

DON'T ABANDON THE WATER COOLER YET: FLEXIBLE WORK
ARRANGEMENTS AND THE UNIQUE EFFECT OF FACE-TO-FACE INFORMAL
COMMUNICATION ON IDEA GENERATION AND INNOVATION

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by

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Cornell University 2017

As many organizations have begun to scale back on flexible work arrangements out of concern for their potential negative impact on team coordination and innovation, there remains very limited scholarly research that tests the assumptions behind these decisions. The purpose of this research is to investigate the team dynamics associated with team flexibility in an effort to understand whether such concerns may be merited. Using data collected from 99 teams in a U.S.-based Fortune 500 company, I develop and test a model that examines the effects of team location flexibility on multiple forms of team communication and their subsequent impact on idea generation and innovation. Specifically, I investigate whether informal “water cooler” communication is a uniquely important predictor of idea generation and, critically, whether teams in which members work more flexibly are at a greater risk of missing out on these types of interactions. Based on a series of team-level regression analyses supplemented by relative weights analyses, I find that teams with greater location flexibility reported engaging less frequently in two forms of face-to-face informal communication: face-to-face spontaneous work-related communication, and to a lesser extent, face-to-face non-work-related communication. However, teams did not engage less frequently in face-to-face formal communication. Moreover, I find that the type of communication most affected by team location flexibility—face-to-face spontaneous work-related communication—is also the type that has the greatest impact on team idea generation and, consequently, team innovation. Finally, I find evidence that teams were unable to effectively

compensate for the loss of face-to-face informal communication by using electronic media, such as email, instant message, or audio/visual communication tools. Taken together, I find that an important type of innovation-related communication is reduced when teams work more flexibly. Future research that builds on these findings is needed, as managers and organizations weigh the potential trade-offs between the benefits of flexible work arrangements for individual employees with the drawbacks of flexibility for teams—particularly on their ability to innovate in unexpected and unplanned ways at the office.

BIOGRAPHICAL SKETCH

Kristie earned her Bachelor's degree from Kalamazoo College in 2009, with a major in Psychology, a minor in Spanish Language and Literature, and a concentration in Women's Studies. She then earned a Master's degree in Human Resources and Labor Relations from Michigan State University in 2011. Since joining the Cornell University School of Industrial and Labor Relations (ILR), she earned a Master's degree (Major: Human Resource Studies; Minor: Organizational Behavior) and will graduate with a Ph.D. in May 2017 (Major: Human Resource Studies; Minors: Organizational Behavior, Statistics). In August 2017, Kristie will join the Michigan State University School of Human Resources and Labor Relations as an Assistant Professor. Her research explores three key themes associated with the changing nature of work: increasing employee flexibility (e.g., flextime, telework), growing workforce diversity, and the changing work-family interface.

DEDICATION

Thank you to my family and friends, who have believed in me and who have tirelessly supported me throughout my Ph.D. journey. Thank you to my mom, Debbie, for always providing a listening ear and showing enthusiasm about my research. I doubt that I would be here today studying people at work if it were not for our countless talks over the years about how to make workplaces better and about the unique importance of valuing employees. I have fond memories of my early “ethnographic” observations during the many trips to your office and “take your daughter to work” days. Thank you to my dad, Jeff, for the rounds of golf, canoe trips, and long walks (and even a ride on the golf cart at the plant!) during which we talked about the changing nature of organizations, particularly manufacturing and shift work. Your candor and insight have inspired me, and our debates have motivated me. Thank you to David Dwertmann for being a strong partner and encouraging me to do great work, while also taking time to travel the world and enjoy a Kölsch or two. Thank you to my friends for the late-night talks, wine nights, walks around the lake, and the unflagging support. I could not have done it without you: Adam McAlpine, Adam Miros, Maia Kelner, Becky Paluch, Björn Mitzinneck, Melanie Mahoney, Hao Zhang, Rohini Jalan, Matt Piszczek, Aidis and Scott Suever, and Josephine and Shawn Wong.

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LIST OF ABBREVIATIONS

A/V	audio/visual
β	beta coefficient
B	standardized coefficient
CEO	chief executive officer
cf.	confer/consult
CI	confidence interval
Δ	delta/change
df	degrees of freedom
Ed(s).	editor(s)
e.g.	example gratia/for example
et al.	et alii/and others
etc.	et cetera/and other similar things
F2F	face-to-face
FWA(s)	flexible work arrangement(s)
HR	human resources
ICC	intraclass correlation coefficient
i.e.	id est/that is
IM	instant message
LL	lower limit
M	mean
N	number of observations
n.d.	no date
n.s.	not significant

Non-Work Comm.	non-work-related communication
OLS	ordinary least squares
p	level of significance
p(p).	page(s)
r	correlation coefficient
R ²	coefficient of determination
rw	raw weight
Rwg(j)	index of interrater agreement
SD	standard deviation
UL	upper limit
U.S.	United States of America
Work Comm.	work-related communication
***	$p < .001$ (two-tailed test)
**	$p < .01$ (two-tailed test)
*	$p < .05$ (two-tailed test)
+	$p < .10$ (two-tailed test)

INTRODUCTION

Employees using flexible work arrangements (FWAs), or “work options that permit flexibility in terms of ‘where’ work is completed [e.g., flexplace, telework] and/or ‘when’ work is completed [e.g., flextime, schedule flexibility]” (Allen et al., 2013, p. 345) now comprise a larger share of the workforce than ever before. A recent Society for Human Resource Management survey documented a threefold increase in firms offering telework arrangements over the past two decades (Society for Human Resource Management, 2015, 2016). In the wake of this growth—and the implications that it poses for employee coordination—questions have begun to surface about the potential negative impact of employee flexibility on innovation. Nowhere is this more apparent than in organizations with high concentrations of high-tech, knowledge-based workers. A 2013 Yahoo! internal memo to employees, released by then-CEO Marissa Mayer as she shuttered the organization’s telework program, illustrates this tension:

“To become the absolute best place to work, communication and collaboration will be important, so we need to be working side-by-side. That is why it is critical that we are all present in our offices. Some of the best decisions and insights come from hallway and cafeteria discussions, meeting new people, and impromptu team meetings. Speed and quality are often sacrificed when we work from home.” (Swisher, 2013)

Although considerable research has been conducted on the outcomes associated with FWAs for individuals, surprisingly little is known about outcomes for teams. As many organizations have begun to drastically scale back on FWAs out of concern for the assumed negative impact on team coordination and innovation, scholarly research that tests the validity of the assumptions on which these decisions are being made is needed. It is critical that we develop a deeper understanding of FWAs in the context of teams in order to understand the full impact of flexibility and to weigh possible trade-offs between the benefits of FWAs for individual employees with the potential drawbacks that FWAs

could have for teams, particularly on their potential to innovate in unexpected and unplanned ways by “bumping into each other” at work.

The purpose of this study is to shift attention to team-level flexibility in an effort to understand whether fears about the negative impact of FWAs on team communication and team innovation are warranted. As an increasing number of organizations have announced cuts to FWA programs, they have cited particular concerns about the impact of flexibility on impromptu in-person communication (DePass, 2016; Hesseldahl, 2013; Lee, 2016; Pepitone, 2013; Roberts, 2014; Swisher, 2013; Truong, 2014). Beliefs about the importance of informal “water cooler” communication are not new; the notion that shared office spaces are fertile environments for social interaction has deep roots in American culture (“Naval customs, traditions, & etiquette,” n.d.; “Scuttlebutt,” n.d.). The rationale behind such beliefs is that as employees bump into one another in hallways, elevators, and at the coffee machine, they are presented with opportunities to spontaneously engage in interactions that foster greater connection and information sharing.

Using data collected from teams in a U.S.-based Fortune 500 company, I develop and test a model that examines the effects of team flexibility on multiple forms of team communication and their subsequent impact on idea generation and innovation. Specifically, I investigate whether informal “water cooler” communication is an important predictor of idea generation and innovation and, critically, whether teams in which members work more flexibly are at a greater risk of losing out on these types of interactions. To do this, I draw from and extend literature on flexible work arrangements (e.g., Kossek & Michel, 2011; Kossek & Van Dyne, 2008), communication formality and media richness (e.g., Daft & Lengel, 1984, 1986; Kraut, Fish, Root, & Chalfonte, 1990), and

creativity and innovation (e.g., Anderson, Potočnik, & Zhou, 2014; Baer, 2012; Perry-Smith & Mannucci, 2017).

This study is intended to make three related contributions. First, it shifts the focus to examining flexibility in the context of teams. Although our understanding of the effects of flexibility for individuals has grown considerably in recent years (e.g., Bloom, Liang, Roberts, & Ying, 2015; Moen et al., 2016), our knowledge of flexibility in teams is extremely limited (Gajendran & Harrison, 2007; Gajendran, Harrison, & Delaney-Klinger, 2015). This is problematic, as the recent growth in FWA offerings has corresponded with an increase in the reliance on teams to carry out work in organizations (Kozlowski & Bell, 2003, 2013). Without taking the interdependence among employees using FWAs into account, we risk missing an important piece of the flexibility puzzle. When employees work interdependently in teams, their individual work arrangement decisions can have wide-reaching implications for how their team carries out its work. Teams with members working flexibly can no longer assume that everyone will always be available and present in the office at the same time, posing potential barriers to coordination. This may be particularly true in knowledge-based work settings, where teams are engaged in complex tasks characterized by high levels of uncertainty and change (Drucker, 1999). Team members must remain agile and adaptive in such changing circumstances, underscoring the central role of timely, effective team communication. Therefore, building our awareness of how FWAs influence team dynamics is an important step forward in understanding how employee flexibility operates in organizations.

A second contribution of this study is the distinction I make among multiple forms of team communication in the service of understanding which forms are most affected by team flexibility and which have the greatest impact on team innovation outcomes. A large body of past research has established the importance of communication for team

creativity and innovation, as it provides an essential vehicle through which team members make sense of complex tasks and share knowledge (Drazin, Glynn, & Kazanjian, 1999; Hülshager, Anderson, & Salgado, 2009). Yet, as the earlier quote from the Yahoo! memo clearly illustrates, firms are concerned about communication suffering as a result of team members working more flexibly. In particular, they worry about a decline in the type of informal, spontaneous communication that occurs when employees are together in the office. These concerns are not without foundation; early research points to the importance of physical proximity for informal interactions (T. J. Allen, 1977; Kiesler & Cummings, 2002; Olson & Olson, 2000). Drawing from literature on communication formality (Hinds & Mortensen, 2005; Kraut, Fish, et al., 1990), I distinguish between formal communication and two forms of informal communication, finding evidence for the unique effect of informal interactions on team innovation outcomes. Further, drawing on media richness and synchronicity literature (Daft & Lengel, 1984, 1986; Dennis, Fuller, & Valacich, 2008; Dennis & Valacich, 1999), I compare the relative importance of whether teams engage in this type of informal communication face to face or via electronic tools. In doing so, I address important questions about whether teams who miss out on opportunities for impromptu face-to-face communication are still able to achieve the same innovation outcomes using alternative media.

Finally, a third contribution of this study is the introduction of a new set of outcomes into the literature on flexible work arrangements. Extant studies of FWAs have primarily focused on outcomes associated with individuals' work-family conflict (e.g., Allen et al., 2013), job attitudes (e.g., Baltes et al., 1999; Gajendran & Harrison, 2007; Golden, 2006a; Golden & Veiga, 2005), and occupational stress and health (e.g., Butler, Grzywacz, Ettner, & Liu, 2009; Golden, 2006b; Grzywacz, Carlson, & Shulkin, 2008; Moen

et al., 2016). While this series of findings has established the important role that flexibility plays in attracting, engaging, and retaining a diverse talent pool, it has provided less insight into the impact of flexibility on key dimensions of performance. A small, but growing number of studies have examined the effects of flexibility on task and contextual performance outcomes (e.g., Bloom et al., 2015; Gajendran et al., 2015; Golden & Veiga, 2008), but few have examined creativity and innovation (see Coenen & Kok, 2014 for an exception). Our limited understanding of innovation outcomes is problematic because firms are not only concerned with the retention and productivity of their employees, but with their ability to generate and implement novel and useful new ideas that will contribute to the long-term survival and success of the organization. Consequently, I draw from research on creativity and innovation (e.g., Anderson et al., 2014; Baer, 2012; Perry-Smith & Mannucci, 2017) to examine how the team dynamics associated with flexibility impact idea generation and innovation.

