Jyväskylän yliopiston julkaisuarkisto
Jyväskylä University Digital Archive

UNIVERSITY OF JYVÄSKYLÄ

This is an electronic reprint of the original article.
This reprint *may differ* from the original in pagination and typographic detail.

Author(s): Gibbs, Jennifer L.; Sivunen, Anu; Boyraz, Maggie

Title: Investigating the impacts of team type and design on virtual team processes

Year: 2017

Version:

Please cite the original version:

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, 590-603. https://doi.org/10.1016/j.hrmr.2016.12.006

All material supplied via JYX is protected by copyright and other intellectual property rights, and duplication or sale of all or part of any of the repository collections is not permitted, except that material may be duplicated by you for your research use or educational purposes in electronic or print form. You must obtain permission for any other use. Electronic or print copies may not be offered, whether for sale or otherwise to anyone who is not an authorised user.

Running head: INVESTIGATING THE IMPACTS OF TEAM TYPE AND DESIGN

Investigating the Impacts of Team Type and Design on Virtual Team Processes

Jennifer Gibbs, Ph.D.
Department of Communication
University of California Santa Barbara, USA

Anu Sivunen, Ph.D.
Department of Language and Communication Studies
University of Jyväskylä, Finland

Maggie Boyraz, Ph.D.
Department of Communication
California State Polytechnic University, Pomona, USA

This is the authors' accepted manuscript of the published article:

Gibbs, J. L., Sivunen, A., & Boyraz, M. (2017). Investigating the impacts of team type and design on virtual team processes. *Human Resource Management Review* (Special Issue on Virtual Teams in Organizations). doi: 10.1016/j.hrmr.2016.12.006

Abstract

While much is known about virtual team processes and outcomes, the literature relies on a variety of team configurations and types (including student versus organizational samples, short-term versus long-term teams, functional versus project-based teams, and teams with various task types) yet has not systematically examined how these differences impact team processes. This is important because much of the virtual teams research has been based on student samples, which are easier to access and control, with the implicit assumption that the findings from student samples will generalize to organizational virtual teams. This manuscript reviews the last 15 years of research on virtual teams and conducts an analysis of team type and study design on a sample of 265 articles. We then analyze several systematic differences based on these factors that are apparent in research in three areas: leadership, cultural composition, and technology use, and develop propositions to guide future research in these areas. Our findings have important implications for future virtual teams research by suggesting that researchers should be more explicit about the biases carried by particular methods and designs and the ways in which they impact our knowledge of the field.

Investigating the Impacts of Team Type and Design on Virtual Team Processes

Introduction

As communication technologies have become more sophisticated and diverse over the past two decades their use by virtual teams has grown, as has scholarly attention to such teams (see Gilson, Maynard, Jones Young, Vartiainen, & Hakonen, 2014; Kirkman, Gibson, & Kim, 2012; Martins, Gilson, & Maynard, 2004; Stanko & Gibson, 2009 for reviews). While much is known about virtual team processes and outcomes, the literature relies on a variety of team configurations and types (including student versus organizational samples, short-term versus long-term teams, functional versus project-based teams, and teams with various task types) yet has not systematically examined how these differences impact team processes. This is important because much of the virtual teams research has been based on student samples, which are easier to access and control, with the implicit assumption that the findings from student samples will generalize to organizational virtual teams.

Virtual teams span an array of team types and configurations. For instance, some teams have a formal leader, while others are self-managed. Teams in some studies are ongoing and members have pre-existing, established roles and relationships with one another, while teams in other studies are zero-history and members are randomly assigned. While virtual teams are often culturally diverse, their configuration may vary such that some teams are split between two locations with dominant cultural groups (e.g., the U.S. and India), while other teams are composed of one member per site, each of a different nationality. Further, virtual teams rely on a growing range of technologies, and while a wealth of research has studied the impacts of technology in virtual teams (for reviews see Fjermestad, 2004 and Rains, 2005), less attention has been devoted to unpacking the particular communication media repertoires (Watson-

Manheim & Bélanger, 2007) used by such teams and the ways in which they shape team processes. Rather than assuming that findings will generalize across various team designs and technologies, there is a need to unpack the ways in which various team types, tools, configurations, and reporting structures shape virtual team processes and provide boundary conditions for research on virtual teams. In this article, we systematically review virtual teams research over the last 15 years in order to identify boundary conditions and gaps in the research.

Our findings highlight important differences in team type (especially student versus organizational) and suggest that both key assumptions and findings may be conditioned by study designs in systematic ways. These findings call attention to the importance of unpacking different team types and designs in research on virtual teams. The literature has tended to lump together student samples and organizational samples, field and lab studies, and short-term and long-term teams and treat them as functionally equivalent. Our findings suggest that student virtual teams may possess different characteristics that impact team processes in fundamentally different ways and challenge their comparability with field studies of organizational teams.

To illustrate how study design impacts our knowledge of virtual teams, we focus on three key research topics: leadership, cultural composition, and technology use, and analyze how findings on these topics are shaped by team type, configuration, and study design. Our analysis makes important contributions to the virtual teams literature by developing propositions to guide future research as well as by urging scholars to consider their implicit methodological biases and the ways in which these choices shape their assumptions and findings. Our findings help to inform future research and practice on virtual teams in field settings by helping better specify the boundary conditions of existing knowledge in the field and its application to particular team

types. In so doing, we address the underexplored role played by both team type and study design in virtual team processes and extend theory on their impacts.

Review of Virtual Teams Research over the Last 15 Years

We conducted a thorough review of the research on virtual teams published over the last 15 years. Using the interdisciplinary Web of Science, EBSCO, and JSTOR research databases, we ran a search for articles containing any of the terms "global", "distributed", "dispersed", or "virtual" plus "teams" in order to capture the various labels used for virtual (most commonly defined as geographically distributed and electronically dependent) teams in the literature. Given that research on virtual teams started to burgeon in the early 2000's, we included literature from 2000-2015, focusing on empirical journal articles and omitting theory or review pieces, conference proceedings, and book chapters.

Our initial search yielded over 500 articles. To narrow this down to the most relevant articles, all three authors went through the abstracts and excluded articles that were (1) not empirical studies or (2) about teams per se. We ended up with a final sample of 265 articles. We divided them up among the three researchers who then coded each article based on the following criteria: data collection (field versus lab study), type of analysis (quantitative, qualitative, or mixed), sample (organizational versus student population), team type (project, functional, or mixed), team temporality (long-term, short-term, or mixed), and whether leadership, culture, and technology were measured. We then ran a descriptive analysis of our sample characteristics. A summary of our analysis can be found in Table 1.

[INSERT TABLE 1 ABOUT HERE]

[INSERT FIGURE 1 ABOUT HERE]

Overall, the number of articles grew steadily from 2000-2010, peaked in 2011, and then declined a bit (see Figure 1). Our analysis revealed that the vast majority of studies were field-based (77.7%) compared to lab-based (22.3%). Our coding process revealed some challenges in classifying virtual teams into traditional methodological categories. For instance, a common research design is to set up virtual teams of students and have them work together to conduct a class project. While student teams are different from organizational virtual teams in that they are artificially composed for the purposes of a class assignment rather than working on on-going, paid work assignments, they are also different from traditional lab studies in that they are doing meaningful, often professional, work for which they are rewarded (through a grade). Some teams of MBA students design prototypes or conduct project work for companies from various industries. These projects also typically last several weeks or months and take place outside of a lab. Given that student project-based teams can be argued to be completing "real" work as opposed to an artificial laboratory task, we included both studies of organizational teams and student project teams as field studies. We further broke out these categories into field studies with organizational samples (58.5%) versus field student samples (18.9%), or lab studies of student samples (20.0%) versus lab organizational samples (2.6%). Of these, organizational samples (60.4%) were more common than student samples (38.1%) overall, with a small minority using both organizational and student teams (1.5%). In terms of methods used, quantitative studies were the most prevalent (60.0%), followed by qualitative studies (29.8%) and then mixed designs (10.2%). The vast majority of studies were based on project teams (78.1%) compared to functional (12.5%) or a combination of project and functional (9.4%) teams. Most of the teams were short-term (58.9%) versus long-term (40.0%), and a small percentage of studies used a combination (1.1%).

We also captured the extent to which virtual teams research explicitly focused on issues of leadership, cultural composition, and technology use. Cultural composition and technology use have been identified as defining features of virtuality (Gibson & Gibbs, 2006), and leadership has been an important topic of study. We found that 14% of the studies in our sample measured leadership. Our analysis revealed that technology was studied more frequently than culture in virtual teams research, with 70.9% of studies mentioning specific technologies used by teams and just over half (53.6%) measuring or addressing impacts of technology use in the findings. By contrast, less than half of all studies (44.5%) even mentioned cultural differences by acknowledging national or cultural backgrounds of team members, and only 22.6% measured or addressed impacts of cultural diversity or attitudes in the findings. Cultural composition and technology use are not often operationalized or measured - much less examined together - in virtual teams research (Hinds, Liu, & Lyon, 2011). This was confirmed by our findings, as only 12.6% of studies measured both culture and technology impacts in the same study, and a full 36.6% measured neither.

Scholarship on virtual teams spans a range of disciplines including communication, computer science, information systems, management, and small groups. An analysis of our sample demonstrated that the top journals (those publishing 5 or more articles on virtual teams) were from the disciplines of information systems (*Journal of MIS*, *Information & Management*, *Information Systems Journal*, *Information Systems Research*, *MIS Quarterly*), management (*Organization Science, Journal of Product Innovation Management, Decision Sciences*), small groups (*Small Group Research, Group Decision & Negotiation, Group & Organization Management*), and communication (*Journal of Computer-Mediated Communication*). Out of all the articles, the majority are published in management (41.9%) and information systems (32.8%)

journals. This is followed by interdisciplinary small groups journals (11.3%), communication (6.8%), engineering (5.3%), and other social sciences (1.9%).

