 2007. HRM and distributed work: Managing people across distances. ***Academy of Management Annals***, 1(1), 549-615.

Magni, M., Ahuja, M. K., & Maruping, L. M. Forthcoming. Distant but fair: Intra-team justice climate and performance in dispersed teams. ***Journal of Management Information Systems***.

Magni, M., Maruping, L. M., Hoegl, M., & Proserpio, L. 2013. Managing the unexpected across space: Improvisation, dispersion, and performance in NPD teams. ***Journal of Product Innovation Management***, 30(5), 1009-1026.

Majchrzak, A., Faraj, S., Kane, G. C., & Azad, B. 2013. The contradictory influence of social media affordances on online communal knowledge sharing. ***Journal of Computer-Mediated Communication***, 19(1), 38-55.

Majchrzak, A., Malhotra, A., & John, R. 2005. Perceived individual collaboration know-how development through information technology–enabled contextualization: Evidence from distributed teams. ***Information Systems Research***, 16(1), 9-27.

Makarius, E. E., & Larson, B. Z. 2017. Changing the perspective of virtual work: Building virtual intelligence at the individual level. ***Academy of Management Perspectives***, 31(2), 159-178.

Markoulli, M., Lee, C. I., Byington, E., & Felps, W. A. 2017. Mapping human resource management: Reviewing the field and charting future directions. ***Human Resource Management Review***, *27*(3), 367-396.

Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. 2001. A temporally based framework and taxonomy of team processes. ***Academy of Management Review***, 26(3), 356-376.

Martins, L. L., Gilson, L. L., & Maynard, M. T. 2004. Virtual teams: What do we know and where do we go from here? ***Journal of Management***, 30(6), 805-835.

Maruping, L. M., & Agarwal, R. 2004. Managing team interpersonal processes through technology: A task-technology fit perspective. ***Journal of Applied Psychology***, 89(6), 975-990.

Maynard, M. T., Mathieu, J. E., Rapp, T. L., & Gilson, L. L. 2012. Something(s) old and something(s) new: Modeling drivers of global virtual team effectiveness. ***Journal of Organizational Behavior***, 33(3), 342-365.

Mazmanian, M. 2013. Avoiding the trap of constant connectivity: When congruent frames allow for heterogeneous practices. ***Academy of Management Journal***, 56(5), 1225-1250.

Mazmanian, M., Orlikowski, W. J., & Yates, J. 2013. The autonomy paradox: The implications of mobile email devices for knowledge professionals. ***Organization Science***, 24(5), 1337-1357.

Maznevski, M. L., & Chudoba, K. M. 2000. Bridging space over time: Global virtual team dynamics and effectiveness. ***Organization Science***, 11(5), 473-492.

McCloskey, D. W., & Igbaria, M. 1998. A review of the empirical research on telecommuting and directions for future research. In (Ed. M. Igbaria & M. Tan) ***The Virtual Workplace***, 338-358, The Idea Group: Hershey USA.

McCloskey, D. W., & Igbaria, M. 2003. Does “out of sight" mean “out of mind"? An empirical investigation of the career advancement prospects of telecommuters. ***Information Resources Management Journal***, 16(2), 19-34.

McFarland, L. A., & Ployhart, R. E. 2015. Social media: A contextual framework to guide research and practice. ***Journal of Applied Psychology***, 100(6), 1653-1677.

McGrath, J. E. 1984. ***Groups: Interaction and performance*** (Vol. 14). Englewood Cliffs, NJ: Prentice-Hall.

McGrath, J. E. 1991. Time, interaction, and performance (TIP): A theory of groups. ***Small Group Research***, 22(2), 147-174.

McGrath, J. E., & Hollingshead, A. B. 1994. ***Groups interacting with technology: Ideas, evidence, issues and an agenda.*** Sage Publications, Inc.

Mesmer-Magnus, J. R., DeChurch, L. A., Jimenez-Rodriguez, M., Wildman, J., & Shuffler, M. 2011. A meta-analytic investigation of virtuality and information sharing in teams. ***Organizational Behavior & Human Decision Processes***, 115(2), 214-225.