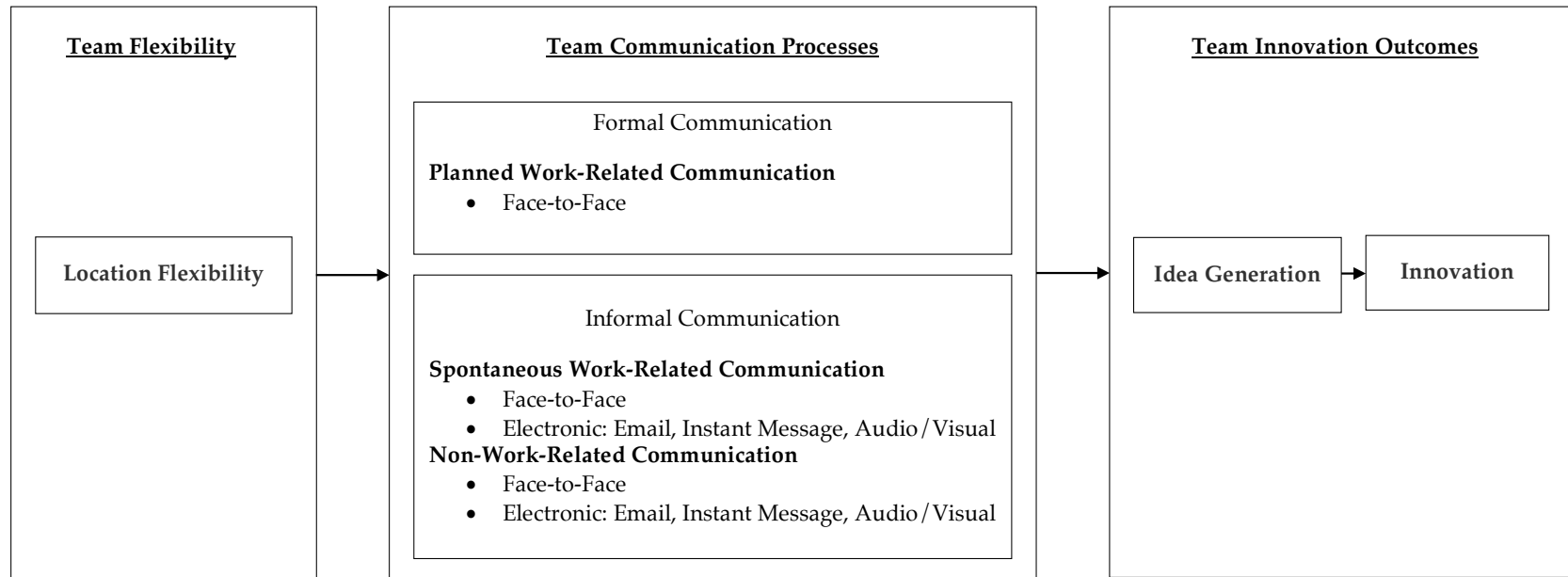
THEORETICAL OVERVIEW AND HYPOTHESES

In this study, I focus on location flexibility, rather than other types of FWAs, for two reasons. First, location flexibility has the greatest potential to impact whether team members are physically present in the office. By definition, location flexibility enables individuals to work remotely for some portion of their workweek and, in practice, this typically involves working some combination of half or full work days away from the office (Gajendran & Harrison, 2007). In contrast, the most common type of FWA—flextime—involves individuals adjusting the start or end time of their work day but maintaining the majority of their work hours in the office over the course of the regular work day (Kossek & Michel, 2011). Second, the recent wave of organizational flexibility cutbacks has explicitly targeted location flexibility. This focus is consistent with literature documenting the pervasiveness of ideal worker norms, which involve the importance of

being physically present at the office (Davies & Frink, 2014; Reid, 2015). Yet, without more research on FWAs in team contexts, it is difficult for managers and organizations to assess the legitimacy of these concerns about location flexibility: are they justified or merely reflective of deeply-rooted beliefs about the best way to organize work?

I proceed in answering this overarching question in four parts. First, I investigate whether teams whose members work a greater proportion of their week remotely engage less frequently in two forms of face-to-face informal communication. Second, I investigate whether this type of communication is uniquely important by testing whether it has a unique effect on team idea generation apart from the effect associated with face-to-face formal communication. Third, I consider whether electronic alternatives to face-to-face informal communication are as effective in driving team idea generation. After all, if face-to-face informal communication is indeed critical and suffers when team members work more flexibly, it is important to consider whether teams can substitute for its loss by utilizing electronic communication tools. Finally, I link team idea generation with manager ratings of innovation to establish whether the ideas that teams produce are implemented in the form of new organizational products, processes, and services. The theoretical model illustrating this approach is depicted in Figure 1.

Figure 1. Theoretical Model



The Effect of Location Flexibility on Face-to-Face Informal Communication

When members of a team work remotely, their work arrangement decisions have implications for not only how they manage their own work but also for how they interface with other members of their team. Simply put, when team members are less physically proximal, their face-to-face contact is limited. Reduced face time among team members can create challenges for the team's ability to coordinate effectively. Preserving face-to-face communication is especially challenging for teams engaging in greater location flexibility (Kossek & Van Dyne, 2008; Van Dyne, Kossek, & Lobel, 2007). However, when faced with the challenge of reduced face time, it is unclear whether all forms of face-to-face communication suffer equally, or whether some forms are impeded more than others. Drawing from literature on communication formality and content (Hinds & Mortensen, 2005; Kraut, Egidio, & Galegher, 1990; Kraut, Fish, et al., 1990; Marlow, Lacerenza, & Salas, 2016), I differentiate in this study among two key forms of face-to-face communication: (1) face-to-face formal communication (i.e. *face-to-face planned work-related communication*); and (2) face-to-face informal communication (i.e. *face-to-face spontaneous work-related communication* and *face-to-face non-work-related communication*). I posit that these two forms of face-to-face communication are likely to be differentially impacted by team members working remotely, such that there will be a reduction in face-to-face informal communication but not in face-to-face formal communication.

The distinction between formal and informal communication has received surprisingly little attention in the organizational literature, yet it is essential to our understanding of which interactions may be diminished when members of a team work more flexibly. Kraut and Fish et al. (1990) characterize informal communication as a

behavior that participants engage in, with key features being its lack of pre-specification or rule boundedness and its richness and interactivity. Through spontaneous encounters and “water cooler” talk, members of a team can communicate more casually and in a less structured context, one with fewer situational constraints and norms about how they should interact and about which topics they should interact (Cooper & Withey, 2009; Mischel, 1977). In informal encounters, the length of interaction time, the role of participants, and the content of the conversation are not specified in advance. Team members may interact about issues related to their work or share information about their non-work lives. Because face-to-face informal communication, by its very nature, is unlikely to be coordinated in advance, it tends to diminish when team members are less proximal to one another (T. J. Allen, 1977; Kiesler & Cummings, 2002; Olson & Olson, 2000). As a result, when team members work a greater proportion of their workweek away from the office, they miss out on opportunities to bump into one another and connect informally, be it about work or non-work related matters.

In contrast, formal communication involves interactions that are structured and specified in advance (Kraut, Fish, et al., 1990), enabling workers to plan their engagement ahead of time. When team members make decisions about their work location, they are able to coordinate their schedules so that they are present for pre-specified interactions with teammates. Planned team meetings, for example, involve team members convening at a specific time with a purpose for moving forward on group tasks. Thus, even when team meetings are scheduled to take place at the office, team members who take advantage of location flexibility can still plan to attend these meetings in person. As a result, location flexibility should not have a significant impact on face-to-face planned work-related communication. Consequently, I posit the following hypothesis:

***Hypothesis 1:** Teams with greater location flexibility will engage in less frequent face-to-face informal communication ([a] face-to-face spontaneous work-related communication and [b] face-to-face non-work-related communication).*

The Effects of Face-to-Face Formal and Informal Communication on Idea Generation

New ideas for products, services, and processes are essential for sustained organizational competitiveness in an increasingly dynamic economy. Research has established the importance of communication as a major source of idea generation and innovation (e.g., Hülshager et al., 2009; Keller, 2001; Leenders et al., 2003). When team members interact, they have opportunities to share past experiences and ideas with one another. Frequent communication is especially important when teams are engaged in knowledge-intensive work, when tasks are complex and the path to achieving team goals is uncertain (Kraut, Fussel, Brennan, & Siegel, 2002; Leenders et al., 2003). Consistent updates, real-time problem solving, and reliable access to team members is important in dynamic knowledge work settings. Moreover, scholars have long argued that face-to-face communication is critical for teams to coordinate their work, particularly when teams are engaged in complex knowledge-based work (Van de Ven, 1986). Consistent with this, creativity and innovation researchers have emphasized the instrumental role that in-person interactions play in the early stages of the idea journey when teams are focused on generating, rather than implementing, ideas (e.g., Perry-Smith & Mannucci, 2017).

The Effect of Face-to-Face Formal Communication on Idea Generation. Planned, in-person communication is a key way in which team members interact. Regularly scheduled team meetings, for example, provide the foundation for team members to get together, share important updates, and strategize about the work ahead. Formal

communication, with its greater structure and pre-specification, constitutes a stronger situation in which there are clearer norms and behavioral scripts guiding who will interact, what topics will be discussed, how they will be sequenced, and whether decisions are expected to be made (Cooper & Withey, 2009; Gioia & Poole, 1984; Mischel, 1977). I posit that planned communication impacts idea generation through its effects on the structure of interactions. For example, because team meetings are typically convened with a purpose, topics are likely to be pre-specified and planned in advance (e.g., through the use of an agenda), ensuring that important problems or issues will be considered rather than remain unaddressed (Kraut, Fish, et al., 1990). Moreover, planned, formal communication also enables team members to know what to expect and to come prepared, which may improve the quality and quantity of shared information. Finally, formal communication can facilitate greater information clarity and high-quality feedback by ensuring that team members hear, interpret, and confirm their understanding of shared information (Marlow et al., 2016; McIntyre & Salas, 1995). Taken together, engagement in frequent planned in-person interactions about the team's work provides a vehicle through which the team can address complex problems, share high-quality information, and identify novel solutions. Therefore, I put forth the following hypothesis:

***Hypothesis 2a:** Teams engaging in more frequent face-to-face formal communication (i.e. face-to-face planned work-related communication) will report greater idea generation.*

The Unique Effect of Face-to-Face Informal Communication on Idea Generation.

In this study, I argue that both types of face-to-face informal communication play a unique role in facilitating team idea generation apart from the effect of face-to-face

planned work-related communication. Informal communication represents a weak situation in which communication norms are less clear and there are fewer behavioral scripts guiding individuals (Cooper & Withey, 2009; Gioia & Poole, 1984; Mischel, 1977). Topics of conversation are not known ahead of time and there are fewer expectations about how interactions should unfold (Kraut, Fish, et al., 1990). Compared to face-to-face formal communication, face-to-face informal communication drives idea generation in a different manner. Creativity researchers have argued that idea generation involves a sensemaking process by which individuals seek to reduce the ambiguity inherent in complex work through interactions with others (Drazin et al., 1999; House, Rousseau, & Thomas-Hunt, 1995). Unstructured, informal interactions provide team members with a particularly fertile context for sensemaking, as it occurs without the situational constraints of formal meetings. When team members communicate in an informal, spontaneous manner, they can tackle issues in real time, engaging when topics are most salient and “top of mind.” In less constrained, flexible interaction contexts, team members may feel less inhibited and more willing to share their raw, partially processed thinking about their work since conversations are “off the record.” In addition to work-related interactions, in-person spontaneous communication situations present an important opportunity to discuss non-work-related topics. Team members may feel more comfortable to engage in personal interactions with one another and share more of their authentic selves (Bonaccio, O’Reilly, O’Sullivan, & Chiochio, 2016; Nishii, 2013). Such communication is important for bringing team members together to build and reinforce the team’s “social glue,” or the connections that create the foundation for team members to take risks and consider diverse points of view (Carmeli, Brueller, & Dutton, 2009; Losada & Heaphy, 2004). As a result, engagement in informal, unstructured

communication affords an important additional outlet for team members to personally connect, share timely information, and generate ideas together. Building on these arguments, I predict that both types of face-to-face informal communication will have unique effects on team idea generation:

***Hypothesis 2b:** Teams engaging in more frequent face-to-face informal communication—(1) face-to-face spontaneous work-related communication and (2) face-to-face non-work-related communication—will report greater idea generation, with each type of face-to-face informal communication accounting for unique variance apart from the effect of face-to-face formal communication (i.e. face-to-face planned work-related communication) on idea generation.*

Comparing Communication Media: The Effects of Face-to-Face and Electronic Informal Communication on Idea Generation

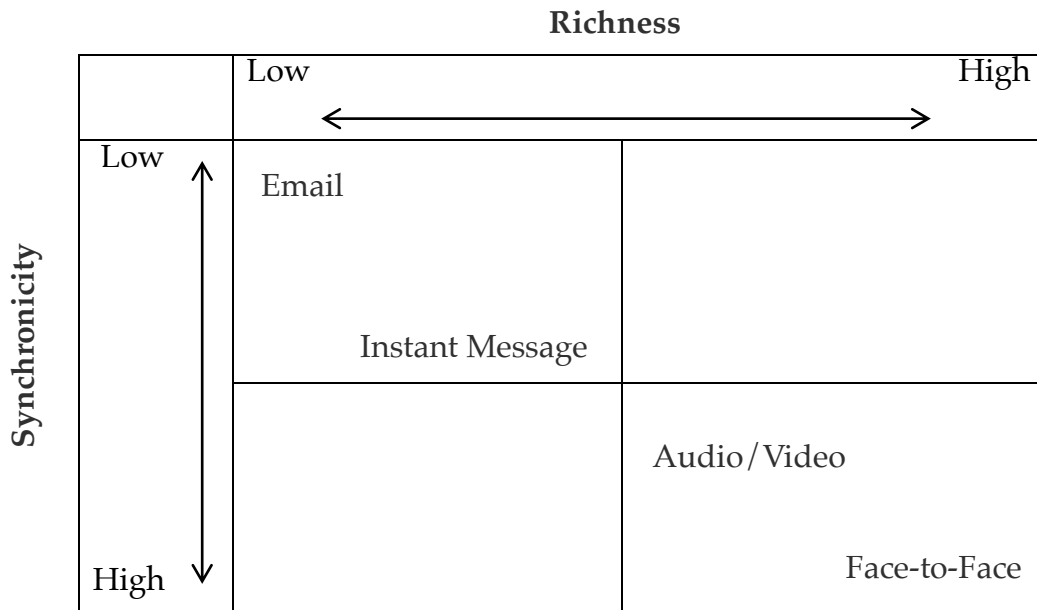
Concerns about the impact of flexibility on informal “water cooler” communication hinge on assumptions about the unique importance of the face-to-face medium. If face-to-face informal communication is truly the most effective method for generating ideas, then it follows that teams should be careful to preserve these regular, in-person interactions. However, with the proliferation of electronic communication tools, teams have access to a number of alternatives to facilitate informal communication outside of face-to-face contexts. In this study, I compare the effects of both types of face-to-face informal team communication (i.e., face-to-face spontaneous work-related and face-to-face non-work-related) with electronic informal communication using three types of media—email, instant message, audio/visual—to examine their effectiveness in facilitating team idea generation. Because these media differ along key dimensions of richness and synchronicity, they have different implications for their utility in facilitating

the kind of high quality communication required for novel tasks (Dennis et al., 2008). Media richness theory (Daft & Lengel, 1984, 1986; Daft, Lengel, & Trevino, 1987) identifies four main properties that characterize rich communication media and which are useful for understanding the differences among the media I capture: immediacy of feedback, multiplicity of cues, language variety, and personalization. First, a rich medium is one that enables team members to quickly seek feedback and ask for clarification, reducing the likelihood that messages are miscommunicated and misunderstood. Second, rich media offer a number of channels through which messages may be conveyed. For example, words convey only one aspect of communication; tone and body language offer important pieces of additional contextual information like subtext. Third, rich media permit team members to convey information more organically, such as through speech rather than written or numeric expressions. Fourth, rich media enable highly customized messages to be shared, ones that convey not only basic information but also personal meaning.

Extending insights from media richness theory, media synchronicity theory (Dennis et al., 2008; Dennis & Valacich, 1999) argues that synchronicity is also a key dimension of communication. Whether a medium permits members of a team to engage in real-time interaction, rather than experience coordination delays, is important for idea generation because it enables them to share less processed, “top of mind” thoughts and seek immediate feedback, facilitating the creative sensemaking process (Dennis et al., 2008). For example, among the three electronic media types captured here, audio/visual communication is not only richer than email or instant message communication, but it also enables more synchronous interactions. When members of a team send an email or instant message, it is not necessarily received immediately by the recipient; there may be

delays between messages, causing the interaction to be less fluid and in sync. Figure 2 depicts a two-by-two figure of the four media I capture plotted in accordance with their communication richness and synchronicity capabilities.

Figure 2. Communication Media by Richness and Synchronicity



Apart from providing a framework for understanding the differences among communication media, media richness and synchronicity theories emphasize the importance of selecting the appropriate medium for the context of the work: “for effective communication to occur, the richness of the medium should match the level of message ambiguity” (Daft et al., 1987, p. 359). This point is key for understanding when particular media should be leveraged and highlights the importance of fit; team members may not be best served by relying on their most preferred or the most accessible medium of communication. For example, routine tasks that focus on the maintenance of existing work processes do not involve the level of ambiguity that necessitates the use of a rich communication medium. With simple, routine tasks, email communication may be the

most efficient and effective medium. In contrast, generating new ideas to improve or replace existing products, processes, or services is an inherently ambiguous process that may be best supported by the use of a rich medium like face-to-face communication. As such, I argue that, for both types of informal communication, frequent face-to-face communication will be the strongest predictor of team idea generation, with the three electronic media varying in effectiveness according to their degree of richness and synchronicity:

***Hypothesis 3:** For both types of informal team communication—(a) spontaneous, work-related communication and (b) non-work-related communication—face-to-face communication will be the strongest positive predictor of idea generation, followed by audio/video, instant message and email communication.*

The Effect of Idea Generation on Innovation

Although idea generation—particularly of ideas that are both novel and useful—has been the primary focus of research on creativity (e.g., Amabile, 1996; Oldham & Cummings, 1996), to realize the benefits of new ideas that teams generate, the ideas must be applied to the organization’s products, processes, or services. Although producing ideas is a critical starting point for teams engaged in innovative work, it alone is insufficient for driving innovation. As such, the innovation literature is distinguished from the creativity literature by its focus on the implementation of creative ideas, or the “process of converting the idea into a tangible outcome that can subsequently be diffused or adopted” (Perry-Smith & Mannucci, 2017, p. 56). Despite consensus among researchers that idea generation and idea implementation capture distinct phases of the “idea journey” (e.g., Baer, 2012; Perry-Smith & Mannucci, 2017; West, 2002), much of the creativity and innovation research has not been explicit about conceptualizing and

measuring this distinction. For example, the most widely used creativity measure in the literature to date (12% of studies; cf. Anderson et al., 2014) includes items that tap into the extent to which employees suggest “new ways to achieve goals or objectives” and seek “new technologies, processes, techniques, and/or product ideas” *but also* whether they develop “adequate plans and schedules for the implementation of new ideas” (Zhou & George, 2001, p. 696). In this study, I measure both team idea generation and innovation—and do so using multi-source data—in order to avoid conflating these two constructs. In doing so, I am able to theoretically and empirically examine the impact of team communication on the critical first stage of the idea journey and subsequently predict how well teams put their ideas to use by measuring team innovation. Building on previous individual-level research that has found a positive relationship between the two idea phases (Axtell et al., 2000; Frese, Teng, & Wijnen, 1999), I hypothesize that:

Hypothesis 4: *Team idea generation will positively predict team innovation.*

METHODS

Sample and Data Collection

Data for this study were collected in a Fortune 500 company based in the United States. The organization was an ideal partner for this research for three reasons. First, the partner organization is strongly focused on creativity and innovation. Employees throughout the organization share an overarching goal of creating new products, processes, and services, and of identifying ways to re-engineer existing ones. Second, employees work in teams, collaborating interdependently to solve problems and work toward novel solutions. As such, the ability for team members to engage in timely and effective communication with one another is highly important. Third, although team members all work from the same office location and can interact face to face, they are

afforded discretion in managing their work location, enabling me to capture variability in location flexibility across teams. In addition to face-to-face communication, team members use electronic communication tools, such as email, instant message, and audio/visual platforms, to connect with one another.

Data collection consisted of a multi-source field study of U.S.-based teams with 3 or more members, with a survey administered to team members and managers and HR data collected from the organization. Surveys were delivered securely and electronically through a personalized link to 1,485 employees and 155 managers working in 155 teams (i.e. one manager per team) with an average team size of 9 members. Of the 155 teams surveyed, I received responses from 589 employees in 149 teams (40% overall employee survey response rate) and from 82 managers (53% overall manager response rate). Because I capture group-level properties, I limited my analyses to teams with 3 or more employee respondents ($M = 5$, $Range = 3-13$), yielding a total of 510 employees in 99 teams. Of the 99 teams with 3 or more respondents that were retained for analyses, a total of 54 matching manager responses were received. Thus, Hypotheses 1-3 were tested using data from all 99 teams and Hypothesis 4 was tested using data from the subset of 54 teams with matched manager responses.

Measures

Location Flexibility. Location flexibility was measured by asking team members: “What percentage of your work hours do you work remotely, out of the office, in a typical week?” Respondents indicated the extent to which they worked remotely on a sliding scale ranging from 0-100%, an approach that has been used in past studies of FWAs (e.g., Golden & Veiga, 2008; Kossek, Lautsch, & Eaton, 2006). Team member responses were averaged to form a team location flexibility variable.

Team Communication. The approach to measuring team communication in this study was drawn from prior theoretical and empirical work in the communication literature and specifically adapted to capture differences in the *spontaneity*, *content*, and *mode* of communication (Daft & Lengel, 1984, 1986; Daft et al., 1987; Hinds & Mortensen, 2005; Marlow et al., 2016; Wiesenfeld, Raghuram, & Garud, 1999). To assess *spontaneity*, I draw from the only empirical study of spontaneous communication to date (Hinds & Mortensen, 2005), in which respondents were asked to count how many times they had “unplanned, spontaneous” interactions with their team members within a given timeframe (e.g., “per year,” “per hour”). I retained the wording regarding the un/planned nature of the communication, but adapted the measurement scale to assess the overall frequency of communication in a typical week (e.g., “very infrequently,” “very frequently”) because a single interaction could involve more than one type of content. To assess communication *content*, I adopted the distinction in the communication literature between “task-oriented interaction” and “relational interaction” (Marlow et al., 2016) and asked team members to report their frequency of communication about either “work-related matters” or “non-work-related matters” with their teammates. Finally, to capture communication *medium*, I draw on media richness theory (Daft & Lengel, 1986) and empirical studies of communication media (e.g., Wiesenfeld et al. 1999) to distinguish between face-to-face and electronic communication media. To identify the specific forms of electronic communication most relevant to the teams in this sample, I consulted organizational leaders who indicated that the most widely used electronic communication platforms were email, instant message (e.g., Skype for Business), and audio/visual tools (e.g., Skype for Business). Team members were asked to respond to each of the following communication items on a 5-point scale

(1 = *very infrequently* to 5 = *very frequently*) and their responses for each item were averaged.

Face-to-Face Formal Communication: Face-to-face formal communication was captured by asking team members how frequently they engaged in *face-to-face planned work-related communication*: “In the typical week, how frequently do you engage in planned face-to-face interactions with your teammates about the work that you do at [the organization] (e.g., scheduled meetings)?”

Face-to-Face Informal Communication: Two forms of face-to-face informal communication were captured in this study: (1) face-to-face spontaneous work-related communication and (2) face-to-face non-work-related communication. *Face-to-face spontaneous work-related communication* was measured by asking team members: “In the typical week, how frequently do you engage in unplanned, spontaneous face-to-face interactions with your teammates about the work that you do at [the organization] (e.g., unscheduled or informal conversations)?” *Face-to-face non-work-related communication* was assessed with the following item: “In the typical week, how frequently do you engage in face-to-face interactions with your teammates about matters other than the work you do at [the organization]?”

Electronic Informal Communication: For each of the two types of informal communication, three forms of electronic media were measured. *Electronic spontaneous work-related communication* was captured with three questions asking team members to report their frequency of communication using each of three electronic media: “In the typical week, how frequently do you engage with your teammates in unplanned, spontaneous [(1) email, (2) instant message, (3) audio/visual] interactions about the work that you do at [the organization]?” Similarly, to measure *electronic non-work-related*

communication, team members reported their frequency of non-work-related communication with each electronic medium: “In the typical week, how frequently do you engage with your teammates in [(1) email, (2) instant message, (3) audio/visual] interactions about matters other than the work you do at [the organization]?”