Impacts of Team Type and Design on Virtual Team Findings

We decided to focus on three key areas in which research findings seem to be especially conditioned by team type and design: leadership, cultural composition, and technology use. Although these are not the only or even necessarily the most important areas of study, we selected these three topics because (1) they constitute a substantial portion of research studies, and (2) they each represent contested terrain within the field that is illustrative of the ways in which team type and design shape research findings. We will now discuss each area, providing findings from key studies as exemplars of how the findings differ, and developing propositions.

Leadership

Out of the 265 research articles, 14% of them focused on leadership in virtual teams. The literature on virtual team leadership has proliferated over the years. Overall, a general trend can be seen to move away from the study of vertical leadership styles such as leader-member exchange (LMX) or transformational leadership to study emergent forms of leadership such as shared leadership (Eisenberg, Gibbs, & Erhardt, 2016; Hoch & Kozlowski, 2014). Nevertheless, two dominant perspectives on leadership can be identified. Table 2 summarizes the key distinctions we observed in the leadership area.

[INSERT TABLE 2 ABOUT HERE]

“Strong” versus “emergent” leadership. The “strong” leadership approach assumes that virtual teams require stronger or simply more leadership behaviors than face-to-face teams because of their dispersion and reduced socioemotional cues. This approach argues that is necessary for the leader to impose more structure and be more explicit in establishing shared

objectives and vision and coordinating tasks. Research taking this approach studies a range of leadership behaviors and styles, but tends to assume that (1) a formal, vertical leader is necessary to impose top-down leadership and (2) that this is even more critical in virtual teams than in face-to-face teams, given the added difficulties of motivating, coordinating, and unifying team members who are not working together physically. For instance, Joshi, Lazarova, and Liao (2009) found that inspirational leadership (a type of transformational leadership) was beneficial in building trust and commitment among team members in all types of teams, but that its effects were most pronounced in distributed teams. Zimmermann, Wit, and Gill (2008) studied a wider range of task-oriented and relationship-oriented leadership behaviors and found that their importance increased with the level of virtualness in team members' work. Sivunen (2006) identified four tactics used by virtual team leaders to foster identification among team members through computer-mediated communication (CMC), and Malhotra, Majchrzak, and Rosen (2007) elaborated ways in which leaders of successful virtual teams established trust, managed meetings, and monitored team progress via CMC.

On the other hand, the "emergent" leadership approach suggests that virtual teams as networked or self-managing forms often lack a centralized, formally appointed leader and may benefit more from sharing leadership behaviors among team members. Some of these studies examine "strong" leadership styles such as transformational leadership and how it emerges among team members, finding that effective leaders increase their transformational leadership in virtual teams compared to face-to-face teams (Purvanova & Bono, 2009) or that transformational leadership emerges through linguistic communication rather than through personality traits in virtual teams (Balthazard, Waldman, & Warren, 2009). Other studies focus on the importance of shared leadership, in which authority is distributed among team members such that they share

leadership responsibilities. Hoch and Kozlowski (2014) argue that hierarchical leadership is more difficult to implement in virtual settings due to the lack of face-to-face contact, and they find that shared leadership and structural supports are more effective than hierarchical leadership in virtual teams. Shared leadership is advocated as beneficial for virtual teams as it is linked with collaborative decision-making (Pearce & Conger, 2003), collaborative behavior that increases trust and knowledge sharing among team members (Hill, 2005), higher performance (Muethel & Hoegl, 2010), and positive team and organizational outcomes (Hoch & Dulebohn, 2013).

Notably, studies taking a "strong" leadership approach are predominantly field-based studies of organizational teams, while studies taking an "emergent" approach are more often based on student teams without a formal leader. These divergent findings are heavily conditioned by the study design and team type. In organizational teams, vertical leadership is more likely to exist as part of the larger reporting structure and be needed for teams to function. Despite the seductive rhetoric of virtual organizations as decentralized, boundaryless, and post-bureaucratic (Nohria & Berkley, 1994), few (if any) corporate teams are completely without hierarchy. Even self-managing teams are embedded in larger organizational structures and hierarchies and require a formal leader or team lead who answers to a supervisor higher up the reporting chain. For instance, Joshi et al. (2009) studied 171 members of the customer services division of a large multinational Fortune 500 company who were working in 41 dispersed teams and reporting to formally assigned leaders, and who had been with their teams for an average of two years. It is typical for organizational research to study teams with formally designated leaders that are embedded in larger organizational structures.

By contrast, student teams used in both field-based and laboratory studies are often set up without a formal leader, and the fact that students are typically peers completing the same

assignment for a course sets up implicit or explicit assumptions that work should be conducted in an egalitarian manner. In addition, such teams are often artificially constructed across university sites such that members have no prior relationship history, and teams are not embedded in any larger organizational structures beyond the class. For instance, Robert (2013) studied shared leadership in 22 virtual teams of graduate students from an online global campus providing distance education to working professionals. Students were randomly assigned to their teams and worked together from 15 to 100 days. Students were asked to rate each of their teammates on how much the team relied on them for leadership, and shared leadership was measured in terms of the density of leadership displayed by all team members. Thus, studies using student samples are more likely to take an "emergent" leadership approach given their lack of formal leader and relative absence of hierarchy and structure. Other studies of leadership emergence in self-managed teams all rely on student samples (Carte, Chidambaram, & Becker, 2006; Cogliser, Gardner, Gavin, & Broberg, 2012; Kayworth & Leidner, 2001; Ocker, Huang, Benbunan-Fich, & Hiltz, 2011). This leads to the following proposition:

> Proposition 1. A "strong" leadership approach is likely to be more effective in virtual teams composed of organizational members, whereas an "emergent" leadership approach is likely to be more effective in virtual teams composed of student samples.

Leadership as individual trait versus organizational function. Another difference between organizational and student samples concerns the types of leadership behaviors studied. Studies of both types often emphasize the importance of building personal relationships with team members. For instance, Pauleen (2003) interviewed leaders of 7 virtual teams in New Zealand and developed a model to explain how leaders build relationships with virtual team members; in another study, Pauleen and Yoong (2001) identify ways in which leaders can use

CMC to develop relationships with team members. Similar to these organizational studies, studies using student teams have also examined leadership behaviors that help to foster relationships. For instance, in a study of MBA students, Kayworth and Leidner (2001) found that effective virtual team leaders were able to mentor and display empathy, assert authority without being overbearing, display effective communication, and articulate member responsibilities.

Beyond this similarity, however, studies using student samples often focus on a more restricted range of interpersonal qualities or personality traits of effective leaders (Kayworth & Leidner, 2001; Wang, Fan, Hsieh, & Menefee, 2009) or their linguistic style (Balthazard et al., 2009). On the other hand, studies using organizational samples tend to include a broader array of behaviors and factors that relate not just to the individual leader's style but to the organizational structure and culture: organizational training practices (Rosen, Furst, & Blackburn, 2006), structuring of group tasks (Al-Ani, Horspool, & Bligh, 2011), empowerment climate (Nauman, Khan, & Ehsan, 2010), and team planning processes and performance (Rapp, Ahearne, Mathieu, & Rapp, 2010). Although Hoch and Kozlowski (2014) study emergent shared leadership in research and development teams, they do not study it in isolation but in conjunction with hierarchical leadership and structural supports, recognizing the broader range of leadership functions that are required in organizational settings and taking into account factors such as career mentoring and reward systems, which are beyond the purview of student teams doing class projects. Thus, the type of team design impacts the types of leadership behaviors considered, with studies of student teams considering primarily interpersonal qualities while studies using organizational teams tend to consider a broader array of interpersonal as well as organizational functions that leaders must perform. This leads to our next proposition:

Proposition 2. Effective leadership in virtual teams composed of student samples depends primarily on interpersonal competencies, whereas effective leadership in virtual teams composed of organizational samples depends on both interpersonal and organizational competencies.

Cultural Composition

Out of the 265 research articles, less than half (45%) of them mentioned culture and less than one in four (23%) of the articles measured culture as a variable or otherwise assessed its influence in the findings. Many studies consider culture as an important factor for virtual teams but do not directly measure it (e.g., Baralou & McInnes, 2013; Daniel, Agarwal, & Stewart, 2013). In general, a team member's country of origin frequently serves as a proxy for culture (e.g., Chamakiotis, Dekoninck, & Panteli, 2013; Ruppel, Gong, & Tworoger, 2013). Overall, studies in the past 15 years are much less likely to consider such attributes of cultural diversity as ethnicity, gender or functional diversity. Table 3 summarizes the key distinctions we observed in the area of cultural composition.

[INSERT TABLE 3 ABOUT HERE]

Cultural configuration and impacts. A general trend in the virtual teams research observed over time is the move away from quantitative lab studies using student samples to more field and organizational studies (especially from the 1990s until today). Research projects using student teams also benefit from easy access to information and communication technologies (ICTs) and utilize inter-university collaboration projects as a good opportunity to educate students and collect data. In the group of 58 articles that explicitly measured cultural differences, 53% were quantitative studies, 34% were qualitative, and 12% used mixed methods. The vast majority of studies measuring culture in global and virtual teams were field studies, whether of

student or organizational teams: only 12% of studies were conducted in a lab and 88% in the field. This represents a departure from the field's origins in research on CMC groups, which was predominantly based on lab studies of student samples (Hollingshead & McGrath, 1995). This shift may reflect the field's expanded conceptualization of virtuality, which has moved away from that of a dichotomous "on-off" switch (in which purely virtual teams are contrasted to purely face-to-face teams) to a construct that is multidimensional, ranges on a continuum, and is subjectively perceived (Gibbs & Boyraz, 2015; Shemla, Meyer, Greer, & Jehn, 2014). The majority of studies in our sample (64%) were based on organizational samples, while about one third (36%) used student samples.