Mokhtarian, P. L. 1991. Telecommuting and travel: State of the practice, state of the art. ***Transportation***, 18(4), 319-342.

Mokhtarian, P. L. 1998. A synthetic approach to estimating the impacts of telecommuting on travel. ***Urban Studies***, 35(2), 215-241.

Mokhtarian, P. L., & Bagley, M. N. 2000. Modeling employees' perceptions and proportional preferences of work locations: The regular workplace and telecommuting alternatives. ***Transportation Research Part A: Policy and Practice***, 34(4), 223-242.

Mokhtarian, P. L., & Salomon, I. 1994. Modeling the choice of telecommuting: Setting the context. ***Environment and Planning A***, 26(5), 749-766.

Mokhtarian, P. L., & Salomon, I. 1997. Modeling the desire to telecommute: The importance of attitudinal factors in behavioral models. ***Transportation Research Part A: Policy and Practice***, 31(1), 35-50.

Montoya-Weiss, M. M., Massey, A. P., & Lockwood, N. S. 2011. 3D collaborative virtual environments: Exploring the link between collaborative behaviors and team performance. ***Decision Sciences***, 42(2), 451-476.

Montoya-Weiss, M. M., Massey, A. P., & Song, M. 2001. Getting it together: Temporal coordination and conflict management in global virtual teams. ***Academy of Management Journal***, 44(6), 1251-1262.

Mortensen, M., & Hinds, P. J. 2001. Conflict and shared identity in geographically distributed teams. ***International Journal of Conflict Management***, 12(3), 212-238.

Muethel, M., Siebdrat, F., & Hoegl, M. 2012. When do we really need interpersonal trust in globally dispersed new product development teams? ***R&D Management***, 42(1), 31-46.

Münzer, S., & Holmer, T. 2009. Bridging the gap between media synchronicity and task performance: Effects of media characteristics on process variables and task performance indicators in an information pooling task. ***Communication Research***, 36(1), 76-103.

Nerur, S. P., Rasheed, A. A., & Natarajan, V. 2008. The intellectual structure of the strategic management field: An author co-citation analysis. ***Strategic Management Journal***, *29*(3), 319-336.

Nilles, J. M. 1994. ***Making telecommuting happen: A guide for telemanagers and telecommuters.***

Nilles, J. M. 1997. Telework: Enabling distributed organizations: Implications for IT managers. ***Information Systems Management***, 14(4), 7-14.

Nurmi, N. 2011. Coping with coping strategies: how distributed teams and their members deal

with the stress of distance, time zones and culture. ***Stress and Health***, 27(2), 123-143.

Ocker, R., Huang, H., Benbunan-Fich, R., & Hiltz, S. 2011. Leadership dynamics in partially distributed teams: An exploratory study of the effects of configuration and distance. ***Group Decision & Negotiation***, 20(3), 273-292.

O'Leary, M. B., & Cummings, J. N. 2007. The spatial, temporal, and configurational characteristics of geographic dispersion in teams, ***MIS Quarterly***, 31(3), 433-452.

O'Leary, M. B., & Mortensen, M. 2010. Go (con) figure: Subgroups, imbalance, and isolates in geographically dispersed teams. ***Organization Science***, 21(1), 115-131.

O'Leary, M. B., Wilson, J. M., & Metiu, A. 2014. Beyond being there: The symbolic role of communication and identification in perceptions of proximity to geographically dispersed colleagues**.** ***MIS Quarterly***, 38(4), 1219-1243.

Olson-Buchanan, J. B., & Boswell, W. R. 2006. Blurring boundaries: Correlates of integration and segmentation between work and nonwork. ***Journal of Vocational Behavior***, 68(3), 432-445.

Olson, G. M., & Olson, J. S. 2000. Distance matters. ***Human-computer Interaction***, 15(2), 139-178.

Orlikowski, W. J. 1992. The duality of technology: Rethinking the concept of technology in organizations. ***Organization Science***, 3(3), 398-427.

Orlikowski, W. J. 2002. Knowing in practice: Enacting a collective capability in distributed organizing. ***Organization Science***, 13(3), 249-273.