Idea Generation. Idea generation was measured using three items from Zhou and George’s (2001) widely-used 12-item individual creativity scale and one item added in consultation with organizational leaders to more closely align with the organizational context.¹ The items were adapted to the team level based on referent shift logic (Chan, 1998). An example item is: “The members of this team generate new and innovative ideas.” The three items from the original creativity scale were selected based on their theoretical alignment with the idea generation stage, rather than with later stages of the innovation process (Perry-Smith & Mannucci, 2017).² Team members rated each of the items on a 5-point scale ranging from 1 = “strongly disagree” to 5 = “strongly agree.” Cronbach’s alpha for the scale was .88 and aggregation indices indicated strong agreement among team members, justifying the team consensus logic (Chan, 1998) and the creation of a team-level variable: ICC(1) = .12; ICC(2) = .40; Median Rwg(j) = .88 (Bliese, 2000; LeBreton & Senter, 2008).

Innovation. Team managers assessed team innovation using a 4-item scale developed by De Dreu and West (2001) and used in prior field studies on team innovation (e.g., Gajendran & Joshi, 2012). Sample items include: “Team members often implement

¹ Appendix A contains the full scale items.

² Examples of items from the original Zhou and George creativity scale that were not chosen because they capture later stages of the innovation process: “promotes and champions ideas to others” (idea championing stage) and “develops adequate plans and schedules for the implementation of new ideas” (idea implementation stage; Zhou & George, 2001, p. 696).

new ideas to improve the quality of our products or processes” and “This is an innovative team”; managers measured items on a 5-item scale (1 = *strongly disagree* to 5 = *strongly agree*). Cronbach’s alpha for the scale was .75, demonstrating adequate reliability (Cortina, 1993).

Control Variables. To rule out alternative explanations for the hypothesized relationships, I included control variables that account for differences among teams in their: size and work structure (*team size, task interdependence, autonomy*), tenure (*team tenure [in years], organizational tenure [in years]*), *work hours*, and diversity (*gender diversity, ethnic diversity, age diversity*). Although the teams in the sample were included because of their comparable size and interdependence, I also included these variables as controls to account for any remaining variability that may affect team processes. In addition, I controlled for the average number of years that employees had worked in their teams and in the organization to account for their prior knowledge and experience with one another and their work. I also included controls for team autonomy and team average weekly work hours to rule out the possibility that the team location flexibility variable is capturing the team’s flexibility in deciding how they complete their work tasks or differences in how long they work. Finally, I controlled for three dimensions of team diversity (gender, ethnicity, age) to account for potential differences in the nature of team interactions. Team size was assessed with HR data from the organization and the remaining control variables were assessed using individual employee survey responses and combined to form team-level variables. Task interdependence and autonomy were each measured using 3-item scales (Campion, Medsker, & Higgs, 1993; Spreitzer, 1995,

respectively).³ Gender diversity (0 = male, 1 = female) and ethnic diversity (0 = non-white; 1 = white) were measured using Blau indices, and age diversity (years) was captured with a standard deviation measure (Harrison & Klein, 2007).

ANALYSES AND RESULTS

Descriptive Statistics

The means, standard deviations, and correlations of all study variables are presented in Table 1. On average, teams engaged in low levels of location flexibility ($M = 10.04\%$, $SD = 8.27\%$, $Range = 0-44.5\%$), with team members working an average of 4.5 hours of their typical week away from the office. Teams reported high frequencies of face-to-face planned and spontaneous work-related communication ($M = 3.90$ and $M = 4.28$, respectively), and a moderate frequency of face-to-face non-work-related communication ($M = 3.58$). When teams engaged in spontaneous work-related and non-work-related communication, they did so primarily in person, relying less frequently on email and instant message communication, and the least on audio/visual communication. Team members indicated moderately high levels of idea generation ($M = 3.89$) and managers reported high levels of team innovation ($M = 4.07$).

Consistent with my predictions in Hypothesis 1, team location flexibility was significantly and negatively correlated with face-to-face spontaneous work-related communication ($r = -.26$, $p < .05$) and with face-to-face non-work-related communication ($r = -.22$, $p < .05$); location flexibility was unrelated to face-to-face planned work-related communication ($r = .03$, n.s.). In line with my predictions in Hypothesis 2, team idea generation was significantly and positively correlated with all three forms of face-to-face

³ Full scale items, Cronbach's alpha, and aggregation statistics for both scales are shown in Appendix A.

communication: planned work-related ($r = .28, p < .01$), spontaneous work-related ($r = .36, p < .001$), and non-work-related ($r = .24, p < .05$). Interestingly, face-to-face spontaneous work-related communication demonstrated the strongest correlation with idea generation among all forms of face-to-face communication. The only form of electronic communication that was significantly correlated with idea generation was audio/visual spontaneous work-related communication ($r = .20, p < .05$), which is in line with my predictions in Hypothesis 3. Finally, team idea generation was strongly and positive correlated with team innovation, as expected based on Hypothesis 4 ($r = .42, p < .01$).

Table 1. Descriptive Statistics and Correlations Among Study Variables

Variable	M	SD	N	1	2	3	4	5	6	7	8
1. Location Flexibility	10.04	8.27	99	–							
2. F2F Planned Work Comm.	3.90	0.54	99	0.03	–						
3. F2F Spontaneous Work Comm.	4.28	0.52	99	-0.26*	0.48***	–					
4. F2F Non-Work Comm.	3.58	0.61	99	-0.22*	0.30**	0.49***	–				
5. Email Spontaneous Work Comm.	3.38	0.61	99	0.14	0.11	0.18+	0.11	–			
6. IM Spontaneous Work Comm.	3.10	0.90	99	0.22*	0.13	0.13	-0.03	0.41***	–		
7. AV Spontaneous Work Comm.	1.65	0.69	99	0.33***	-0.03	-0.17+	-0.12	0.27**	0.42***	–	
8. Email Non-Work Comm.	1.70	0.52	99	-0.11	0.16	-0.04	0.25*	0.18+	0.15	0.20*	–
9. IM Non-Work Comm.	1.89	0.64	99	0.03	0.09	0.05	0.15	0.20*	0.53***	0.36***	0.55***
10. AV Non-Work Comm.	1.19	0.37	99	0.29**	0.00	-0.28**	-0.05	0.05	0.19+	0.60***	0.40***
11. Idea Generation	3.89	0.50	99	0.03	0.28**	0.36***	0.24*	0.18+	0.12	0.20*	-0.03
12. Innovation	4.07	0.64	54	0.08	0.05	0.09	0.05	0.01	-0.18	0.01	-0.19
13. Autonomy	4.09	0.39	99	0.28**	0.16	0.02	0.08	0.17+	-0.13	0.01	0.03
14. Task Interdependence	3.89	0.48	99	-0.01	0.11	0.22*	0.07	0.27**	0.04	0.06	-0.18+
15. Team Size	10.41	2.65	99	-0.16	0.00	-0.02	0.07	-0.05	-0.17+	-0.15	0.01
16. Work Hours	44.35	3.81	99	0.32**	0.20*	0.03	-0.05	0.18+	0.15	0.20*	-0.12
17. Organizational Tenure	14.11	6.48	99	0.03	0.08	0.04	0.02	-0.06	-0.40***	-0.24*	-0.06
18. Team Tenure	2.89	1.99	90	0.19+	-0.01	-0.18+	-0.04	-0.22+	-0.33**	-0.05	0.24*
19. Gender Diversity	0.23	0.21	99	-0.03	0.05	0.03	0.09	0.16	0.09	-0.04	0.05
20. Ethnic Diversity	0.21	0.21	99	0.27**	-0.02	-0.03	-0.13	-0.05	0.01	-0.09	-0.20+
21. Age Diversity	10.00	4.61	93	-0.14	0.07	0.10	0.11	0.07	-0.08	-0.12	-0.09

Table 1. (CONTINUED)

	Variable	9	10	11	12	13	14	15	16	17	18	19	20	21
10.	AV Non-Work Comm.	0.44***	-											
11.	Idea Generation	-0.01	0.12	(.88)										
12.	Innovation	-0.19	-0.06	0.42**	(.75)									
13.	Autonomy	-0.09	0.02	0.18+	0.15	(.88)								
14.	Task Interdependence	-0.18+	-0.11	0.40***	0.23+	0.07	(.74)							
15.	Team Size	-0.14	-0.17+	-0.07	-0.01	0.15	-0.06	-						
16.	Work Hours	-0.06	0.05	0.27**	0.27*	0.21*	0.21*	-0.16	-					
17.	Organizational Tenure	-0.46***	-0.29**	0.10	0.47***	0.30**	0.06	0.00	0.19+	-				
18.	Team Tenure	-0.15	0.07	0.03	0.09	0.19+	-0.06	0.07	-0.07	0.37***	-			
19.	Gender Diversity	0.16	-0.05	-0.09	0.06	0.14	0.05	0.03	0.14	-0.18+	-0.08	-		
20.	Ethnic Diversity	-0.04	-0.03	-0.02	0.05	0.06	-0.07	0.04	0.11	-0.03	0.00	0.02	-	
21.	Age Diversity	-0.07	-0.07	-0.01	0.23	-0.09	0.21*	0.04	-0.16	-0.18+	-0.11	-0.09	0.10	-

Note. Cronbach's alphas are reported along the diagonal in parentheses.

Hypothesis Tests

All hypotheses were tested with team-level OLS regressions in Stata and interpreted using two-tailed significance tests. Data from the full sample of 99 teams with 3 or more respondents (regardless of receiving matched manager data) was used to test Hypotheses 1-3, whereas Hypothesis 4 was tested using data from only the subset of teams with matching manager innovation data).⁴ For each hypothesis test, I ran two models: I entered the full set of control variables in the first model, followed by the hypothesized predictor(s) in the second model. Due to the moderately high correlations among the communication variables in my dataset, I supplemented the OLS regressions with relative weight analyses to provide a more interpretable estimation of the unique effect of each communication predictor on idea generation.

Relative weight analyses are a useful technique to assess the relative importance of a variable, or the unique contribution it makes in predicting an outcome variable (Johnson & Lebreton, 2004). Despite the utility of the method in addressing common issues that arise in management research (e.g., correlated predictor variables), and recent developments to provide user-friendly tools (Tonidandel & LeBreton, 2015), it has remained underutilized in the management literature (see Dragoni, Oh, Van Katwyk, & Tesluk, 2011; Judge & Zapata, 2015 for exceptions). Relative weight analyses address multicollinearity issues by creating a new, uncorrelated set of predictors (i.e., orthogonal) that are maximally related to the original predictors. Thus, in doing so, the technique partials out the shared variance among correlated predictors in the model. After the

⁴ For the sake of model parsimony and to preserve sample size, I tested each hypothesis using separate regression models rather than testing all hypotheses simultaneously in a path model ($N = 49$ teams when all variables are entered simultaneously into one model).

outcome variable is regressed on the new set of orthogonal predictors, they are then transformed back into the scale of the original predictors (Tonidandel & LeBreton, 2011, 2015). The results of the analyses yield a raw weight estimate for each predictor, which can be used to calculate the proportion of variance in the outcome variable that each predictor explains (Tonidandel & LeBreton, 2011). Finally, a bias-corrected bootstrapped confidence interval can be estimated to assess the statistical significance of the relative weights (Johnson, 2004; Tonidandel, LeBreton, & Johnson, 2009).

Results

The Effect of Location Flexibility on Face-to-Face Informal Communication. In Hypothesis 1a, I predicted that teams with greater location flexibility would engage in less frequent face-to-face spontaneous work-related communication. Results of the regression in Model 4 of Table 2 provide strong support for this hypothesis ($\beta = -.30, p < .05$). After entering the team location flexibility predictor variable to Model 4 (Table 2; compared to Model 3, Table 2), an additional 6% of the variance in face-to-face spontaneous work-related communication is explained ($R^2\Delta = .06$). In Hypothesis 1b, I predicted that teams with greater location flexibility would engage in less frequent face-to-face non-work-related communication. Based on the regression results shown in Model 6 of Table 2, I find marginally significant support for this prediction ($\beta = -.27, p = .05$). Introducing the team location flexibility predictor variable to Model 6 (Table 2; compared to Model 5, Table 2) accounts for an additional 4% of the variance in face-to-face non-work-related communication ($R^2\Delta = .04$). As a supplementary post-hoc analysis, I also tested the effect of team location flexibility on face-to-face planned work-related communication and found no significant effect ($\beta = -.12, n.s.$; Model 2, Table 2).