A good portion of the studies concerned with culture were field studies with students. This category of studies is primarily comprised of inter-university student projects (described earlier, ranging from a few weeks to several months long). This design is attractive in that it accounts for impacts of geographic distribution and multiple nationalities better than lab studies drawn from local student populations would, while also allowing for control in assigning students to teams in a way that maximizes cultural diversity. Culture is often studied in organizational teams as well, although rather than having one team member of a different nationality in each location as is common in student team designs (e.g., Erez, Lisak, Harush, Glikson, Nouri, & Shokef, 2013), studies of organizational teams tend to span several sites with homogeneous cultural subgroups at each site (e.g., Metiu, 2006) or compare cultural differences of individual top management team leaders (e.g., Hutzschenreuter & Horstkotte, 2012). While laboratory studies using student samples who interact on short-term artificial tasks (e.g., Martins & Shalley, 2011; Paul, Samarah, Seetharaman, & Mykytyn, 2004) contribute to our knowledge of the impacts of diversity on creativity (for example), these findings may not be transferrable to

other contexts because of their short-term task, lack of history, and lack of organizational structure. Student field studies, on the other hand, are likely to provide a better simulation of organizational behavior, because they tend to have a required task that is meaningful to the students on which they are graded, providing a more realistic incentive to participate. This serves as a good simulation of accountability and structure. Nevertheless, their cultural configuration often differs as they are artificially set up to maximize heterogeneity. In addition, designs using students working together in project teams involve team members with a strong shared professional culture (e.g., MBA students) that may dampen the effects of national culture differences. This may explain why some studies of student global teams have downplayed the effects of cultural differences (Jarvenpaa & Leidner, 1999; Van Knippenberg, Dawson, West, & Homan, 2001). This leads to our third proposition:

Proposition 3. Cultural differences are likely to be less salient in virtual teams composed of student samples than in virtual teams composed of organizational samples.

Cultural diversity as enabling or constraining. A great number of studies reviewed focusing on culture explain the role of team diversity for team processes and outcomes (e.g., Chamakiotis et al., 2013; Kirkman, Cordery, Mathieu, Benson & Kukenberger, 2013). Among them, national diversity has been found to have either positive (Schmidt, Montoya-Weiss, & Massey, 2001), negative (Gibson & Gibbs, 2006; Staples, & Zhao, 2006) or curvilinear (U-shaped) effects on performance (Kirkman et al., 2013) moderated by such team processes as psychological safe communication climate and the extent of rich CMC use. In other words, the general understanding is that team diversity poses challenges but that it can benefit performance, creativity and innovation if managed effectively. We found that conclusions reached were associated with sample type.

Organizational studies tend to show more positive outcomes of diversity than student samples. The reason for this may be that the main motive organizations have for employing virtual distributed teams is to capitalize on the local knowledge and diversity of opinions. Therefore, organizational members seek ways to overcome challenges related to cultural diversity and geographic distribution by building shared identity while student team members may not see the benefits of working across distance and process losses are greater. For instance, based on a student-based sample of electronic chat room participants, Martins and Shalley (2011) found that differences in nationality had a strong negative direct effect and interacted with differences in technical experience to affect creativity. On the other hand, Shachaf's (2008) qualitative field study in organizational setting found that cultural diversity had a positive influence on decision-making, but a negative influence on communication. Certain ICTs (such as email or teleconferencing) were found to mitigate the negative impact of diversity on intercultural communication and support the positive impact of diversity on decision-making, and cultural diversity influenced the selection of communication media. Thus we propose:

Proposition 4. Cultural diversity is more likely to have positive outcomes in organizational virtual teams than in virtual teams composed of student samples.

Faultlines and subgroups as based on interpersonal or organizational factors. Researchers have recently proposed that it is not team diversity per se that has an effect on team processes and outcomes, but the alignment of diversity characteristics within the team (Thatcher & Patel, 2011). This has led to a growing body of research on the impacts of faultlines and subgroups in virtual teams, especially global teams. Cramton & Hinds (2005) compared faultlines to the earth's crust: "they describe the pathways along which a group would most likely split into subgroups and the vulnerability of the group to this occurrence" (p. 235). While

faultlines often refer to the demographic alignment of team members, they may be dormant and may or may not lead to subgroup formation (Bezrukova, Jehn, Zanutto, & Thatcher, 2009).

Much of the faultlines research in general (not just in virtual teams) has used lab-based studies to create faultlines using experimental manipulations. Our sample revealed, however, that the virtual teams research on subgroups and faultlines relies on a range of designs including both organizational and student samples, field and lab studies, and quantitative and qualitative methods. However, our analysis revealed some important differences that were shaped by study design and team type. The most commonly studied outcomes of faultline studies are group performance, group satisfaction, and intragroup conflict (Thatcher & Patel, 2011). Lau and Murnighan's initial formulation of faultline theory (1998) implicitly assumed two opposing subgroups, while organizational virtual teams can be more complex than that. There is a general agreement among researchers that teams with strong faultlines (regardless of their composition) have low levels of performance, but our findings suggest that this may be conditioned by the fact that many of these studies rely on student samples, which are often more rife with conflict.

Perceived faultlines have been found to have negative consequences for teams (i.e. heightening conflict and impairing decision process quality), and resulting subgroups are assumed to be detrimental to team processes resulting in dispositional attributions (Cramton & Hinds, 2005) and conflict (Polzer, Crisp, Jarvenpaa, & Kim, 2006). Our analysis revealed that studies using student samples (e.g., Chiu & Staples, 2013; Polzer et al., 2006) were more likely than studies of organizational teams to emphasize the negative consequences of subgroups. For example, Polzer and colleagues found that teams divided into two homogenous geographically distributed subgroups had the highest levels of conflict and the lowest levels of trust. The study by Polzer and others (2006) is among the few that looks at how team faultlines are activated

across geographical distance. The faultlines had more potential to turn into subgroups when a team was divided into two equal-sized subgroups of collocated members homogeneous in nationality than if a team was divided into three locations. Another study using a student sample identified factors that may prevent subgroups from forming or mitigate their negative effects, such as social attraction (Chiu & Staples, 2013). In a third example, Kankanhalli, Tan, and Wei (2007) investigated the role of cultural and functional diversity in teams and their impact on task conflict, relational conflict, and team performance in a mixed-method field study. They found that cultural diversity (measured as national and linguistic differences) led to relational conflict more often than task conflict, whereas functional diversity was more likely to lead to task conflict in student project teams. These studies illustrate that studies of faultlines using student samples tend to focus more on interpersonal conflict among members and the negative consequences it produces.

Studies using organizational teams, on the other hand, are more likely to examine faultlines in virtual teams arising from organizational issues such as power dynamics or status differences among locations, and also more likely to acknowledge benefits as well as drawbacks of subgroups. For instance, Hinds, Neeley, and Cramton (2014) found that power struggles among U.S., German, and Mexican team members activated faultlines based on language, location, and nationality. Metiu (2006) found that status differences formed around code ownership that resulted in a rift between the U.S. and India location of a distributed software team and reinforced the dominance of the U.S. site. Based on research on faultlines using interviews with employees from different countries, Chrobot-Mason, Ruderman, Weber and Ernst (2009) found that employees perceived differential treatment by managers based on cultural similarity (for example, a Palestinian boss giving overtime pay to a Palestinian and

denying it to a Jordanian).

This reveals that whereas subgroups in student teams often arise on the basis of interpersonal conflicts among individual members, global teams in organizations often contend with subgroups that are based on a more complex combination of organizational power dynamics and hierarchical structures, geographical distribution, and national cultural differences that are grounded in global inequalities. While studies of student teams are more likely to focus on differences between individuals and locations such as relational conflict among culturally diverse and distributed team members (Cramton, 2001; Cramton & Hinds, 2005; Kankanhalli et al., 2007), organizational studies tend to focus on organizational issues such as relationships among locations, power and status differences (Chrobot-Mason et al., 2009; Van Marrewijk, 2010), building shared team identity (Sidhu & Volberda, 2011), or learning and training (Lunnan & Barth, 2003). Further, while most research has identified negative outcomes of subgroups, some organizational research has found benefits as well. For instance, Bezrukova, Spell, and Perry's (2010) findings suggest that the social support and strong bonds resulting from subgroups result in increased levels of subgroup satisfaction. In some cases, high levels of subgroup satisfaction may have positive spillover effects onto overall group satisfaction. Cooperative behaviors within subgroups mediated the interactive effect of faultlines with psychological distress. Thus we propose:

> Proposition 5. Subgroups in student teams are more likely to produce negative consequences, while subgroups in organizational virtual teams are more likely to produce both negative and positive consequences.

Technology Use

The findings of our review show that in the 265 virtual team articles we reviewed,

specific technologies used by the teams were mentioned in 70.9% of the articles and just over half (53.6%) measured or addressed impacts of technology use in the findings. Most of the studies focusing on technology were investigating the effects that the use of technology had on virtual teams and their members. However, the findings of the effects were often contradictory, showing both benefits and challenges related to technology use or lack of face-to-face communication in virtual teams. Another stream of research studied technology use as a process, intertwined with organizational practices and structures. Finally, a large body of virtual team studies focusing on technology use has investigated technology's role in virtual teams by comparing groups using face-to-face versus CMC or groups using different technologies in laboratory settings.