Parker, S. K., Morgeson, F. P., & Johns, G. 2017. Work design theory and research: Looking back over 100 years and looking forward to the future. ***Journal of Applied Psychology***, *102*, 403-420.

Pinjani, P., & Palvia, P. 2013. Trust and knowledge sharing in diverse global virtual teams. ***Information & Management***, 50(4), 144-153.

Polzer, J. T., Crisp, C. B., Jarvenpaa, S. L., & Kim, J. W. 2006. Extending the faultline model to geographically dispersed teams: How colocated subgroups can impair group functioning. ***Academy of Management Journal***, 49(4), 679-692.

Postmes, T., Spears, R., & Lea, M. 1998. Breaching or building social boundaries? Side-effects of computer-mediated communication. ***Communication Research***, 25(6), 689-715.

Postmes, T., Spears, R., & Lea, M. 2000. The formation of group norms in computer-mediated communication. ***Human Communication Research***, 26(3), 341-371.

Powell, A., Piccoli, G., & Ives, B. 2004. Virtual teams: A review of current literature and directions for future research. ***ACM SIGMIS Database: the DATABASE for Advances in Information Systems***, 35(1), 6-36.

Purvanova, R. K., & Bono, J. E. 2009. Transformational leadership in context: Face-to-face and virtual teams. ***Leadership Quarterly***, 20(3), 343-357.

Raasch, C., Lee, V., Spaeth, S., & Herstatt, C. 2013. The rise and fall of interdisciplinary research: The case of open source innovation. ***Research Policy***, *42*(5), 1138-1151.

Raghuram, S. 1996. Knowledge creation in the telework context. ***International Journal of Technology Management***, 11(7-8), 859-870.

Raghuram, S., Garud, R., Wiesenfeld, B., & Gupta, V. 2001. Factors contributing to virtual work adjustment. ***Journal of Management***, 27(3), 383-405.

Raghuram, S., Tuertscher, P., & Garud, R. 2010. Mapping the field of virtual work: A cocitation analysis**.** ***Information Systems Research***, 21(4), 983-999.

Raghuram, S., Wiesenfeld, B., & Garud, R. 2003. Technology enabled work: The role of self-efficacy in determining telecommuter adjustment and structuring behavior. ***Journal of Vocational Behavior***, 63(2), 180-198.

Raghuram, S., & Wiesenfeld, B. 2004. Work-nonwork conflict and job stress among virtual workers. ***Human Resource Management***, 43(2-3), 259-277.

Ramos-Rodríguez, A. R., & Ruíz-Navarro, J. 2004. Changes in the intellectual structure of strategic management research: A bibliometric study of the Strategic Management Journal, 1980–2000. ***Strategic Management Journal***, *25*(10), 981-1004.

Rice, R. E., & Love, G. 1987. Electronic emotion: Socioemotional content in a computer-mediated communication network. ***Communication Research***, 14(1), 85-108.

Robert Jr., L.P., Dennis, A.R., & Ahuja, M.K. Forthcoming. Differences are different: Examining the effects of communication media on the impacts of racial and gender diversity in decision-making teams. ***Information Systems Research***. In press. https://pubsonline.informs.org/doi/10.1287/isre.2018.0773

Roehling, M. 2017. The important but neglected legal context of virtual teams: Research implications and opportunities. ***Human Resource Management Review***, 27(4), 621-634.

Schulze, J., & Krumm, S. 2017. The "virtual team player": A review and initial model of knowledge, skills, abilities, and other characteristics for virtual collaboration. ***Organizational Psychology Review***, 7(1), 66-95.

Schweitzer, L., & Duxbury, L. 2010. Conceptualizing and measuring the virtuality of teams. ***Information Systems Journal***, 20(3), 267-295.

Scott, C. R., & Timmerman, C. E. 1999. Communication technology use and multiple workplace identifications among organizational teleworkers with varied degrees of virtuality. ***IEEE Transactions on Professional Communication***, 42(4), 240-260.

Shamir, B. 1992. Attribution of influence and charisma to the leader: The romance of leadership revisited. ***Journal of Applied Social Psychology***, 22(5), 386-407.