In addition to the main analyses testing Hypothesis 1a and 1b using the full sample of teams and all control variables (N = 84 after 15 teams were dropped from analyses due to missing data), I also conducted two additional sets of analyses to check the robustness of the results. First, I re-ran models 2, 4, and 6 in Table 2 without including control variables (Models 2 and 3, Table B1; Appendix B) and confirmed that the pattern of results is consistent in direction and magnitude, with support for Hypothesis 1b becoming significant ($\beta = -.22, p < .05$; Model 3, Table B1; Appendix B). Second, I re-ran models 2, 4, and 6 in Table B2 with two more conservative within-team response rate cut-offs of 40% and 50%. Results from these analyses (Tables B2 and B3, Appendix B) show a robust and consistent pattern of results.

Table 2. Team-Level OLS Models: Location Flexibility on Face-to-Face Communication

Face-to-Face Planned Work-Related Communication							
Model 1				Model 2			
Variable	B	SE	β	B	SE	β	
Intercept	0.15	(1.12)		-0.07	(1.15)		
1. Autonomy	0.18	(.17)	0.13	0.23	(.18)	0.16	
2. Interdependence	0.14	(.13)	0.12	0.13	(.13)	0.11	
3. Team Size	0.02	(.02)	0.08	0.01	(.02)	0.05	
4. Work Hours	0.05 *	(.02)	0.30 *	0.06 *	(.02)	0.33 *	
5. Organizational Tenure	0.00	(.01)	0.02	0.00	(.01)	-0.01	
6. Team Tenure	-0.01	(.03)	-0.02	0.00	(.03)	0.01	
7. Gender Diversity	-0.13	(.31)	-0.05	-0.18	(.31)	-0.07	
8. Ethnic Diversity	-0.28	(.31)	-0.11	-0.20	(.32)	-0.07	
9. Age Diversity	0.01	(.01)	0.06	0.01	(.01)	0.05	
10. Location Flexibility				-0.01	(.01)	-0.12	
	N	84			84		
	R ²	0.14			0.15		
Face-to-Face Spontaneous Work-Related Communication							
Model 3				Model 4			
Variable	B	SE	β	B	SE	β	
Intercept	2.78 *	(1.07)		2.25 *	(1.07)		
1. Autonomy	-0.03	(.16)	-0.02	0.10	(.17)	0.07	
2. Interdependence	0.28 *	(.13)	0.25 *	0.24 +	(.13)	0.22 +	
3. Team Size	0.01	(.02)	0.04	-0.01	(.02)	-0.03	
4. Work Hours	0.01	(.02)	0.06	0.02	(.02)	0.13	
5. Organizational Tenure	0.01	(.01)	0.13	0.01	(.01)	0.06	
6. Team Tenure	-0.06 *	(.03)	-0.24 *	-0.05	(.03)	-0.17	
7. Gender Diversity	0.18	(.29)	0.07	0.07	(.29)	0.03	
8. Ethnic Diversity	-0.37	(.30)	-0.14	-0.17	(.30)	-0.07	
9. Age Diversity	0.01	(.01)	0.08	0.01	(.01)	0.05	
10. Location Flexibility				-0.02 *	(.01)	-0.30 *	
	N	84			84		
	R ²	0.16			0.22*		
Face-to-Face Non-Work-Related Communication							
Model 5				Model 6			
Variable	B	SE	β	B	SE	β	
Intercept	2.24 +	(1.24)		1.71	(1.24)		
1. Autonomy	0.19	(.18)	0.13	0.32	(.19)	0.21	
2. Interdependence	0.05	(.15)	0.04	0.01	(.15)	0.01	
3. Team Size	0.00	(.03)	0.00	-0.01	(.03)	-0.06	
4. Work Hours	0.01	(.02)	0.04	0.02	(.02)	0.11	
5. Organizational Tenure	0.01	(.01)	0.08	0.00	(.01)	0.03	
6. Team Tenure	-0.04	(.03)	-0.12	-0.02	(.04)	-0.06	
7. Gender Diversity	0.21	(.34)	0.07	0.10	(.34)	0.03	
8. Ethnic Diversity	-0.65 +	(.34)	-0.23 +	-0.45	(.35)	-0.16	
9. Age Diversity	0.01	(.02)	0.09	0.01	(.01)	0.07	
10. Location Flexibility				-0.02 +	(.01)	-0.27 +	
	N	84			84		
	R ²	0.09			0.13		

The Effects of Face-to-Face Formal and Informal Communication on Idea Generation. In Hypothesis 2a, I predicted that teams engaging in more frequent face-to-face formal work-related communication would report greater idea generation. Results of the regression in Model 2 in Table 3 provide strong support for this hypothesis ($\beta = .28, p < .05$). After entering the face-to-face planned work-related communication predictor variable to Model 2 (Table 3; compared to Model 1, Table 3), an additional 7% of the variance in idea generation is explained ($R^2\Delta = .07$).

In Hypothesis 2b, I posited that teams engaging in more frequent face-to-face informal communication—(1) face-to-face spontaneous work-related communication and (2) face-to-face non-work-related communication—will report greater idea generation, with each type of face-to-face informal communication accounting for unique variance apart from the effect of face-to-face formal communication (i.e. face-to-face planned work-related communication) on idea generation. Results from Table 3 show that face-to-face spontaneous work-related communication is marginally significant when added to the model with face-to-face planned work-related communication ($\beta = .22, p < .10$; Model 3, Table 3), whereas face-to-face non-work-related communication is not significant when added to the model with face-to-face planned work-related communication ($\beta = .17, n.s.$; Model 4, Table 3). However, because teams that engage in face-to-face planned work-related communication tend to also frequently engage in face-to-face spontaneous work-related communication ($r = .48, p < .001$) and face-to-face non-work-related communication ($r = .30, p < .01$), the inclusion of the informal communication variables introduces multicollinearity that makes it difficult to interpret the unique effects of each variable on idea generation. Similarly, stemming from the multicollinearity between the informal communication variables ($r = .49, p < .001$), face-

to-face spontaneous work-related communication and face-to-face non-work-related communication are not individually significant when they are simultaneously added to the model ($\beta = .17$, n.s. and $\beta = .12$, n.s., respectively; Model 5, Table 3).⁵

Therefore, to account for the shared variance among the face-to-face communication variables, and to assess the unique effects of each of the two informal communication variables, I conducted a relative weight analysis as a supplemental test of Hypothesis 2b. As shown in Model 1 in Table 6, once the shared variance is partialled out, face-to-face spontaneous work-related communication is the only significant predictor among the three face-to-face communication variables ($rw = .08$, $p < .05$), accounting for 53% of the variance in idea generation. The fact that the results of the OLS regression (Model 5, Table 3) and the relative weight analysis (Model 1; Table 6) are not in accordance is not unexpected (Tonidandel et al., 2009) and can be explained by the difference in focus of the two analyses. On the one hand, regression weights in an OLS regression analysis reflect the explanation of incremental variance in an outcome variable; thus, when predictors are correlated, each individual predictor may not explain significant incremental variance. On the other hand, relative weights analyses remove the shared variance among correlated predictors and generate raw weights that reflect the non-trivial variance that each predictor explains in the outcome variable (Tonidandel & LeBreton, 2015). Based on the series of OLS regression analyses reported in Table 3, and the supplementary relative weights analyses reported in Table 6, I find significant

⁵ As a post-hoc test, I created a composite face-to-face informal communication variable by taking the team average of the face-to-face spontaneous work-related communication and face-to-face non-work-related communication variables. The composite variable significantly and positively predicts idea generation ($\beta = .24$, $p < .05$), when entered into the model with face-to-face planned work-related communication.

support for Hypothesis 2b. Informal face-to-face communication significantly and positively predicts idea generation over and above formal face-to-face communication, with this effect being primarily driven by face-to-face spontaneous work-related communication.

In addition to the tests of Hypothesis 2a and 2b reported above, and which use the full sample of teams and all control variables, I conducted two post-hoc analyses to examine the robustness of these results without the inclusion of control variables and with more conservative response rate cuts. First, I re-ran models 2 and 5 in Table 3 without including control variables (Models 1 and 4, Table C1; Appendix C) and found that the addition of the two informal communication variables accounts for a $R^2\Delta$ of .07, explaining variance in idea generation above and beyond face-to-face planned work-related communication. Moreover, the face-to-face spontaneous work-related communication variable remains significant in the model with all three face-to-face communication variables ($\beta = .26$ $p < .05$; Model 4, Table C1; Appendix C). Second, I re-ran models 2 and 5 in Table 3 with two more conservative within-team response rate cut-offs of 40% and 50%. Results from these analyses (Tables C2 and C3, Appendix C) show that the pattern of results remains consistent, albeit without achieving statistical significance.

Table 3. Team-Level OLS Models: Face-to-Face Communication on Idea Generation

		Idea Generation								
		Model 1			Model 2			Model 3		
Variable		B	SE	β	B	SE	β	B	SE	β
	Intercept	1.16	(.99)		1.12	(.95)		0.55	(.99)	
1.	Autonomy	0.21	(.15)	0.16	0.17	(.14)	0.13	0.19	(.14)	0.14
2.	Interdependence	0.41	** (.12)	0.38	** 0.37	** (.11)	0.34	** 0.33	** (.12)	0.30
3.	Team Size	-0.01	(.02)	-0.05	-0.01	(.02)	-0.07	-0.01	(.02)	-0.08
4.	Work Hours	0.01	(.02)	0.09	0.00	(.02)	0.01	0.00	(.02)	0.03
5.	Organizational Tenure	-0.01	(.01)	-0.07	-0.01	(.01)	-0.07	-0.01	(.01)	-0.10
6.	Team Tenure	0.00	(.03)	0.02	0.01	(.03)	0.02	0.02	(.03)	0.08
7.	Gender Diversity	-0.43	(.27)	-0.17	-0.40	(.26)	-0.16	-0.45	+	(.26)
8.	Ethnic Diversity	-0.08	(.27)	-0.03	-0.01	(.26)	0.00	0.04	(.26)	0.02
9.	Age Diversity	-0.01	(.01)	-0.06	-0.01	(.01)	-0.07	-0.01	(.01)	-0.08
10.	F2F Planned Work-Related Comm.				0.25	*	(.10)	0.28	*	0.16
11.	F2F Spontaneous Work-Related Comm.							0.21	+	(.12)
12.	F2F Non-Work-Related Comm.							0.22	+	0.22
	N	84			84			84		
	R ²	.21*			.28**			.31**		
		Model 4			Model 5					
Variable		B	SE	β	B	SE	β			
	Intercept	0.79	(.96)		0.47	(.99)				
1.	Autonomy	0.14	(.14)	0.11	0.17	(.14)	0.13			
2.	Interdependence	0.37	** (.11)	0.34	** 0.34	** (.12)	0.31	**		
3.	Team Size	-0.01	(.02)	-0.07	-0.01	(.02)	-0.07			
4.	Work Hours	0.00	(.02)	0.01	0.00	(.02)	0.03			
5.	Organizational Tenure	-0.01	(.01)	-0.09	-0.01	(.01)	-0.10			
6.	Team Tenure	0.01	(.03)	0.04	0.02	(.03)	0.08			
7.	Gender Diversity	-0.43	+	(.26)	-0.17	+	(.26)	-0.19	+	
8.	Ethnic Diversity	0.08	(.27)	0.03	0.09	(.27)	0.04			
9.	Age Diversity	-0.01	(.01)	-0.09	-0.01	(.01)	-0.09			
10.	F2F Planned Work-Related Comm.	0.22	*	(.10)	0.24	*	(.11)	0.17		
11.	F2F Spontaneous Work-Related Comm.				0.16	(.13)	0.17			
12.	F2F Non-Work-Related Comm.	0.15	(.09)	0.17	0.10	(.10)	0.12			
	N	84			84					
	R ²	.31**			.32**					

Comparing Communication Media: The Effects of Face-to-Face and Electronic Informal Communication on Idea Generation. In Hypothesis 3a, I predicted that face-to-face spontaneous work-related communication would be the strongest predictor of idea generation, followed by audio/video spontaneous work-related communication, instant message spontaneous work-related communication and email spontaneous work-related communication. Models 2-5 in Table 4 show separate tests of the effects of spontaneous work-related communication on idea generation using each medium. The results provide partial initial support: only face-to-face spontaneous work-related communication significantly predicted idea generation ($\beta = .30, p < .01$; Model 2, Table 4), whereas email spontaneous work-related communication ($\beta = .13, n.s.$; Model 3, Table 4), instant message spontaneous work-related communication ($\beta = .12, n.s.$; Model 4, Table 4), and audio/visual spontaneous work-related communication ($\beta = .11, n.s.$; Model 5, Table 4), did not. When all four spontaneous work-related communication predictors were added to the same model (Model 6, Table 4), face-to-face spontaneous work-related communication was the only significant predictor of idea generation ($\beta = .38, p < .01$), with a marginally significant effect for audio/visual spontaneous work-related communication ($\beta = .23, p < .10$).