To unpack the ways in which team type and study design impacts the findings in this area, we categorized virtual team studies related to technology use into three general approaches: (1) the "effects" approach, (2) the "process" approach, and (3) the "comparative" approach. First, we will present some of the representative studies of each approach and discuss how the studies in these streams of research discuss technology use and the role of CMC in virtual teams. Then we will elaborate on what kinds of methods and study designs are employed in these approaches, what kind of communication media virtual teams in these studies use (voice-based versus text-based, asynchronous versus synchronous, single media versus multiple media), and what types of teams are being studied (student versus organizational, project-based versus functional, and short-term versus long-term). Table 4 summarizes the key distinctions we observed in the area of technology use. Finally, we will develop a proposition related to the effects of technology use in virtual teams.

[INSERT TABLE 4 ABOUT HERE]

The "effects" approach. The virtual teams studies taking an "effects" approach typically treat technology as an input or mediating variable that affects virtual team processes and outcomes. For instance, technology use in virtual teams has been shown to have an effect on message reception and understanding (Lee & Watson-Mannheim, 2014), shared mental model development (Andres, 2012), communication breakdowns (Daim, Ha, Reutiman, Hughes, Pathak, Bynum, & Bhatla, 2012), information and knowledge sharing processes (Minas, Potter, Dennis, Bartelt, & Bae, 2014; Pinjani & Palvia, 2013), as well as team members' agreeableness (Bradley, Baur, Banford, Postlewaithe, 2013) and performance (Bradley et al., 2013; Montoya-Weiss, Massey & Song, 2001; Venkatesh & Windeler, 2012). However, we found that findings were often mixed on whether the technology's effect on virtual teams was positive or negative. A study by Johnson, Bettenhausen, and Gibbons (2009) provides a typical example of the negative effects of technology on virtual teams. Their survey of 150 MBA students showed that the degree of virtuality, measured by the amount of CMC used in participants' work teams during the last two weeks, was negatively related to affective commitment and led to lower levels of positive affect while working in their teams. Another typical example of the effects approach is a longitudinal study by Venkatesh & Windeler (2012) with 91 organizational teams that shows a positive effect of a specific technology on virtual teams. Their study showed that using a 3D virtual environment technology was more strongly and positively related to team cohesion than using a traditional collaboration system over time.

Studies taking an "effects" approach are divided equally between field and lab studies, but they are conducted predominantly with student samples, of which a few were field studies with MBA or IS students working on real tasks over several weeks (e.g., Ayoko, Konrad, Boyle, 2013; Bradley et al., 2013; McLeod, 2013). Thus, several studies using this approach were

investigating the effect of technology on virtual teams with tools that team members may not have been using for long. Interestingly, the technologies studied in this approach also varied a lot from asynchronous, text-based tools such as asynchronous discussion boards (McLeod, 2013) or weblogs (Chiu & Staples, 2013), to synchronous, text-based tools such as instant messaging (Altschuller & Benbunan-Fich, 2010; 2013), to various kinds of asynchronous and synchronous media, such as email, text messaging and teleconferencing (Johnson et al., 2009; Lee & Watson-Manheim, 2014; Muethel, Siebdrat, & Hoegl, 2012). To conclude, it seems that very different communication media are used to explain technological effects in virtual teams, and often these studies are conducted with teams of students who lack a common history of working together or with the tools provided.

The "process" approach. We called the second approach of technology studies within virtual team research "the process approach", because of the way these studies treat technology's role in virtual teams. Studies in this approach did not study technology as a variable that affects other variables in virtual teams, but were more focused on technical features and technology-mediated processes and contexts. These studies typically investigate technologies as intertwined with organizational processes and practices. Process approach studies deal with, for example, technology structures in inter-organizational virtual teams (Majchrzak, Rice, Malhotra, King & Ba, 2000), patterns of media use over time (Maznevski & Chudoba, 2000), and strategic and sequential structures using multiple media (Bélanger & Watson-Mannheim, 2006).

Furthermore, process approach studies investigated certain technologies or their features and their role in virtual team members' knowledge sharing practices (Klitmøller & Lauring, 2013), social presence (Sivunen & Nordbäck, 2015), relationship building (Pauleen & Yoong, 2001) and work-life boundary management (Ruppel et al., 2013). A typical example of a process

paradigm study on virtual teams and technology is a study by Malhotra and Majchrzak (2014), in which they studied 54 organizational virtual teams from different functions and industries that all had a high reliance on communication technologies in their collaboration. The study found that separating the degree from the type of technology use can explain some of the differences in technology effects studies. Furthermore, the use of technology that supported the creation and maintenance of situational awareness within the virtual team was found to be positively associated with team performance whereas technology that did not support this awareness was not. Another study by Sivunen and Valo (2006) showed that team leaders' technology choices in virtual teams are based on various functional needs, such as accessibility, information sharing, and creation or maintenance of social distance. They found that technology features did not explain all technology choices made in virtual team communication, but that various contextual issues played a role too.

When looking at the team type and design in these virtual team studies that had a process approach to technology use, it was clear that field studies – especially qualitative and mixed-method studies – formed the majority of this approach with a focus on organizational members collaborating in virtual project teams. Examples of such studies include Shachaf and Hara's (2007) study of media selection in global virtual teams, Wiredu's (2011) study of the functions of teleconferences for global teams, and Koppman & Gupta's (2014) study of virtual teams' use of knowledge management systems to coordinate their work and compensate for the lack of mutual knowledge. Virtual teams studies taking a process approach are also more often focused on an entire communication repertoire rather than a specific tool or its features. However, surprisingly few of the articles in this category studied virtual teams over time or longitudinally (see Majchrzak et al., 2000 and Maznevski & Chudoba, 2000 for exceptions). As most of the

field studies taking a process approach were focused on virtual project teams, the teams studied were often temporary, and the methods applied were cross-sectional.

The "comparative" approach. The third approach to technology use in virtual teams studies included studies comparing teams using CMC to teams that operated face-to-face; or comparing teams using different kinds of technologies or technology features (text, pictures, audio or video) to one another. For example, studies compared virtual team decision making to individual decision making (Schmidt et al., 2001), trust development in computer-mediated teams to trust development in face-to-face teams (Wilson, Straus, & McEvily, 2006), deception and group decision making in computer-mediated versus collocated teams (Marett & George, 2013), and personal responsibility taking and blaming of others in virtual versus collocated groups (Walther & Bazarova, 2007). A typical example of a study in this approach was a study by Alge, Wiethof, and Klein (2007) that compared zero history computer-mediated teams to zero history face-to-face teams, and to computer-mediated teams with a history. The lab study, conducted on a sample of 198 undergraduate student team members forming 66 teams, showed that zero-history face-to-face teams exhibited higher openness, trust and information sharing than zero-history CMC teams using chat software, but CMC teams that had worked frequently throughout the quarter were able to eliminate these differences.

Virtual teams studies investigating the role and effects of technology use with a comparative approach tend to use predominantly lab-based and field-based experiments. One example is Walther, Slovacek and Tidwell's (2001) study, in which a field experiment with a student sample comparing the use of photographs in zero-history and long-term groups found that in unacquainted teams, seeing team members' photographs enhanced affection and social attraction, but in long-term teams, adding photographs dampened affinity among team members.

While most of these studies were based on student samples, a minority were lab studies or simulations conducted on samples of organizational teams (e.g., Kennedy, McComb, & Vozdolska, 2011; Chiravuri, Nazareth, & Ramamurthy, 2011). Finally, there were also a few organizational field studies in the comparative approach that compared collocated teams to virtual teams (Webster & Wong, 2008; Forman & Zeebroek, 2012; Mortensen & Hinds, 2001; Bjørn & Ngwenyama, 2009), and studies that compared the use of particular technologies (such as instant messaging) in face-to-face and computer-mediated team meetings (Dennis, Rennecker & Hansen, 2010).

To conclude, technology in virtual teams research tends to be studied either from the perspective of technology effects, processes and practices related to technology use, or with a comparative approach. Studies in the "effects" approach are mainly quantitative and predominantly conducted with student samples, and the effects of technology use in these studies are mixed, partly due to the great variance in specific technologies studied. On the contrary, technology studies in virtual teams research taking a "process" approach seem to be predominantly qualitative field studies using organizational samples; however, they still often focus on short-term project teams such that not many longitudinal studies are available. Finally, studies taking a "comparative" approach tend to be lab studies that compare face-to-face and computer-mediated teams or teams using different types of technologies and media features. Like the effects approach, this approach often uses samples of students who lack a common history of working together or with the tools provided. This leads to our final proposition:

> Proposition 6. The effects of technology use in virtual teams vary according to the specific tool or platform, members' degree of experience with the tools provided, and the usage context (organizational or student setting).

Discussion

In this manuscript, we have reviewed and analyzed the past 15 years of research on virtual teams with an eye to the ways in which team type and study design impact findings on virtual team collaboration. We find several key distinctions to be of key import: in particular, student versus organizational teams and field versus laboratory studies. While a number of reviews have critically assessed the state of the virtual teams research (e.g., Gilson et al., 2014; Kirkman et al., 2012; Martins et al., 2004), scholarship generally tends to take for granted the fact that findings will generalize across studies and team types. Our goal in this manuscript has been to unearth some of the ways in which team type and study design impact core assumptions and findings in systematic ways. While we do not attempt to be comprehensive in explaining all of the differences that exist, we identify three key research topics in which these systematic biases are most pronounced: leadership, cultural composition, and technology use, and develop propositions to help guide future research in each area. We will first summarize our findings and their implications for scholarship in each of these three areas, and then discuss the broader implications of our analysis for virtual teams scholarship.