Shamir, B., & Salomon, I. 1985. Work-at-home and the quality of working life. ***Academy of Management Review***, 10(3), 455-464.

Shin, L. 2016. At these 125 companies, all or most employees work remotely. ***Forbes,*** Mar 31, https://www.forbes.com/sites/laurashin/2016/03/31/at-these-125-companies-all-or-most-employees-work-remotely/#3b9abc1a6530.

Shin, Y. 2004. A person-environment fit model for virtual organizations. ***Journal of Management***, *30*(5), 725-743.

Short, J., Williams, E., & Christie, B. 1976. ***The Social psychology of telecommunications***. London: John Wiley & Sons.

Siegel, J., Dubrovsky, V., Kiesler, S., & McGuire, T. W. 1986. Group processes in computer-mediated communication. ***Organizational Behavior and Human Decision Processes***, 37(2), 157-187.

Siha, S. M., & Monroe, R. W. 2006. Telecommuting's past and future: a literature review and research agenda. ***Business Process Management Journal***, 12(4), 455-482.

Sivunen, A., & Nordbäck, E. 2015. Social presence as a multidimensional group construct in 3D virtual environments. ***Journal of Computer-Mediated Communication***, 20(1), 19–36.

Small, H. 1973. Co-citation in the scientific literature: A new measure of the relationship between two documents, ***Journal of the American Society for Information Science***, 24(4), 265- 269.

Small, H., & Griffith, B. C. 1974. The structure of scientific literatures: Identifying and graphing specialties. ***Science Studies***, 4(1), 17-40.

Sonnentag, S. 2001. Work, recovery activities, and individual well-being: a diary study. ***Journal of Occupational Health Psychology***, *6*(3), 196.

Spears, R., & Lea, M. 1994. Panacea or panopticon? The hidden power in computer-mediated communication**.** ***Communication Research***, 21(4), 427-459.

Sproull, L., & Kiesler, S. 1986. Reducing social context cues: Electronic mail in organizational communication. ***Management Science***, 32(11), 1492-1512.

Staples, D. S., Hulland, J. S., & Higgins, C. A. 1999. A self-efficacy theory explanation for the management of remote workers in virtual organizations. ***Organization Science***, 10(6), 758-776.

Stark, E. M., & Bierly III, P. E. 2009. An analysis of predictors of team satisfaction in product development teams with differing levels of virtualness. ***R&D Management***, 39(5), 461-472.

Straus, S. G., & McGrath, J. E. 1994. Does the medium matter? The interaction of task type and technology on group performance and member reactions. ***Journal of Applied Psychology***, 79(1), 87.

Suh, A., Shin, K. S., Ahuja, M., & Kim, M. S. 2011. The influence of virtuality on social networks within and across work groups: A multilevel approach. ***Journal of Management Information Systems***, 28(1), 351-386.

Sullivan, C., & Lewis, S. 2001. Home-based telework, gender, and the synchronization of work and family: Perspectives of teleworkers and their co-residents. ***Gender, Work, and Organization***, 8(2), 123-145.

Swaab, R. I., Phillips, K. W., & Schaerer, M. 2016. Secret conversation opportunities facilitate minority influence in virtual groups: The influence on majority power, information processing, and decision quality. ***Organizational Behavior and Human Decision Processes***, 133, 17-32.

Tidwell, L. C., & Walther, J. B. 2002. Computer-mediated communication effects on disclosure, impressions, and interpersonal evaluations: Getting to know one another a bit at a time. ***Human Communication Research***, 28(3), 317-348.

Thatcher, S. M., & Zhu, X. 2006. Changing identities in a changing workplace: Identification, identity enactment, self-verification, and telecommuting. ***Academy of Management Review***, 31(4), 1076-1088.

Townsend, A. M., DeMarie, S. M., & Hendrickson, A. R. 1998. Virtual teams: Technology and the workplace of the future. ***The Academy of Management Executive***, 12(3), 17-29.

Treem, J. W., Dailey, S. L., Pierce, C. S., & Leonardi, P. M. 2015. Bringing technological frames to work: How previous experience with social media shapes the technology's meaning in an organization. ***Journal of Communication***, 65(2), 396-422.