To supplement the findings from Model 6 (Table 4), I also conducted a relative weight analysis to better understand the unique impact of each predictor on idea generation. The results from Model 2, shown in Table 6, are consistent; face-to-face spontaneous work-related communication was the only significant predictor ($rw = .14, p < .05$), accounting for 67% of the variance in idea generation explained by the four predictors of spontaneous work-related communication through different media.

Although all of the relative weights are not statistically significant,⁶ the pattern of the relative weights among the electronic communication predictors is largely in line with my predictions: audio/visual spontaneous work-related communication explained the most variance in idea generation (24%), followed by email spontaneous work-related communication (7%) and instant message spontaneous work-related communication (2%). Based on this series of results, Hypothesis 3a is mostly supported; face-to-face spontaneous work-related communication is the strongest predictor of idea generation, surpassing the effects of engaging in the same type of communication via electronic media.

In Hypothesis 3b, I put forth a parallel prediction for non-work-related communication, positing that face-to-face non-work-related communication would be the strongest predictor of idea generation, followed by audio/video non-work-related communication, instant message non-work-related communication and email non-work-related communication. Models 2-5 in Table 5 show separate tests of the effects of non-work-related communication on idea generation using each medium. The results provide partial initial support: only face-to-face non-work-related communication significantly predicted idea generation ($\beta = .22, p < .05$; Model 2, Table 5), whereas email non-work-related communication ($\beta = .02, n.s.$; Model 3, Table 5), instant message non-work-related communication ($\beta = .11, n.s.$; Model 4, Table 5), and audio/visual non-work-related communication ($\beta = .11, n.s.$; Model 5, Table 5), did not. When all four non-work-related communication predictors were added to the same model (Model 6, Table 5), face-

⁶ Due to the small sample size of teams, there is low power to detect significant effects of small to moderate magnitude (Tonidandel et al., 2009)

to-face non-work-related communication was the only significant predictor of idea generation ($\beta = .27, p < .05$).

Once again, to supplement the findings from Model 6 (Table 5), I conducted a relative weight analysis to assess the unique impact of each predictor on idea generation. The pattern of results in Model 3 (Table 6) illustrates that face-to-face non-work-related communication was the strongest predictor of idea generation (explaining 65%), followed by audio/visual non-work-related communication (24%), email non-work-related communication (8%), and instant message non-work-related communication (3%). However, the confidence intervals indicate that none of the four relative weights are statistically significant. Although face-to-face non-work-related communication explained a substantial amount of variance in idea generation among the non-work-related communication media predictors, the overall amount of variance in idea generation explained by non-work-related communication is small ($R^2 = .11$). Thus, each predictor accounts for a small relative weight, the significance of which is difficult to detect with a small sample size (Tonidandel et al., 2009). Taken together, I find partial support for Hypothesis 3b, concluding that face-to-face non-work-related communication is a stronger predictor of idea generation than non-work-related communication using electronic media.

Table 4. Team-Level OLS Models: Face-to-Face and Electronic Spontaneous Work-Related Communication on Idea Generation

		Idea Generation								
		Model 1			Model 2			Model 3		
Variable		B	SE	β	B	SE	β	B	SE	β
	Intercept	1.16	(.99)		0.36	(.99)		0.97	(1.00)	
1.	Autonomy	0.21	(.15)	0.16	0.22	(.14)	0.17	0.19	(.15)	0.14
2.	Interdependence	0.41 **	(.12)	0.38 **	0.33 **	(.12)	0.30 **	0.38 **	(.12)	0.36 **
3.	Team Size	-0.01	(.02)	-0.05	-0.01	(.02)	-0.06	-0.01	(.02)	-0.04
4.	Work Hours	0.01	(.02)	0.09	0.01	(.02)	0.08	0.01	(.02)	0.08
5.	Organizational Tenure	-0.01	(.01)	-0.07	-0.01	(.01)	-0.11	0.00	(.01)	-0.06
6.	Team Tenure	0.00	(.03)	0.02	0.02	(.03)	0.09	0.01	(.03)	0.05
7.	Gender Diversity	-0.43	(.27)	-0.17	-0.49 +	(.26)	-0.19 +	-0.45 +	(.27)	-0.18 +
8.	Ethnic Diversity	-0.08	(.27)	-0.03	0.03	(.26)	0.01	-0.07	(.27)	-0.03
9.	Age Diversity	-0.01	(.01)	-0.06	-0.01	(.01)	-0.08	-0.01	(.01)	-0.06
10.	F2F Spontaneous Work Comm.				0.29 **	(.10)	0.30 **			
11.	Email Spontaneous Work Comm.							0.12	(.10)	0.13
12.	IM Spontaneous Work Comm.									
13.	AV Spontaneous Work Comm.									
N		84			84			84		
R ²		.21*			.29**			.23*		
		Model 4			Model 5			Model 6		
Variable		B	SE	β	B	SE	β	B	SE	β
	Intercept	1.00	(1.00)		1.15	(.99)		0.02	(.99)	
1.	Autonomy	0.22	(.15)	0.17	0.21	(.15)	0.16	0.20	(.14)	0.15
2.	Interdependence	0.40 **	(.12)	0.37 **	0.40 **	(.12)	0.37 **	0.28 *	(.12)	0.26 *
3.	Team Size	-0.01	(.02)	-0.05	-0.01	(.02)	-0.04	-0.01	(.02)	-0.04
4.	Work Hours	0.01	(.02)	0.07	0.01	(.02)	0.06	0.00	(.02)	0.00
5.	Organizational Tenure	0.00	(.01)	-0.02	0.00	(.01)	-0.02	0.00	(.01)	-0.01
6.	Team Tenure	0.01	(.03)	0.04	0.00	(.03)	0.01	0.03	(.03)	0.11
7.	Gender Diversity	-0.39	(.27)	-0.16	-0.37	(.28)	-0.15	-0.38	(.27)	-0.15
8.	Ethnic Diversity	-0.07	(.27)	-0.03	-0.05	(.27)	-0.02	0.12	(.26)	0.05
9.	Age Diversity	0.00	(.01)	-0.04	0.00	(.01)	-0.03	0.00	(.01)	-0.05
10.	F2F Spontaneous Work Comm.							0.36 **	(.11)	0.38 **
11.	Email Spontaneous Work Comm.							0.08	(.10)	0.09
12.	IM Spontaneous Work Comm.	0.07	(.07)	0.12				-0.01	(.07)	-0.01
13.	AV Spontaneous Work Comm.				0.08	(.09)	0.11	0.18 +	(.09)	0.23 +
N		84			84			84		
R ²		.22*			.22*			.34**		

Table 5. Team-Level OLS Models: Face-to-Face and Electronic Non-Work-Related Communication on Idea Generation

		Idea Generation								
		Model 1			Model 2			Model 3		
Variable		B	SE	β	B	SE	β	B	SE	β
	Intercept	1.16	(.99)		0.72	(.99)		1.13	(1.01)	
1.	Autonomy	0.21	(.15)	0.16	0.17	(.15)	0.13	0.21	(.15)	0.16
2.	Interdependence	0.41	** (.12)	0.38	** 0.40	** (.11)	0.37	** 0.41	** (.12)	0.38
3.	Team Size	-0.01	(.02)	-0.05	-0.01	(.02)	-0.05	-0.01	(.02)	-0.05
4.	Work Hours	0.01	(.02)	0.09	0.01	(.02)	0.08	0.01	(.02)	0.09
5.	Organizational Tenure	-0.01	(.01)	-0.07	-0.01	(.01)	-0.09	-0.01	(.01)	-0.07
6.	Team Tenure	0.00	(.03)	0.02	0.01	(.03)	0.05	0.00	(.03)	0.01
7.	Gender Diversity	-0.43	(.27)	-0.17	-0.47	+	(.26)	-0.19	+	(.27)
8.	Ethnic Diversity	-0.08	(.27)	-0.03	0.05	(.27)	0.02	-0.07	(.29)	-0.03
9.	Age Diversity	-0.01	(.01)	-0.06	-0.01	(.01)	-0.08	-0.01	(.01)	-0.05
10.	F2F Non-Work Comm.				0.19	*	(.09)	0.22	*	
11.	Email Non-Work Comm.							0.02	(.12)	0.02
12.	IM Non-Work Comm.									
13.	AV Non-Work Comm.									
	N		84			84			84	
	R ²		.21*			.26*			.21*	
		Model 4			Model 5			Model 6		
Variable		B	SE	β	B	SE	β	B	SE	β
	Intercept	0.95	(1.01)		0.97	(1.01)		0.34	(1.02)	
1.	Autonomy	0.21	(.15)	0.16	0.20	(.15)	0.15	0.13	(.15)	0.10
2.	Interdependence	0.42	** (.12)	0.39	** 0.42	** (.12)	0.39	** 0.42	** (.12)	0.39
3.	Team Size	-0.01	(.02)	-0.05	-0.01	(.02)	-0.03	0.00	(.02)	0.00
4.	Work Hours	0.01	(.02)	0.08	0.01	(.02)	0.08	0.01	(.02)	0.06
5.	Organizational Tenure	0.00	(.01)	-0.02	0.00	(.01)	-0.02	0.00	(.01)	0.02
6.	Team Tenure	0.00	(.03)	0.02	0.00	(.03)	0.00	0.02	(.03)	0.06
7.	Gender Diversity	-0.42	(.27)	-0.17	-0.39	(.27)	-0.16	-0.42	(.27)	-0.17
8.	Ethnic Diversity	-0.03	(.28)	-0.01	-0.04	(.28)	-0.02	0.06	(.28)	0.03
9.	Age Diversity	0.00	(.01)	-0.04	-0.01	(.01)	-0.05	-0.01	(.01)	-0.06
10.	F2F Non-Work Comm.							0.23	*	(.09)
11.	Email Non-Work Comm.							-0.15	(.14)	-0.14
12.	IM Non-Work Comm.	0.10	(.10)	0.11				0.09	(.11)	0.11
13.	AV Non-Work Comm.				0.14	(.15)	0.11	0.23	(.17)	0.18
	N		84			84			84	
	R ²		.22*			.22*			.29*	

Table 6. Team-Level Relative Weight Analyses: Communication Media on Idea Generation

Idea Generation				
Model 1				
Variable	Raw Weight	Rescaled Weight	95% CI LL	95% CI UL
1. F2F Planned Work Comm.	0.04	29%	[-0.014,	0.160]
2. F2F Spontaneous Work Comm.	0.08*	53%	[0.002,	0.191]
3. F2F Non-Work Comm.	0.03	18%	[-0.018,	0.119]
	N	99		
	R ²	0.15**		
Idea Generation				
Model 2				
Variable	Raw Weight	Rescaled Weight	95% CI LL	95% CI UL
1. F2F Spontaneous Work Comm.	0.14*	67%	[0.013,	0.311]
2. Email Spontaneous Work Comm.	0.01	7%	[-0.042,	0.101]
3. IM Spontaneous Work Comm.	0.00	2%	[-0.097,	0.024]
4. AV Spontaneous Work Comm.	0.05	24%	[-0.024,	0.163]
	N	99		
	R ²	0.21***		
Idea Generation				
Model 3				
Variable	Raw Weight	Rescaled Weight	95% CI LL	95% CI UL
1. F2F Non-Work Comm.	0.07	65%	[-0.033,	0.182]
2. Email Non-Work Comm.	0.01	8%	[-0.108,	0.035]
3. IM Non-Work Comm.	0.00	3%	[-0.063,	0.109]
4. AV Non-Work Comm.	0.03	24%	[-0.122,	0.014]
	N	99		
	R ²	0.11*		

Note. Confidence intervals were calculated using a bias-corrected bootstrapping procedure using 10,000 replications with $\alpha = .05$ (Tonidandel et al., 2009). Due to the small sample size of teams, there is low power to detect significant effects of a small to moderate magnitude (i.e. $rw = .05-.07$). Based on Tonidandel et al.'s (2009) simulation using a 95% CI, power is estimated to be approximately .50-.60; as a result, the probability of Type 2 errors is high.