Theoretical Implications

Implications for leadership. Within the literature on leadership in virtual teams, research can be divided into two camps: the "strong" leadership approach – which tends to characterize field-based studies of organizational teams – and the "emergent" leadership approach – which tends to characterize field and lab studies of student teams. The "strong" leadership approach assumes that formal, vertical leadership styles are even more critical in virtual teams due to the greater effort needed to facilitate teamwork across geographical locations, time zones, and cultural differences using communication technologies, and leadership

behaviors in the studies of organizational teams that characterize this approach recognize the ways in which leadership is embedded in larger organizational structures and hierarchies. The "emergent" leadership approach, on the other hand, assumes that leadership emerges as team members enact particular behaviors and that it may be most effective when shared by all team members. This approach is often taken by studies employing student samples, in which there is no formally designated leader or larger organizational structure, students are peers and have expectations to work in an egalitarian fashion, and team members are randomly assigned and have no pre-existing relationships with one another. A further systematic difference observed concerns the types of leadership behaviors considered by virtual teams research. Studies drawing on student samples tend to focus primarily on individual personality traits and interpersonal styles that are enacted by leaders through oral or written communication. By contrast, field-based studies in organizations tend to examine a wider array of leadership behaviors that include both interpersonal styles and organizational factors such as training practices, planning of team tasks, team climate, reward systems, or career development. In this way, the style and type of leadership behaviors vary quite a bit across study designs.

These findings have implications for the study of leadership in virtual teams. They suggest that effective leadership may differ significantly for teams with formal leaders that are embedded in larger organizational structures and sets of relationships than for zero-history teams without formal leaders in which all members are peers, must negotiate roles and relationships, and are equally accountable for outcomes. This suggests that scholars should more explicitly consider the reporting structure (formal versus emergent leadership) and research context (e.g., on-going global software team in a multinational corporation versus an assigned global student team doing a class assignment), as what is considered effective leadership is likely to vary based

on the structure and context. Second, the findings suggest that studies vary widely in terms of the leadership behaviors that are considered. The systematic difference between student samples, which tend to focus on a restricted range of interpersonal traits and styles, and organizational samples, which focus on a broader range of interpersonal and organizational factors for which the leader is responsible, suggests that leadership studies using student samples may be missing a large part of the picture. Leaders in organizations are often expected to take on a much wider range of responsibilities than leaders of short-term, class or lab-based student projects. While both types of leadership have value, virtual teams researchers should be more careful in their conceptualizations and operationalizations of leadership and strive for consistency across studies – or note their boundary conditions more explicitly.

Implications for culture. Our findings reveal that research on cultural composition in virtual teams is also conditioned by team type and sample design in several systematic ways. First, we observed that research in this area has moved from being predominantly conducted in lab-based studies of student samples to being comprised mainly of field studies of both organizational and student teams. While field studies of student teams are an attractive option for capturing effects of geographical dispersion and national culture differences, the cultural configuration of such teams often differs as they are artificially set up to maximize heterogeneity. Studies of student teams tend to either downplay the effects of cultural differences, or emphasize negative outcomes, whereas studies of organizational teams are more likely to emphasize positive outcomes of diversity for innovation and performance. Conversely, studies of student teams tend to emphasize the negative consequences of subgroups that stem from interpersonal conflicts among members. Organizational studies, on the other hand, tend to study faultlines and subgroups arising from organizational power dynamics or status differences,

and are also more likely to acknowledge the benefits as well as drawbacks of subgroups. These differences imply that study design impacts whether individual or organizational factors are considered in determining subgroups, and that student samples in particular may emphasize interpersonal or relational concerns without consideration of larger organizational power structures. Our findings also imply that more explicit consideration of team type and design can help to make sense of contradictory research findings on the positive or negative consequences of cultural diversity and subgroups for virtual teams. Further research should consider various cultural configurations more explicitly and how they impact team process and outcomes.

The literature on multicultural teams and virtual teams has largely been separate, such that intercultural concerns are not often studied in virtual teams research (Hinds et al., 2011). Many studies adopt implicit Western cultural assumptions about leadership and teamwork, which may not extend to other cultural contexts. Future research should examine the intersection of culture and technology use more explicitly, as well as developing new ways of using ICTs to structure student field studies in order to foster intercultural competence and a cosmopolitan orientation among team members. In addition, studies should broaden their definitions of culture beyond simple measures of nationality to consider more complex measures of cultural orientations that include hybrid cultural identities. Research should also do more to incorporate additional dimensions of culture such as race, age, gender, or functional background.

Implications for technology. We find systematic differences in the literature that can be classified into three main categories: the “effects” approach, the “process” approach, and the “comparative” approach. Studies taking an effects approach are mainly quantitative and predominantly conducted with student samples, whereas studies taking a process approach are much more often qualitative field studies with organizational samples. Finally, studies taking a

comparative approach are usually lab studies that compare face-to-face and computer-mediated teams or teams using different types of technologies and media features.

One observation concerning technology use studies in virtual teams research is that a minority of studies are longitudinal; the majority of them are focused on short-term project teams (either with student or field samples) and not many studies following virtual team technology use over longer periods of time exist. Especially in the studies belonging to the effects and comparative approach, participants are usually student members who lack a common history of working together or with the tools provided. These team type and team design issues may explain some of the contradictory results related to the effects of technology and the processes and performance of face-to-face versus virtual teams. In particular, an implication of our findings is that the negative effects of technology use, or the so-called "deficiency model" (Gibbs, Nekrassova, Grushina, & Abdul Wahab, 2008) may be explained by the lack of time team members have to learn to use these tools and to develop relationships with one another that can facilitate teamwork (Walther, 1992).

Another implication of these findings is that, rather than focusing on individual technologies and media, studies would benefit from taking an affordances approach to study technology use in virtual teams. Our review showed that even though several virtual team studies make strong statements about technologies and their effects on team processes and performance, these studies are often not comparable with one another in terms of the technologies they study. It is likely the case that effects and possibilities for communication resulting, for example, from using a single asynchronous communication medium (e.g., email) as the sole means of communication in virtual teams are very different than those resulting from a large repertoire of various technologies in use. While most studies tend to either isolate a particular technology

(which may become obsolete in a few years) or lump technologies together into terms like "electronic dependence", "virtuality", or "computer-mediated communication", taking an affordances approach (e.g., Gibbs, Rozaidi, & Eisenberg, 2013) enables researchers to explain comparative technological influences in a way that transcends the features of particular tools. It also enables researchers to go beyond simplistic accounts of positive or negative effects and examine ways in which team members use and understand technologies and what they afford them in terms of possibilities for action in terms of the team's task, goals, and processes (see also Malhotra & Majchrzak, 2004).

Conclusion

Our findings have implications for scholarship in each of the three areas discussed above. Beyond that, they have broader implications for the study of virtual teams. Most importantly, they suggest the need for scholars to explicitly consider the impacts of team type and study design and how they influence the knowledge that is generated, and caution against treating all virtual team configurations as equivalent. It is important for scholars to acknowledge their own biases, whether methodological, topical, or disciplinary, and the ways in which they impact the assumptions brought to the research, construction of research designs, and the generalizability of the findings produced. In particular, student samples are often easier to access and control but our analysis suggests that such designs may not produce findings that generalize to naturally occurring organizational virtual teams. Our review has limitations in that we may not have succeeded in covering all of the published research on virtual teams, and our analysis of systematic differences among studies is only partial at best. Nevertheless, we hope that our findings will provoke virtual teams scholars to consider the role of team type and design more

explicitly in designing future studies, and the ways in which they may condition assumptions about key constructs and subsequent findings, as well as our broader knowledge of the field.

References

*Al-Ani, B., Horspool, A., & Bligh, M. (2011). Collaborating with 'virtual strangers': Towards developing a framework for leadership in distributed teams. *Leadership*, *7*(3), 219-249. doi:10.1177/1742715011407382

*Alge, B. J., Ballinger, G. A., & Green, S. G. (2004). Remote control: Predictors of electronic monitoring intensity and secrecy. *Personnel Psychology*, *57*(2), 377-410.

*Alge, B. J., Wiethoff, C., & Klein, H. J. (2003). When does the medium matter? Knowledge-building experiences and opportunities in decision-making teams. *Organizational Behavior and Human Decision Processes*, *91*(1), 26-37. doi:10.1016/S0749-5978(02)00524-1

*Altschuller, S., & Benbunan-Fich, R. (2010). Trust, performance, and the communication process in ad hoc decision-making virtual teams. *Journal of Computer-Mediated Communication, 16*(1), 27-47. doi:10.1111/j.1083-6101.2010.01529.x

*Altschuller, S., & Benbunan-Fich, R. (2013). The pursuit of trust in ad hoc virtual teams: How much electronic portrayal is too much? *European Journal of Information Systems*, *22*(6), 619-636. doi:10.1057/ejis.2012.39

*Andres, H. P. (2012). Technology-mediated collaboration, shared mental model and task performance. *Journal of Organizational and End User Computing*, *24*(1), 64-81.

*Ayoko, O. B., Konrad, A. M., & Boyle, M. V. (2012). Online work: Managing conflict and emotions for performance in virtual teams. *European Management Journal*, *30*(2), 156-174. doi:10.1016/j.emj.2011.10.001

*Balthazard, P. A., Waldman, D. A., & Warren, J. E. (2009). Predictors of the emergence of transformational leadership in virtual decision teams. *The Leadership Quarterly*, *20*651-663. doi:10.1016/j.leaqua.2009.06.008

*Baralou, E., & McInnes, P. (2013), Emotions and the spatialisation of social relations in text-based computer-mediated communication. *New Technology, Work and Employment, 28*: 160–175. doi:10.1111/ntwe.12012

*Bélanger, F., & Watson-Manheim, M. B. (2006). Virtual teams and multiple media: Structuring media use to attain strategic goals. *Group Decision and Negotiation*, *15*(4), 299-321. doi:10.1007/s10726-006-9044-8

Bezrukova, K., Jehn, K. A., Zanutto, E. L., & Thatcher, S. M. B. (2009). Do workgroup faultlines help or hurt? A moderated model of faultlines, team identification, and group performance. *Organization Science*, *20*(1), 35–50. doi:10.1287/orsc.1080.0379

Bezrukova, K, Spell, C. & Perry, J. (2010).Violent splits or healthy divides? Coping with injustice through faultlines. *Personnel Psychology, 63,* 719–751.