Treem, J. W., & Leonardi, P. M. 2012. Social media use in organizations: Exploring the affordances of visibility, editability, persistence, and association. ***Communication Yearbook***, 36(1), 143-189.

Tzabbar, D., & Vestal, A. 2015. Bridging the social chasm in geographically distributed R&D teams: The moderating effects of relational strength and status asymmetry on the novelty of team innovation. ***Organization Science***, 26(3), 811-829.

Valacich, J. S., Dennis, A. R., & Connolly, T. 1994. Idea generation in computer-based groups: A new ending to an old story. ***Organizational Behavior and Human Decision Processes***, 57(3), 448-467.

Valacich, J. S., George, J. F., Nunamaker, J. F., & Vogel, D. R. 1994. Physical proximity effects on computer-mediated group idea generation. ***Small Group Research***, 25(1), 83-104.

van Eck, N. J., & Waltman, L. 2010. Software survey: VOSviewer, a computer program for bibliometric mapping. ***Scientometrics***, 84(2), 523-538.

Venkatesh, V., & Johnson, P. 2002. Telecommuting technology implementations: A within and between subjects longitudinal field study. ***Personnel Psychology***, 55(3), 661-687.

Wajcman, J., & Rose, E. 2011. Constant connectivity: Rethinking interruptions at work. ***Organization Studies***, 32, 941-961.

Walther, J. B. 1992. Interpersonal effects in computer-mediated interaction a relational perspective. ***Communication Research***, 19(1), 52-90.

Walther, J. B. 1995. Relational aspects of computer-mediated communication: Experimental observations over time. ***Organization Science***, 6(2), 186-203.

Walther, J. B. 1996. Computer-mediated communication: Impersonal, interpersonal, and hyperpersonal interaction. ***Communication Research***, 23(1), 3-43.

Walther, J. B. 1997. Group and interpersonal effects in international computer-mediated collaboration. ***Human Communication Research***, 23(3), 342-369.

Walther, J. B., & Bunz, U. 2005. The rules of virtual groups: Trust, liking, and performance in computer-mediated communication. ***Journal of Communication***, 55(4), 828-846.

Warkentin, M. E., Sayeed, L., & Hightower, R. 1997. Virtual teams versus face-to-face teams: An exploratory study of a Web-based conference system. ***Decision Sciences***, 28(4), 975-996.

Watad, M. M., & DiSanzo, F. J. 2000. The synergism of telecommuting and office automation. ***Sloan Management Review***, 41(2), 85.

Watson-Manheim, M. B., & Bélanger, F. 2007. Communication media repertoires: Dealing with the multiplicity of media choices. ***MIS Quarterly***, 267-293.

Wiesenfeld, B., Raghuram, S., & Garud R. 1999. Communication patterns as determinants of organizational identification in a virtual organization. ***Organization Science***, 10(6), 777-790.

Wiesenfeld, B. M., Raghuram, S., & Garud, R. 2001. Organizational identification among virtual workers: The role of need for affiliation and perceived work-based social support. ***Journal of Management***, 27(2), 213-229.

Wilson, J. M., O'Leary, M., Metiu, A., & Jett, Q. R. 2008. Perceived proximity in virtual work: Explaining the paradox of far-but-close. ***Organization Studies***, 29(7), 979-1002.

Wilson, J. M., Straus, S. G., & McEvily, B. 2006. All in due time: The development of trust in computer-mediated and face-to-face teams. ***Organizational Behavior & Human Decision Processes***, 99(1), 16-33.

Windeler, J. B., Maruping, L. M., Robert Jr., L. P., & Riemenschneider, C. K. 2015. E-profiles, conflict, and shared understanding in distributed teams. ***Journal of the Association for Information Systems***, 16(7), 608-645.

Zupic, I., & Čater, T. 2015. Bibliometric methods in management and organization. ***Organizational Research Methods***, *18*(3), 429-472.