The Effect of Idea Generation on Innovation. Finally, in Hypothesis 4, I posited that idea generation would predict innovation. I tested this hypothesis using data from the subset of 54 teams with matching manager data and retained a total of 49 teams after accounting for missing data. The results shown in Model 2 of Table 7 provide strong support for this hypothesis ($\beta = .42, p < .01$). Teams that generate more ideas for products, processes, and services are rated by their managers as being more innovative.

Table 7. Team-Level OLS Models: Idea Generation on Innovation

Variable	Innovation						
	Model 1			Model 2			
	B	SE	β	B	SE	β	
Intercept	2.00	(1.61)		1.45	(1.48)		
1. Autonomy	-0.05	(.23)	-0.03	-0.18	(.21)	-0.12	
2. Interdependence	0.11	(.18)	0.09	-0.07	(.17)	-0.05	
3. Team Size	-0.01	(.03)	-0.06	-0.01	(.03)	-0.03	
4. Work Hours	0.03	(.03)	0.13	0.01	(.03)	0.04	
5. Organizational Tenure	0.04	** (.02)	0.44	** 0.05	** (.01)	0.47	**
6. Team Tenure	0.00	(.04)	0.01	0.00	(.04)	0.00	
7. Gender Diversity	0.07	(.44)	0.02	0.17	(.40)	0.05	
8. Ethnic Diversity	0.33	(.49)	0.11	0.37	(.44)	0.12	
9. Age Diversity	0.01	(.02)	0.09	0.02	(.02)	0.11	
10. Idea Generation				0.60	** (.20)	0.42	**
	N	49			49		
	R ²	.30+			.43**		

DISCUSSION

Drawing on a sample of 99 teams in a U.S.-based Fortune 500 company, I find that location flexibility has an impact on how team members communicate with one another, but, importantly, that location flexibility does not impact all forms of face-to-face communication equally. Teams with greater location flexibility reported engaging in less frequent face-to-face spontaneous work-related communication, and to a lesser extent, less frequent face-to-face non-work-related communication. However, they did not convene any less frequently for face-to-face planned work-related communication like

team meetings. Further, I find that the type of communication most affected by team location flexibility—face-to-face spontaneous work-related communication—is also the type that has the greatest impact on team idea generation and, consequently, team innovation. Finally, based on the results of a series of analyses comparing both types of face-to-face informal communication with electronic alternatives, I find evidence that idea generation is highest when teams communicate informally face to face. Thus, teams were not able to effectively make up for the loss of face-to-face informal communication by using electronic media, like email, instant message, or audio/visual communication tools.

Taken together, these findings suggest that organizations need to be cautious about the use of FWAs in teams engaged in complex knowledge work. A particularly surprising finding from this study is that, although teams reported low averages of location flexibility, I still observe a negative effect on both types of face-to-face informal team communication. Thus, the implications of this research apply to settings in which people are working even a small proportion of their workweek outside of the office. With that said, managers and organizations should not pull back on flexibility just yet. Although I find that an important type of innovation-related communication is diminished when teams work more flexibly, this finding does not necessarily indicate that FWAs are inherently incompatible with team creativity and innovation. Rather, it suggests that managers and organizations should take care to implement and manage flexibility in a thoughtful and deliberate manner so that the benefits of FWAs for individuals may be sustained without undermining the collaboration and performance of teams. The key to doing this may be in how managers, teams, and organizations

cultivate and preserve opportunities for team members to engage in the types of exchanges that occur via rich, face-to-face informal communication.

Theoretical Implications and Future Research

The findings from this study make a number of contributions to the literature. First, this study is among the first to examine team-level flexibility and to link it to team communication dynamics. It builds on a body of work assessing the individual outcomes of FWAs (e.g., Bloom, Liang, Roberts, & Ying, 2015; Moen et al., 2016) and extends it to the context of teams to broaden the focus on flexibility in organizations. My results indicate that flexibility impacts an important form of face-to-face informal communication, such that teams engaging in more location flexibility interact informally in person less frequently. One important question arising from this finding concerns who within the team is engaging in less face-to-face informal communication. The assumption I make here is that it is the team members who are taking advantage of flexibility that are engaging in less face-to-face informal communication, though this assumption requires further examination. Future research should build on the team-level location flexibility and communication measures used in this study to unpack the distribution of location flexibility and communication within the team. Social network methods, for example, would enable researchers to map team communication networks (e.g., Jia, Shaw, Tsui, & Park, 2014; Perry-Smith & Shalley, 2003) to understand who within the team is engaging in different forms of communication and how this is impacted by FWA use within the team. Perhaps team members who work a greater proportion of their workweek remotely are isolated from the in-person “water cooler” communication that occurs in the office and, thus, engage in it less frequently (Golden, Veiga, & Dino, 2008). It is also possible, however, that as team members work more hours remotely, the office becomes

a less fertile environment for informal communication, even for those at the office, because fewer members of the team are present to engage with (Rockmann & Pratt, 2015).

In addition to better understanding the patterns of flexibility and communication within the team, future research should also examine the boundary conditions of these relationships. For instance, identifying the potential moderating effects of team leadership and norms would assist organizations in understanding how to minimize the negative impact of FWAs on face-to-face informal communication. For instance, research exploring the implementation and outcomes of team work time norms (e.g., core office hours)—whether initiated by the manager or collectively by the team—would aid in our understanding of how the team’s time may be best structured to permit individual flexibility while also creating shared space for informal face-to-face team communication (e.g., Perlow, 1997; Perlow, 2001). Moreover, future studies could examine the role of team charters (e.g., Mathieu & Rapp, 2009) and other early mobilization and launch processes (e.g., Ericksen & Dyer, 2004) in establishing expectations regarding how team members should interact, specifically those which emphasize fostering an inclusive team climate that promotes authentic connections among team members (Nishii, 2013) and creating a safe environment for team members to share ideas with one another, even at early stages of thinking (Edmondson, 1999).

Finally, future research might also consider individual differences in team members’ engagement in specific forms of communication, particularly face-to-face spontaneous work-related communication, and how this relates to their use of FWAs. For example, as past work has shown that people draw strong inferences about others based on their presence in the office (Elsbach, Cable, & Sherman, 2010), it is possible that, relative to teammates who work more of their time in the office, FWA users may be the

ones who proactively engage in more face-to-face spontaneous interactions to make up for any real or perceived deficiency in their communication with teammates in the office. Such agency in initiating “water cooler” communication may be part of an FWA user’s strategy to “pass” as an ideal worker and to avoid the negative attributions associated with flexibility (Reid, 2015).

A second contribution of this study is the distinction I make among multiple forms of team communication in the service of understanding which forms are most affected by team flexibility and which have the greatest impact on team innovation outcomes. I distinguish between formal communication and informal communication, finding evidence for the unique effect of informal communication, primarily face-to-face spontaneous work-related communication, on team innovation outcomes. I posited that face-to-face formal and informal communication differ in the way they influence team innovation outcomes, arguing that the less constraining, weaker situational norms that characterize informal interactions serve to uniquely foster idea generation. Future studies that provide a more nuanced examination of the differences between formal and informal communication—for example, through the use of qualitative methods, such as interviews and observation (Kraut, Fish, et al., 1990)—would help us to clarify why there is a unique impact of informal communication on idea generation. One possibility is that there are differences in who initiates and directs informal vs. formal interactions, which may impact the extent to which they yield new ideas. Perhaps team leaders primarily initiate formal, planned communication, whereas team members primarily initiate informal, spontaneous communication. Thus, the difference between these interactions—and their subsequent effects—may be reflective of differences in the centralization of

power and bureaucracy (Hirst, van Knippenberg, Chen, & Sacramento, 2011) and the extent to which team members feel comfortable voicing new ideas (Morrison, 2011).

Moreover, even when managers initiate team communication, the extent to which they exhibit empowering leadership behaviors, such as those that encourage participative decision making and encourage team members to solve problems on their own (Srivastava, Bartol, & Locke, 2006), may impact the degree to which planned, work-related communication resembles spontaneous, work-related communication. Rather than leaving face-to-face spontaneous work-related communication up to chance, there may be ways to structure planned office interactions such that they approximate spontaneous interactions and generate similar benefits. Consequently, future work could examine how face-to-face planned work-related interactions might be better leveraged to offset the reduction in face-to-face spontaneous work-related communication that occurs when teams engage in greater location flexibility. IDEO, the innovative product design firm, is a salient example of an organization that structures regular face-to-face planned team interactions in ways that are designed to generate new ideas, by facilitating brainstorming sessions and fostering a culture that encourages everyone to participate (Sutton & Hargadon, 1996).

Finally, a third contribution of this study is the introduction of a new set of outcomes into the literature on flexible work arrangements. Our current understanding of the innovation outcomes associated with FWAs is limited, which is problematic because firms are not only concerned with the retention and productivity of their employees, but with their ability to generate and implement novel and useful new ideas. Overall, my results suggest that face-to-face informal communication—particularly face-to-face spontaneous work-related communication—has a unique and important impact

on idea generation. This finding has important implications for how team members structure their work location during early stages of the innovation process, suggesting that they should be especially careful to preserve opportunities to spontaneously interact about their work face to face. However, during later stages of the innovation process, when teams are championing or implementing ideas, it is possible that face-to-face informal communication plays a less important role (Perry-Smith & Mannucci, 2017). Future research should examine the roles of team face-to-face formal and informal communication across all stages of creative work (i.e., idea generation, idea elaboration, idea championing, and idea implementation; Perry-Smith & Mannucci, 2017) to better understand when different types of communication are likely to be the most impactful and, by extension, when location flexibility is likely to be the most detrimental to team innovation outcomes. In addition, future research should compare the effects of face-to-face communication to electronic alternatives to understand whether the finding in this study—that face-to-face informal communication is more effective in generating ideas than electronic alternatives—generalizes to all stages of the innovation process. It is possible that, for the later stages of idea championing and implementation, electronic communication tools may be sufficient for fostering informal communication among teammates and, as a result, teams may not experience the same negative effects on team communication processes associated with team location flexibility.

Practical Implications

In addition to the implications that this study has for the research literature, it also has key implications for managers and organizations. As Kossek and Van Dyne noted (2008), “To date, organizations have often implemented flexibility programs without adequate attention to the effects of changes in face-time on social processes in the group,

coordination of work, cooperation among co-workers, and the implications for group performance.” In empirically examining the team’s use of location flexibility and its differential impact on specific forms of team communication, this study highlights the complexity of how flexibility operates in organizations and why care should be taken by organizational leaders to ensure that it is appropriately implemented for the context. Although I find that a key form of face-to-face informal team communication is negatively impacted by flexibility, it does not necessarily suggest that organizations should bring everyone back into the office. As past research has shown that FWA users report higher job satisfaction, lower turnover intentions, and less work-family conflict (Baltes et al., 1999; Bloom et al., 2015; Gajendran & Harrison, 2007), organizations should seek to strike a balance between the individual benefits of flexibility with the potential limitations of flexibility at the team level. Below, I outline two ways of doing this: first, by cultivating predictable office hours for team members and making the most of them through the design of the work environment; and second, by leveraging richer communication tools and implementing training to build team member efficacy with them.

First, managers and teams can implement core office hours that establish a predictable time in which team members are available to informally connect with one another in person, both by increasing opportunities for spontaneous interactions and by structuring planned interactions that foster informal conversations among team members (e.g., team lunches). In doing so, organizations can strike a balance between individual preferences for flexibility and the team’s need for face-to-face informal communication. Leslie Perlow’s (1997) rich, in-depth study of high-tech teams provides compelling evidence that core hours can help teams achieve multiple ends: creating high-quality,

timely, and novel products and services, while also establishing sustainable team processes that enable team members to have greater control over their work schedule and location. Perlow found that members of the teams she studied were exhausted by working long hours in the office to keep up with the pace of their team's fast-moving work. By establishing clear norms for team communication, teams were able manage their time such that there was a predictable window for coordination and yet sufficient time preserved for individual team members to immerse themselves in their work at their discretion.