*Bjørn, P., & Ngwenyama, O. (2009). Virtual team collaboration: building shared meaning, resolving breakdowns and creating translucence. *Information Systems Journal*, *19*(3), 227-253. doi:10.1111/j.1365-2575.2007.00281.x

*Bradley, B. H., Baur, J. E., Banford, C. G., & Postlethwaite, B. E. (2013). Team players and collective performance: How agreeableness affects team performance over time. *Small Group Research, 44*(6), 680-711. doi:10.1177/1046496413507609

*Carte, T., Chidambaram, L., & Becker, A. (2006). Emergent leadership in self-managed virtual teams: A longitudinal study of concentrated and shared leadership behaviors. *Group Decision And Negotiation*, *15*(4), 323-343. doi:10.1007/s10726-006-9045-7

*Chamakiotis, P., Dekoninck, E. A., & Panteli, N. (2013), Factors influencing creativity in virtual design teams: An interplay between technology, teams and individuals. *Creativity and Innovation Management, 22:* 265–279. doi: 10.1111/caim.12039

*Chang, C. M. (2011). New organizational designs for promoting creativity: A case study of virtual teams with anonymity and structured interactions. *Journal of Engineering and Technology Management*, *28*(4), 268-282.

*Chiravuri, A., Nazareth, D., & Ramamurthy, K. (2011). Cognitive conflict and consensus generation in virtual teams during knowledge capture: Comparative effectiveness of techniques. *Journal of Management Information Systems*, *28*(1), 311-350. doi: 10.2753/MIS0742-1222280110

*Chiu, Y. T., & Staples, D. S. (2013). Reducing faultlines in geographically dispersed teams self-disclosure and task elaboration. *Small Group Research*, *44*(5), 498-531. doi: 10.1177/1046496413489735

Chrobot-Mason, D., Ruderman, M. N., Weber, T. J., & Ernst, C. (2009). The challenge of leading on unstable ground: Triggers that activate social identity faultlines. *Human Relations*, *62*(11), 1763–1794. doi:10.1177/0018726709346376

*Cogliser, C., Gardner, W., Gavin, M., & Broberg, J. (2012). Big five personality factors and leader emergence in virtual teams: Relationships with team trustworthiness, member performance contributions, and team performance. *Group & Organization Management*, *37*(6), 752-784.

*Cramton, C. D. (2001). The mutual knowledge problem and its consequences for dispersed collaboration. *Organization Science, 12*, 346–371. doi:10.1287/orsc.12.3.346.10098

Cramton, C. D., & Hinds, P. J. (2005). Subgroup dynamics in internationally distributed teams: Ethno-centrism or cross-national learning? *Research in Organizational Behavior, 26*, 233-265.

*Cramton, C. D., & Hinds, P. J. (2014). An embedded model of cultural adaptation in global teams. *Organization Science*, *25*(4), 1056-1081. doi:10.1287/orsc.2013.0885

*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.

*Daniel, S., Agarwal, R., & Stewart, K. J. (2013). The effects of diversity in global, distributed collectives: A study of open source project success. *Information Systems Research*, *24*(2), 312–333. doi:10.1287/isre.1120.0435

*Dennis, A. R., Rennecker, J. A., & Hansen, S. (2010). Invisible whispering: Restructuring collaborative decision making with instant messaging. *Decision Sciences*, 41(4), 845-886. DOI: 10.1111/j.1540-5915.2010.00290.x

Eisenberg, J., Gibbs, J. L., & Erhardt, N. (2016). The role of vertical and shared leadership in virtual team collaboration. In C. M. Graham (Ed.), *Strategic management and leadership for systems development in virtual spaces* (pp. 22-42). Hershey, PA: IGI Global.

*Erez, M., Lisak, A., Harush, R., Glikson, E., Nouri, R., & Shokef, E. (2013). Going global: Developing management students' cultural intelligence and global Identity in culturally diverse virtual teams. *Academy Of Management Learning & Education*, *12*(3), 330-355. doi:10.5465/amle.2012.0200

*Eseryel, U. Y., & Eseryel, D. (2013). Action-embedded transformational leadership in self-managing global information systems development teams. *The Journal of Strategic Information Systems*, *22*(2), 103-120.

Fjermestad, J. (2004). An analysis of communication mode in group support systems research. *Decision Support Systems, 37*, 239-263.

*Forman, C., & Zeebroeck, N. V. (2012). From wires to partners: How the Internet has fostered R&D collaborations within firms. *Management Science*, *58*(8), 1549-1568.

Gibbs, J. L., & Boyraz, M. (2015). International HRM's role in managing global teams. In Collings, D. G., Wood, G., & Caligiuri, P. (Eds.), *The Routledge companion to international human resource management* (pp. 532-551). New York: Routledge.

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

Gibbs, J. L., Rozaidi, N., & 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.

*Gibson, C., & Gibbs, J. (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*, 451–495.

Gilson, L. L., Maynard, M. T., Jones Young, N. C., Vartiainen, M., & Hakonen, M. (2014). Virtual teams research: 10 years, 10 themes, and 10 opportunities. *Journal of Management*, 41, 1313-1337. doi:10.1177/0149206314559946

*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.

*Hill, N. S. (2005). Leading together, working together: The role of team shared leadership in building collaborative capital in virtual teams. *Advances in Interdisciplinary Studies of Work Teams*, *11*(05), 183–209.

Hinds, P. J., Liu, L. & Lyon, J. (2011). Putting the global in global work: An intercultural lens on the process of cross-national collaboration. *Academy of Management Annals*, 5(1), 1-54.

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

*Hinds, P. J., Neeley, T., & Cramton, C. (2014). Language as a lightning rod: Power contests, emotion regulation, and subgroup dynamics in global teams. *Journal of International Business Studies.*

Hoch, J. E., & Dulebohn, J. H. (2013). Shared leadership in enterprise resource planning and human resource management system implementation. *Human Resource Management Review*, *23*(1), 114–125.

*Hoch, J. E. & Kozlowski, S. W. J. (2014). Leading virtual teams: Hierarchical leadership, structural supports, and shared team leadership. *Journal of Applied Psychology,* 99, 390-403.

Hollingshead, A. B., & McGrath, J. E. (1995). Computer-assisted groups: A critical review of the empirical research. In R. A. Guzzo & E. Salas (Eds.), *Team effectiveness and decision making in organizations* (pp. 46-78). San Francisco: Jossey-Bass.

Hutzschenreuter, T., & Horstkotte, J. (2012). Performance effects of top management team demographic faultlines in the process of product diversification. *Strategic Management Journal, 34*, 704–726. doi: 10.1002/smj.2035

Jarvenpaa, S. L., & Leidner, D. E. (1999). Communication and trust in global virtual teams. *Organization Science*, *10*(6), 791–815. doi:10.1287/orsc.10.6.791

*Johnson, S. K., Bettenhausen, K., & Gibbons, E. (2009). Realities of working in virtual teams: Affective and attitudinal outcomes of using computer-mediated communication. *Small Group Research, 40*(6), 623-649. doi: 10.1177/1046496409346448

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

Kankanhalli, A., Tan, B. C. Y., & Wei, K.-K. (2007). Conflict and performance in global virtual teams. *Journal of Management Information Systems*, *23*(3), 237–274. doi:10.2753/MIS0742-1222230309

*Kayworth, T. R., & Leidner, D. E. (2001). Leadership effectiveness in global virtual teams. *Journal of Management Information Systems*, *18*(3), 7-40.

*Kennedy, D. M., McComb, S. A., & Vozdolska, R. R. (2011). An investigation of project complexity's influence on team communication using Monte Carlo simulation. *Journal of Engineering and Technology Management*, *28*(3), 109-127. doi:10.1016/j.jengtecman.2011.03.001

*Kirkman, B. L., Cordery, J. L., Mathieu, J., Rosen, B., & Kukenberger, M. (2013). Global organizational communities of practice: The effects of nationality diversity, psychological safety, and media richness on community performance. *Human Relations, 66*(3), 333-362. doi: 10.1177/0018726712464076

Kirkman, B.L., Gibson, C.B., & Kim, K. (2012). Across borders and technologies: Advancements in virtual teams research. In S.W. Kozlowski (Ed). *Oxford handbook of industrial and organizational psychology,* vol. 1 (pp. 789-858). New York: Oxford University Press.

*Kirkman, B. L., Rosen, B., Tesluk, P. E., & Gibson, C. B. (2006). Enhancing the transfer of computer-assisted training proficiency in geographically distributed teams. *Journal of Applied Psychology*, *91*(3), 706-716.

*Klitmøller, A., & Lauring, J. (2013). When global virtual teams share knowledge: Media richness, cultural difference and language commonality. *Journal of World Business*, *48*(3), 398-406.

*Koppman, S., & Gupta, A. (2014). Navigating the mutual knowledge problem: a comparative case study of distributed work. *Information Technology & People, 27*(1), 83-105. http://dx.doi.org/10.1108/ITP-12-2012-0153

Lau, D. C., & Murnighan, J. K. (2005). Interactions within groups and subgroups: The effects of demographic faultlines. *Academy of Management Journal, 48*, 645–659. doi:10.5465/AMJ.2005.17843943

*Lee, C.S., & Watson-Manheim, M.B. (2014). Perceived risks and ICT use. *Journal of Computer Information Systems, 54*(2), 16-24.