TABLE 1

Most Commonly Cited Articles in Each Cluster 1995 -Feb 2018 (also see Figure 1)

Telecommuting (150 articles)		Computer-Mediated Communication (118 articles)		Virtual Teams (268 articles)	
# citations	Reference	# citations	Reference	# citations	Reference
144	Bailey & Kurland (2002)	155	Daft & Lengel (1986)	215	Jarvenpaa & Leidner (1999)
77	Gajendran & Harrison (2007)	91	Short, Williams, & Christie (1976)	200	Cramton (2001)
67	Handy (1995)	87	McGrath (1984)	183	Maznevski & Chudoba (2000)
62	Cascio (2000)	84	DeSanctis & Poole (1994)	153	Martins, Gilson, & Maynard (2004)
60	Baruch (2000)	75	Sproull & Kiesler (1986)	127	Hinds & Mortensen (2005)
55	Kurland & Bailey (1999)	69	Lipnack & Stamps (1997)	118	Jarvenpaa, Knoll, & Leidner (1998)
52	Huws, Korte, & Robinson (1990)	63	Walther (1992)	117	Hinds & Bailey (2003)
51	Cooper & Kurland (2002)	61	Siegel, Dubrovsky, Kiesler, & McGuire (1986)	96	Bell & Kozlowski (2002)
49	Mokhtarian & Salomon (1997)	60	Baron & Kenny (1986)	87	Townsend, DeMarie, & Hendrickson (1998)
48	Hill, Miller, Weiner, & Colihan (1998)	60	Kiesler, Siegel, & McGuire (1984)	85	Hertel, Geister, & Konradt (2005)
48	Wiesenfeld, Raghuram, & Garud (1999)	59	Warkentin, Sayeed, & Hightower (1997)	81	Griffith, Sawyer, & Neale (2003)
40	Mokhtarian & Salomon (1994)	57	Daft & Lengel (1984)	79	Gibson & Gibbs (2006)
38	Mokhtarian (1998)	55	Daft, Lengel, & Trevino (1987)	79	Montoya-Weiss, Massey, & Song (2001)
37	Mokhtarian (1991)	54	Straus & McGrath (1994)	72	Polzer, Crisp, Jarvenpaa, & Kim (2006)
36	Nilles (1994)	52	Carlson & Zmud (1999)	70	Mortensen & Hinds (2001)
36	Sullivan & Lewis (2001)	52	Walther (1995)	57	O'Leary & Cummings (2007)
35	Baruch & Nicholson (1997)	49	McGrath (1991)	56	Kiesler & Cummings (2002)
35	Belanger (1999)	48	Chidambaram (1996)	55	Kirkman, Rosen, Tesluk, & Gibson (2004)
35	Handy & Mokhtarian (1995)	48	Walther (1996)	55	Eisenhardt (1989)
35	Kossek, Lautsch, & Eaton (2006)	44	Hiltz, Johnson, & Turoff (1986)	55	Lau & Murnighan (1998)

Note: The full list included in the analysis contains 537 articles and is available from the corresponding author. Citations included in references section.

TABLE 2

Different Approaches to Virtuality across Research Clusters

Virtuality Dimensions	Differences in Approaches	Telecommuting	Virtual Teams	Computer-Mediated Work
Dispersion and Technology Dependence	Primary level(s) of analysis	1. Individual (e.g., individual characteristics and individual level outcomes such as well-being, performance, adjustment) (Bailey & Kurland, 2002; Gajendran & Harrison, 2007)	2. Primarily team (e.g., team processes and emergent states, team level outcomes such as innovation and performance) with some individual (e.g., subjective perception of proximity) (Cramton, 2001; Gibson & Gibbs, 2006; Wilson et al., 2008)	3. Individual (e.g., individual motivations to use technology) (Walther, 1992) Group (e.g., impact of technology on group effectiveness outcomes) (DeSanctis & Poole, 1994; Siegel et al., 1986) Organization (e.g., impact of technology on organizational change, structure, performance) (Daft & Lengel, 1986)
	Context	4. Primary focus on dispersion emphasizing the office and non-office contexts (e.g., social monitoring, level of visibility); technological context examined in terms of individual and mobile technologies (Cooper & Kurland, 2002; Mokhtarian & Salomon, 1994)	5. Primary focus on dispersion emphasizing diversity of team member office context (e.g. culture, work processes); technological context examined in terms of team's use of collaborative technologies (Hinds & Mortensen, 2005; Tzabbar & Vestal, 2015)	6. Primary focus on technology dependence with organizational context de-emphasized (i.e. primarily lab studies) in favor of technological context (e.g., media richness, social presence, synchronicity) (Daft & Lengel, 1986; Short, et al., 1976)