However, establishing core office hours may be an important, yet insufficient, condition for fostering more frequent and fruitful in-person informal interactions. Organizations should consider how workplaces are designed, with an eye for creating office spaces that are fertile environments for spontaneous interactions but that also include quiet spaces for focused, immersive creative work. For example, Google has engineered common office spaces, such as coffee lines and cafeterias, to increase the likelihood of spontaneous interactions among employees (Waber, Magnolfi, & Lindsay, 2014). Similarly, and taking this idea to an extreme, Steve Jobs considered limiting the Pixar office to one set of centrally located bathrooms, hypothesizing that it would force employees to bump into one another and interact more frequently (D'Onfro, 2015). While organizations consider ways to prompt more frequent spontaneous in-person interactions, they should also be mindful of recent findings documenting the startling frequency of interruptions employees experience in the office and the serious impact that it has on productivity and performance on complex cognitive tasks (Mark, Gonzalez, & Harris, 2005; Mark, Gudith, & Klocke, 2008; Mark, Iqbal, Czerwinski, & Johns, 2015).

Taken together, organizations should cultivate an office environment that makes the most of team members' time at work.

Second, organizations can leverage more advanced electronic media beyond email, instant message, or audio/visual tools like Skype to help teams communicate informally and develop stronger relationships virtually. Although none of the forms of electronic media were as effective in generating ideas as face-to-face communication in this study, audio/visual communication came in second place, likely due its greater richness and synchronicity. Investing in richer communication tools that more closely approximate the social presence that face-to-face communication affords may help to close the gap in communication media for facilitating team idea generation. For example, Microsoft uses tools called "embodied social proxies" that physically represent members of the team who are working remotely in face-to-face team interactions. In such settings, for example, a monitor or tablet with a life-sized audio/visual feed of the remote member can be positioned adjacent to the other members of a team in the office. The remote worker then has a direct view of each of the other team members and can communicate in a synchronous manner that approximates the psychological experience of a live, face-to-face interaction (Venolia et al., 2010). In a different example, GitHub has created online platforms that serve as virtual water coolers and encourages employees to share updates about their work on them. When employees post accomplishments in the "#toasts" forum, for example, teammates can respond by posting selfies of themselves toasting them with a beverage to affirm their achievements and reinforce personal connections (Graber, 2015). Electronic tools like these serve to potentially foster better quality interactions and build stronger relationships than might be possible with more traditional forms of electronic media. Yet, beyond the capabilities of a particular medium, it is

necessary to ensure that employees have the necessary knowledge and skills to make the most of electronic communication tools. It is possible that, in this study, I observe that face-to-face communication is best for idea generation because team members have the most efficacy with this medium. With further training and experience, teams may be able to more effectively leverage other forms of rich media for idea generation and innovation.

Limitations

As in all studies, the results of this study should be interpreted in the context of its limitations. First, because I measure all constructs at the same time point, I cannot rule out the possibility of reverse causality. For example, I argue that team location flexibility impacts both forms of face-to-face informal team communication through its reduction in face time among team members. However, it is possible that teams that work a greater proportion of their work hours remotely do so because team members have lower-quality relationships with one another, as evidenced by their engagement in less face-to-face informal communication. In such teams, members may not view one another as productive sounding boards for ideas or feel comfortable sharing about their non-work lives and, as a result, choose to spend more time away from the office and their teammates. Although this possibility should be addressed with future studies that examine these relationships over time, the direction of the relationship that I posit in this study is supported by past work on the antecedents of individual use of location flexibility. Although team members may choose to structure their work location in response to factors in their work environment, non-work factors, such as an individual's family responsibilities and his or her preference for segmentation between his or her work and non-work domains, also serve as strong motivators (e.g., Shockley & Allen,

2010). Thus, it is unlikely that team members' engagement in location flexibility would be solely driven by team communication.

Second, I draw on team-rated idea generation and manager-rated innovation measures. Although past creativity and innovation studies have often relied on self and manager ratings (Anderson et al., 2014), supplementing these ratings of idea generation and innovation with objective outcome data (e.g., the number of new products to market), or ratings from clients or other stakeholders external to the team, would provide greater confidence in these findings. Despite the lack of supplemental external or archival ratings, the measurement approach used in this study was specifically designed to capture multiple sources of data and to leverage the sources of data that are in the most proximal position to assess the team's behavior. For example, the awareness of the frequency of new ideas teams generate may never reach others outside of the team, as just a small fraction of them are likely to actually be implemented. Further, ideas that the team generates may not be systemically recorded in a manner that makes them easy to assess using archival sources of data.

Third, although this study makes an important distinction between formal and informal communication, which is an important step forward in our understanding of team communication processes, I was not able to test all of the assumptions that I make about the properties of these types of communication. As I noted earlier, there is an important opportunity for future research to explicitly examine the properties that drive the unique effects of face-to-face informal communication on idea generation that I observe. One potential limitation associated with my team communication measures is that they do not enable me to observe how many team members are engaged in different types of interactions. For example, it is possible that team members convene as an entire

team when they engage in face-to-face planned work-related communication, whereas both types of face-to-face informal communication may primarily involve dyadic or small sub-group interactions. Thus, my arguments about the unique effect of face-to-face spontaneous work-related communication on idea generation may be confounded with issues associated with the number of team members engaged in interactions, which may influence team members' motivation to speak up or their opportunity to get their ideas out (e.g., due to evaluation apprehension or production blocking, respectively; Gallupe, Bastianutti, & Cooper, 1991). Yet, despite these limitations, the integration of literature on communication formality and the empirical examination of multiple forms of communication in this study is a key improvement to the extant literature on team communication. Because of inherent limitations in how rich any survey measure of team communication can be, future research should draw on mixed methods to develop a more nuanced understanding of team communication behaviors.

Conclusion

As the number of organizations scaling back on FWAs continues to grow, as evidenced by recent major announcements by Honeywell, Aetna, and Bank of America (DePass, 2016; Lee, 2016; Roberts, 2014), it is critical that we develop a better understanding of how FWAs impact team processes and outcomes, particularly in knowledge-intensive work contexts. The purpose of this study was to examine flexibility in the context of interdependent teams to provide an initial answer to the question of whether concerns about the impact of flexibility on innovation are justified. The findings provide initial evidence that flexibility can negatively impact forms of communication that are uniquely important for team innovation outcomes, chiefly forms of face-to-face informal communication. Future research that builds on these findings is needed, as

managers and organizations weigh the potential trade-offs between the benefits of FWAs for individual employees with the possible drawbacks of FWAs for teams—particularly on their ability to innovate in unexpected and unplanned ways at the office.

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APPENDIX A

Table A1. Full Survey Measures

Idea Generation: (Items 1-3 adapted from Zhou & George, 2001)

Cronbach's alpha = .88; ICC(1) = .12; ICC(2) = .40; Median Rwg(j) = .88.

1 = *strongly disagree*, 5 = *strongly agree*

1. The members of this team generate new and innovative ideas.
2. Team members suggest new ways to achieve goals or objectives.
3. Team members come up with creative solutions to problems.
4. Team members put forward new ideas for improving or re-engineering work processes or products.

Team Innovation: (De Dreu & West, 2001)

Cronbach's alpha = .75.

1 = *strongly disagree*, 5 = *strongly agree*

1. Team members often implement new ideas to improve the quality of our products or processes.
2. This team gives little consideration to new and alternative methods and procedures for doing their work. (reverse-coded)
3. Team members often produce new products or processes.
4. This is an innovative team.

Interdependence: (Campion, Medsker, & Higgs, 1993)

Cronbach's alpha = .74; ICC(1) = .13; ICC(2) = .40; Median Rwg(j) = .84.

1 = *strongly disagree*, 5 = *strongly agree*

1. I cannot accomplish my tasks without information or materials from other members of my team.
2. Other members of my team depend on me for information or materials needed to perform tasks.
3. Within my team, jobs performed by team members are related to one another.

Autonomy: (Spreitzer, 1995)

Cronbach's alpha = .88; ICC(1) = .10; ICC(2) = .34; Median Rwg(j) = .94.

1 = *strongly disagree*, 5 = *strongly agree*

1. I have significant autonomy in determining how I do my job.
 2. I can decide on my own how to go about doing my work.
 3. I have considerable opportunity for independence and freedom in how I do my job.
-

APPENDIX B

Table B1. Location Flexibility Robustness Checks (No Controls): Full Sample

Variable	Face-to-Face Planned Work-Related Communication			Face-to-Face Spontaneous Work-Related Communication			Face-to-Face Non-Work-Related Communication				
	Model 1			Model 2			Model 3				
	B	SE	β	B	SE	β	B	SE	β		
Intercept	3.89	*** (.09)		4.44	*** (.08)		3.74	*** (.09)			
1. Location Flexibility	0.00	(.01)	0.03	-0.01	* (.01)	-0.26	* (.01)	-0.02	* (.01)	-0.22	*
	N	99		99			99				
	R ²	0.00		.07*			.05*				

Table B2. Location Flexibility Robustness Checks (No Controls): 40%+ Response Rate

Variable	Face-to-Face Planned Work-Related Communication			Face-to-Face Spontaneous Work-Related Communication			Face-to-Face Non-Work-Related Communication				
	Model 1			Model 2			Model 3				
	B	SE	β	B	SE	β	B	SE	β		
Intercept	3.90	*** (.09)		4.47	*** (.08)		3.76	*** (.11)			
1. Location Flexibility	0.00	(.01)	-0.05	-0.02	*** (.01)	-0.41	*** (.01)	-0.02	* (.01)	-0.28	*
	N	72		72			72				
	R ²	0.00		.17***			.08*				

Table B3. Location Flexibility Robustness Checks (No Controls): 50%+ Response Rate

Variable	Face-to-Face Planned Work-Related Communication			Face-to-Face Spontaneous Work-Related Communication			Face-to-Face Non-Work-Related Communication				
	Model 1			Model 2			Model 3				
	B	SE	β	B	SE	β	B	SE	β		
Intercept	3.84	*** (.11)		4.46	*** (.10)		3.80	*** (.12)			
1. Location Flexibility	0.00	(.01)	0.02	-0.02	** (.01)	-0.40	** (.01)	-0.02	* (.01)	-0.34	*
	N	53		53			53				
	R ²	0.00		.16**			.12*				

APPENDIX C

Table C1. F2F Communication Robustness Checks (No Controls): Full Sample

Variable	Idea Generation											
	Model 1			Model 2			Model 3			Model 4		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β
Intercept	2.86	*** (.36)		2.40	*** (.39)		3.17	*** (.30)		2.11	*** (.44)	
1. F2F Planned Work Comm.	0.26	** (.09)	0.28 **							0.13	(.10)	0.14
2. F2F Spontaneous Work Comm.				0.35	*** (.09)	0.36 ***				0.25	* (.11)	0.26 *
3. F2F Non-Work Comm.							0.20	* (.08)	0.24 *	0.06	(.09)	0.07
N	99			99			99			99		
R ²	0.08**			0.13***			0.06*			0.15**		

Table C2. F2F Communication Robustness Checks (No Controls): 40% Response Rate

Variable	Idea Generation											
	Model 1			Model 2			Model 3			Model 4		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β
Intercept	3.33	*** (.44)		2.63	*** (.53)		3.25	(.34)		2.39	*** (.61)	
1. F2F Planned Work Comm.	0.15	(.11)	0.15							0.07	(.12)	0.07
2. F2F Spontaneous Work Comm.				0.30	* (.13)	0.27 *				0.21	(.15)	0.19
3. F2F Non-Work Comm.							0.18	+ (.09)	0.23 +	0.10	(.11)	0.12
N	72			72			72			72		
R ²	0.02			0.08*			0.05+			0.09+		

Table C3. F2F Communication Robustness Checks (No Controls): 50% Response Rate

Variable	Idea Generation											
	Model 1			Model 2			Model 3			Model 4		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β
Intercept	3.59	*** (.54)		2.92	*** (.58)		3.56	*** (.40)		2.87	*** (.72)	
1. F2F Planned Work Comm.	0.08	(.14)	0.08							0.01	(.15)	0.01
2. F2F Spontaneous Work Comm.				0.23	+ (.14)	0.23 +				0.22	(.17)	0.22
3. F2F Non-Work Comm.							0.10	(.11)	0.12	0.01	(.13)	0.02
N	53			53			53			53		
R ²	0.01			0.05+			0.01			0.05		