*Lunnan, R., & Barth, T. (2003). Managing the exploration vs. exploitation dilemma in transnational "bridging teams." *Journal of World Business*, *38*(2), 110–126. doi:http://dx.doi.org/10.1016/S1090-9516(03)00005-1

*Majchrzak, A., Rice, R. E., Malhotra, A., King, N., & Ba, S. (2000). Technology adaptation: The case of a computer-supported inter-organizational virtual team. *MIS Quarterly, 24*(4), 569-600.

*Malhotra, A., & Majchrzak, A. (2014). Enhancing performance of geographically distributed teams through targeted use of information and communication technologies. *Human Relations, 67(*4), 389-411.

*Malhotra, A., Majchrzak, A., & Rosen, B. (2007). Leading Virtual Teams. *Academy Of Management Perspectives*, *21*(1), 60-70. doi:10.5465/AMP.2007.24286164

*Marett, K., & George, J. F. (2013). Barriers to deceiving other group members in virtual settings. *Group Decision and Negotiation*, *22*(1), 89-115.

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*, 805-835.

*Martins, L. L., & Shalley, C. E. (2011). Creativity in virtual work: Effects of demographic differences. *Small Group Research* , *42* (5), 536–561. doi:10.1177/1046496410397382

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

*McLeod, P. L. (2013). Distributed people and distributed information vigilant decision-making in virtual teams. *Small Group Research, 44(*6), 627-657. doi:10.1177/1046496413500696

*Metiu, A. (2006). Owning the code: Status closure in distributed groups. *Organization Science, 17,* 418-435.

*Minas, R. K., Potter, R. F., Dennis, A. R., Bartelt, V., & Bae, S. (2014). Putting on the thinking cap: Using neuroIS to understand information processing biases in virtual teams. *Journal of Management Information Systems, 30*(4), 49-82.

*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. *The International Journal of Conflict Management,* 12, 212-238.

*Muethel, M., & Hoegl, M. (2010). Cultural and societal influences on shared leadership in globally dispersed teams. *Journal of International Management, 16*, 234–246.

*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. doi: 10.1111/j.1467-9310.2011.00667.x

*Nauman, S., Khan, A. M., & Ehsan, N. (2010). Patterns of empowerment and leadership style in project environment. *International Journal of Project Management*, *28*638-649. doi:10.1016/j.ijproman.2009.11.013

Nohria, N., & Berkley, J. D. (1994). The virtual organization: Bureaucracy, technology, and the implosion of control. In C. Heckscher & A. Donnellon (Eds.), *The post-bureaucratic organization: New perspectives on organizational change* (pp. 108-128). Thousand Oaks, CA: Sage.

*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 and Negotiation*, *20*(3), 273-292. doi:10.1007/s10726-009-9180-z

*Paul, S., Samarah, I. M., Seetharaman, P., & Mykytyn, P. P. (2004). An empirical investigation of collaborative conflict management style in group support system-based global virtual teams. *Journal of Management Information Systems, 21*(3), 185-222.

*Pauleen, D. J. (2003). An inductively derived model of leader-initiated relationship building with virtual team members. *Journal of Management Information Systems, 20*(3), 227-256.

*Pauleen, D. J., & Yoong, P. (2001). Relationship building and the use of ICT in boundary-crossing virtual teams: a facilitator's perspective. *Journal of Information Technology*, *16*(4), 205-220.

Pearce, C. L., & Conger, J. A. (2003). *Shared leadership: Reframing the hows and whys of leadership.* Thousand Oaks, CA: Sage Publications.

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

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

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

Rains, S. A. (2005). Leveling the organizational playing field virtually: A meta-analysis of experimental research assessing the impact of group support system use on member influence behaviors. *Communication Research, 32*, 193-234.

*Rapp, A., Ahearne, M., Mathieu, J., & Rapp, T. (2010). Managing sales teams in a virtual environment. *International Journal of Research in Marketing*, *27,* 213-224. doi:10.1016/j.ijresmar.2010.02.003

Robert, L. P. (2013). A multi-level analysis of the impact of shared leadership in diverse virtual teams. *Conference on Computer Supported Cooperative Work* (CSCW 2013). http://dx.doi.org/10.1145/2441776.2441818

*Rosen, B., Furst, S., & Blackburn, R. (2006). Training for virtual teams: An investigation of current practices and future needs. *Human Resource Management*, *45*(2), 229-247.

*Ruppel, C., Gong, B., & Tworoger, L. C. (2013). Using communication choices as a boundary-management strategy: How choices of communication media affect the work–life balance of teleworkers in a global virtual team. *Journal of Business and Technical Communication*, 27(4), 436-471.

*Schmidt, J. B., Montoya-Weiss, M. M., & Massey, A. P. (2001). New product development decision-making effectiveness: Comparing individuals, face-to-face teams, and virtual teams. *Decision Sciences, 32:* 575–600.

*Shachaf, P. (2008). Cultural diversity and information and communication technology impacts on global virtual teams: An exploratory study. *Information & Management*, *45*(2), 131–142. doi:10.1016/j.im.2007.12.003

*Shachaf, P., & Hara, N. (2007). Behavioral complexity theory of media selection: a proposed theory for global virtual teams. *Journal of Information Science*, *33*(1), 63-75.

Shemla, M., Meyer, B., Greer, L., & Jehn, K. A. (2014). A review of perceived diversity in teams: Does how members perceive their team's composition affect team processes and outcomes? *Journal of Organizational Behavior*, *37:* S89–S106. doi:10.1002/job.1957

*Sidhu, J. S., & Volberda, H. W. (2011). Coordination of globally distributed teams: A co-evolution perspective on offshoring. *International Business Review*, *20*(3), 278–290. doi: http://dx.doi.org/10.1016/j.ibusrev.2011.01.006

*Sivunen, A. (2006). Strengthening identification with the team in virtual teams: The leaders' perspective. *Group Decision and Negotiation*, *15*(4), 345-366.

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

Sivunen, A., & Valo, M. (2006). Team leaders' technology choice in virtual teams. *IEEE Transactions on Professional Communication, 49*(1), 57-68.

Stanko, T. L., & Gibson, C. B. (2009). The role of cultural elements in virtual teams. In R. S. Bhagat & R. M. Steers (Eds.). *Cambridge handbook of culture, organization, and work* (pp. 272-304). Cambridge: Cambridge University Press.

*Staples, D. S., & Zhao, L. (2006). The effects of cultural diversity in virtual teams versus face-to-face teams. *Group Decision and Negotiation 15*(4), 389–406.

*Thamhain, H. J. (2011). Critical success factors for managing technology-intensive teams in the global enterprise. *Engineering Management Journal*, *23*(3), 30-36.

Thatcher, S. M. B., & Patel, P. C. (2011). Demographic faultlines: A meta-analysis of the literature. *Journal of Applied Psychology, 96*, 1119–1139. doi:10.1037/a0024167

Van Knippenberg, D., Dawson, J., West, M., & Homan, A. (2011). Diversity faultlines, shared objectives, and top management team performance. *Human Relations, 64*, 307-336. doi:10.1177/0018726710378384

*Van Marrewijk, A. (2010). Situational construction of Dutch–Indian cultural differences in global IT projects. *Scandinavian Journal of Management*, *26*(4), 368–380. doi:http://dx.doi.org/10.1016/j.scaman.2010.09.004

*Venkatesh, V., & Windeler, J. B. (2012). Hype or help? A longitudinal field study of virtual world use for team collaboration. *Journal of the Association for Information Systems*, *13*(10), 735-771.

Walther, J. B. (1992). Interpersonal effects in computer-mediated interaction: A relational perspective. *Communication Research, 19* (1), 52-91.

*Walther, J. B., & Bazarova, N. N. (2007). Misattribution in virtual groups: The effects of member distribution on self-serving bias and partner blame. *Human Communication Research, 33*(1), 1-26. doi: 10.1111/j.1468-2958.2007.00286.x

*Walther, J. B., Slovacek, C. L., & Tidwell, L. C. (2001). Is a picture worth a thousand words? Photographic images in long-term and short-term computer-mediated communication. *Communication Research*, *28*(1), 105-134.

*Wang, C. W, Fan, K.T., Hsieh, C.T., Menefee, M. L. (2009). Impact of motivating language on team creative performance. *Journal of Computer Information Systems*, *50*(1), 133-140.

Watson-Manheim, M. B., & Bélanger, F. (2007). Communication media repertoires: Dealing with the multiplicity of media choices. *MIS Quarterly, 31*, 267-293.

*Webster, J., & Wong, W. K. P. (2008). Comparing traditional and virtual group forms: identity, communication and trust in naturally occurring project teams. *The International Journal of Human Resource Management*, *19*(1), 41-62.

*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 and Human Decision Processes, 99*(1), 16-33. doi:10.1016/j.obhdp.2005.08.001

*Wiredu, G. O. (2011). Understanding the functions of teleconferences for coordinating global software development projects. *Information Systems Journal, 21*(2), 175-194. doi: 10.1111/j.1365-2575.2010.00364

*Zhang, S., Tremaine, M., Milewski, A. E., Fjermestad, J., & O'Sullivan, P. (2012). Leader delegation in global software teams: occurrence and effects. *Electronic Markets*, *22*(1), 37-48.