TABLE 2 (continued)

Virtuality Dimensions	Differences in Approaches	Telecommuting	Virtual Teams	Computer-Mediated Work
Dispersion	Temporality	7. Work during normal business hours vs. personal time (Baruch, 2000; Hill et al., 1998)	8. Time zone differences between team members (Montoya-Weiss, et al., 2001; O'Leary & Cummings, 2007)	9. Synchronous vs. asynchronous communication (Dennis, et al., 2008; Münzer & Holmer, 2009)
	Location	10. In and out of office location (Bailey & Kurland, 2002; Kossek et al., 2006)	11. Degree of spatial distance and locational configurations among team members (e.g. subgroups and isolates in different locations) (Hill & Bartol, 2016; Polzer, et al., 2006)	12. Co-location versus distribution, often in lab settings (Alnuaimi et al., 2010; Hollingshead et al.,1993)
Technology dependence	Value of technology	13. Technology-mediation as a hindrance rather than an asset relative to face-to-face (Golden & Raghuram, 2010; Golden, et al., 2008)	14. Technology-mediation as a hindrance rather than an asset relative to face-to-face (Bell & Kozlowski, 2002; Hinds & Bailey, 2003)	15. Technology-mediation as an affordance; potential for technology to offer improvements compared to face-to-face (Ellison, et al., 2015; Leonardi, 2014)
	Type of technology	16. Narrow range of technologies (email, instant messaging, mobile phones) (Wiesenfeld, et al., 1999; Venkatesh & Johnson, 2002)	17. Narrow range of technologies (email, computer conferencing systems, videoconferencing) (Jarvenpaa & Leidner, 1999; Suh, et al., 2011)	18. Wide range of technologies (older technologies as well as social media, virtual worlds, video games, etc.) (Sivunen & Nordbäck, 2015; McFarland & Ployhart, 2015)