*Zimmermann, P., Wit, A., & Gill, R. (2008). The relative importance of leadership behaviours in virtual and face-to-face communication settings. *Leadership*, *4*(3), 321-337. doi:10.1177/1742715008092388

Table 1. Sample Characteristics

Journal Disciplines		Data Collection		Methods		Sample Type		Team Type		Team Temporality	
Management	41.9%	Field	77.7%	Quantitative	60.0%	Organizational	60.4%	Project	78.1%	Short-term	58.9%
Information Systems	32.8%	Lab	22.3%	Qualitative	29.8%	Student	38.1%	Functional	12.5%	Long-term	40.0%
Small Groups	11.3%			Mixed	10.2%	Mixed	1.5%	Mixed	9.4%	Mixed	1.1%
Communication	6.8%										
Engineering	5.3%										
Other Social Science	1.9%										

Table 2. Summary of Findings on Leadership

Topic Area	Sample Studies	Main Findings
Strong Leadership	Al-Ani, Horspool, & Bligh, 2011; Chang, 2011; Eseryel & Eseryel, 2013; Hambley, O'Neill, & Kline, 2007; Joshi, Lazarova & Liao, 2009; Kirkman, Rosen, Tesluk, & Gibson, 2006; Malhotra, Majchrzak & Rosen, 2007; Pauleen & Yoong, 2001; Rosen, Furst, & Blackburn, 2006; Sivunen, 2006; Thamhain, 2011; Zhang, Tremaine, Milewski, Fjermestad, & O'Sullivan, 2012; Zimmermann, Wit & Gill, 2008	• A formal leader is necessary in virtual teams given the added challenges of building trust, commitment and team identity and managing and monitoring team progress in virtual teams compared to traditional teams • Mainly field-based organizational teams
Emergent Leadership	Balthazard, Waldman, & Warren, 2009; Carte, Chidambaram, & Becker, 2006; Cogliser, Gardner, Gavin, & Broberg, 2012; Hill, 2005; Hoch & Kozlowski, 2014; Kayworth & Leidner, 2001; Muethel & Hoegl, 2010; Ocker, Huang, Benbunan-Fich, & Hiltz, 2011	• Virtual teams are seen as networked or self-organized forms that lack formal leader and may benefit from sharing leadership behaviors among team members • Mainly student teams without an assigned leader and no prior relationship history among members
Individual trait	Balthazard, Waldman, & Warren, 2009; Carte, Chidambaram, & Becker, 2006; Kayworth & Leidner, 2001; Wang, Fan, Hsieh, & Menefee, 2009	• Leadership is studied in terms of personality traits or interpersonal qualities • Mainly student teams
Organizational function	Al-Ani, Horspool, & Bligh, 2011; Hoch & Kozlowski, 2014; Nauman, Khan, & Ehsan, 2010; Rapp, Ahearne, Mathieu, & Rapp, 2010; Rosen, Furst, & Blackburn, 2006	• Leadership is studied in terms of both individual and organizational factors (e.g., structure, culture) • Mainly field-based organizational teams

Table 3. Summary of Findings on Cultural Composition

Topic Area	Sample Studies	Main Findings
Configuration	Hutzschenreuter & Horstkotte, 2012; Metiu, 2006; Martins & Shalley, 2011; Paul, Samarah, Seetharaman, & Mykytyn, 2004	• Moving away from quantitative lab studies using student samples to more field and organizational studies • Student samples often artificially set up to maximize heterogeneity; shared student culture may dampen national differences
Culture as enabling or constraining	Gibson & Gibbs, 2006; Kirkman, Cordery, Mathieu, Rosen, & Kukenberger, 2013; Lau and Murnighan, 1998; Martins & Shalley, 2011; Schmidt, Montoya-Weiss, & Massey, 2001; Shachaf, 2008; Staples, & Zhao, 2006	• National diversity found to have either positive, negative or curvilinear effects on performance moderated by various team processes • Organizational studies show more positive outcomes of diversity than student samples
Faultlines and Subgroups	Chiu & Staples, 2013; Chrobot-Mason, Ruderman, Weber and Ernst, 2009; Cramton, 2001; Cramton & Hinds, 2005; Bezrukova, Jehn, Zanutto, & Thatcher, 2009; Bezrukova, Spell, & Perry, 2010; Hinds, Lunnan & Barth, 2003; Neeley, & Cramton, 2014; Kankanhalli, Tan, & Wei, 2007; Metiu, 2006; Polzer, Crisp, Jarvenpaa, & Kim, 2006; Sidhu & Volberda, 2011; Thatcher & Patel, 2011	• Alignment of diversity characteristics within the team matters more than diversity itself • Most commonly studied outcomes are group performance, satisfaction, and intragroup conflict • Studies using student teams tend to focus more on subgroups based on interpersonal conflict and negative outcomes • Studies using organizational teams more likely to examine organizational issues (e.g., power dynamics, global inequalities) and acknowledge subgroup benefits as well as drawbacks

Table 4. Summary of Findings on Technology Use

Topic Area	Sample Studies	Main Findings
Effects Approach	Andres, 2012; Ayoko, Konrad, Boyle, 2013; Bradley, Baur, Banford, Postlewaithe, 2013; Daim, Ha, Reutiman, Hughes, Pathak, Bynum, & Bhatla, 2012; Johnson, Bettenhausen, & Gibbons, 2009; Lee & Watson-Mannheim, 2014; McLeod, 2013; Minas, Montoya-Weiss, Massey & Song, 2001; Potter, Dennis, Bartelt, & Bae, 2014; Pinjani & Palvia, 2013; Venkatesh & Windeler, 2012	• Technology is treated as an input or mediating variable with positive or negative effects on virtual team processes and outcomes • Mainly student samples • Various technologies are studied
Process Approach	Bélanger & Watson-Mannheim, 2006; Klitmøller & Lauring, 2013; Koppman & Gupta, 2014; Majchrzak, Rice, Malhotra, King & Ba, 2000; Malhotra & Majchrzak 2014; Maznevski & Chudoba, 2000; Pauleen & Yoong, 2001; Ruppel, Gong, & Tworoger, 2013; Shachaf & Hara, 2007; Sivunen & Nordbäck, 2015; Sivunen & Valo; 2006; Wiredu, 2011	• Technology is studied as intertwined with team or organizational processes and practices • Mainly field studies of organizational project teams • Often focused on an entire communication repertoire rather than a specific tool or its features
Comparative Approach	Alge, Wiethof & Klein, 2007; Bjørn & Ngwenyama, 2009; Chiravuri, Nazareth, & Ramamurthy, 2011; Dennis, Rennecker & Hansen, 2010; Forman & Zeebroek, 2012; Kennedy, McComb, & Vozdolska, 2011; Marett & George, 2013; Mortensen & Hinds, 2001; Schmidt, Montoya-Weiss, & Massey, 2001; Walther & Bazarova, 2007; Walther, Slovacek & Tidwell, 2001; Webster & Wong, 2008; Wilson, Straus, & McEvily, 2006	• Focus on comparing CMC and face-to-face teams or comparing teams using different kinds of technologies or technology features (text, pictures, audio or video) to one another • Mainly lab-based and field-based experiments
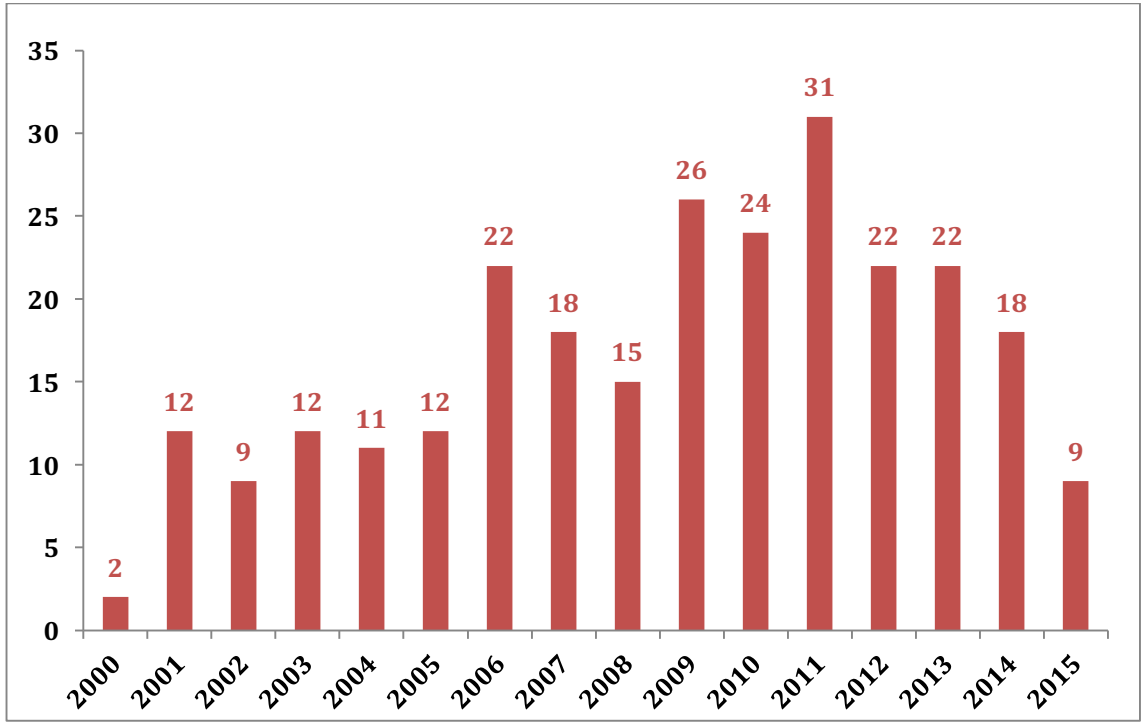
Figure 1. Publication Frequency by Year