Note: Full citation included under references

TABLE 3

Examples of Bridging Research Clusters

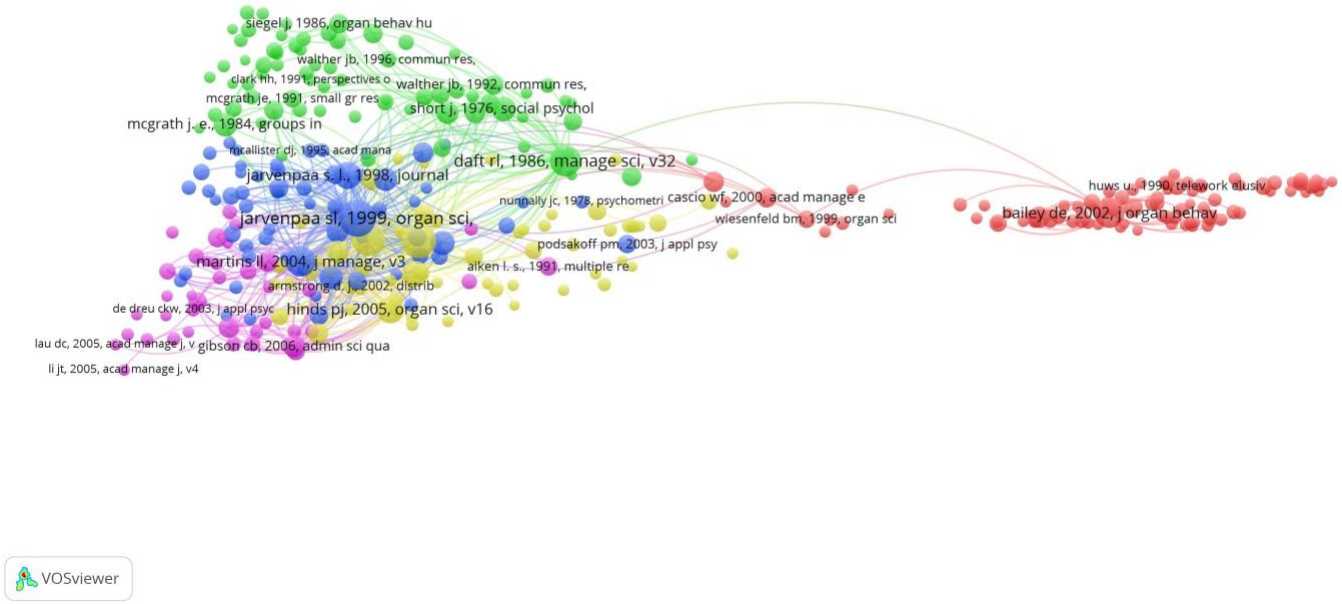
Virtuality Dimensions	Telecommuting⇔Virtual Teams	Telecommuting⇔CMW	Virtual Teams⇔CMW
Dispersion	How do virtual team outcomes in geographically dispersed teams differ, based on the extent to which virtual team members work in or out of home? *TC (cell 10)→ VT (cell 11)* How do locational configurations of and between telecommuters and other co-workers in a work unit impact the unit's outcomes? *VT (cell 11)→ TC (cell 1 and 4)*	How do characteristics of locational context influence the effectiveness of task-media combinations? *TC (cell 4)→ CMW (cell 6)* What contextual factors influence the effectiveness of exercising technology control during work hours and nonwork hours? *TC (cell 7) → CMW (cell 15)*	How do subjective perceptions of distance and different communication media interactively influence participation level, decision-making quality or idea generation? *VT (cell 5 & 11)→ CMW (cell 18)* How do different virtual team configurations inform the communication media affordances necessary to achieve high performance? *(VT (cell 11)→ CMW (cell 12 and 15)*
Technology Dependence	How does technology dependence influence processes and emergent states between telecommuters and their coworkers? *VT (cell 17)→ TC (cell 13)* How does use of mobile technology among home-based virtual team members lead to diminished commitment to continue to work in their team and/or organization? *TC (cell 4)→ VT (cell 2)*	How can social media (for enhanced social network connections) attenuate negative effects of non-office location (such as lower organizational visibility)? *CMW (cell 15 and 18)→ TC (cell 10)* How does CMW impact the social influence of telecommuters on co-workers, supervisors or subordinates? *CMW (cell 15 and 18)→ TC (cell 13 and 16)*	How can we better theorize the affordances of various features of communication technologies in virtual team collaboration? *CMW (cell 15)→ VT (cell 2)* How can social media applications be both an asset and a hindrance to knowledge sharing in virtual teams? *CMW (cell 15 and 18)→ VT (cell 14)*

Notes:

1. Cell numbers refer to the numbers in Table 2
2. Classification under dispersion or technology dependence is based on the cell that is a resource for bridging.

FIGURE 1

Co-Citation Map with Four Clusters



Notes:

1. Cluster 1 (Red) Telecommuting; Cluster 2 (Green) Computer mediated work; Cluster 3 (Blue) Virtual teams, 4 (Yellow) Distributed teams and Cluster 5 (Pink) Teams. Clusters 3, 4 and 5 are combined into one cluster named virtual teams for review purposes, because of the strong overlap.

2. We used VOSviewer software (van Eck & Waltman, 2010) for the co-citation analysis. To check for the stability of the clusters, we also carried out the same analysis with a cut off of 20 minimum citations (resulting in 333 references) and with 10 minimum citations (resulting in 951 references) and once again we find 5 clusters.
3. Each node is an article and the size of the node indicates the frequency with which the article has been co-cited with another article in the map, reflecting its popularity. The distance between the nodes shows the strength of the relationship between two co-cited articles. This allows for the emergence of research clusters based on closely related nodes, where each node is assigned to only one cluster (van Eck & Waltman, 2010).