Differences are Different: Examining the Effects of Communication Media on the Impacts of Racial and Gender Diversity in Decision-Making Teams

Lionel P. Robert Jr.
Associate Professor
School of Information
Core Faculty, Robotics Institute
University of Michigan
4388 North Quad
105 South State Street
Ann Arbor, MI 48109-1285
Email: lprobert@umich.edu

Alan R. Dennis
Professor and John T. Chambers Chair of Internet Systems
Operations and Decision Technologies
Kelley School of Business
Indiana University
Bloomington, IN 47405
Email: ardennis@indiana.edu

Manju K. Ahuja
Professor and University Scholar
Computer Information Systems
College of Business
University of Louisville
Louisville, KY 40292
Email: manju.ahuja@louisville.edu

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Abstract

Diversity can have both positive and negative effects on team decision making. Text communication has been put forth as one solution to addressing this duality of team diversity. Unfortunately, the empirical results have been far from conclusive. We believe that resolving such inconsistencies are crucial to developing a more complete understanding of the use of communication technologies. To accomplish this, we developed a research model based on media synchronicity theory (MST). We empirically tested this model by conducting a laboratory experiment with 46 teams, consisting primarily of men and women self-identified as Caucasians and Asians, performing a decision-making task. The results show that the type of diversity matters. Text communication improved both knowledge sharing (i.e. conveyance) and knowledge integration (i.e. convergence) in racially diverse teams but impaired both in gender diverse teams. Knowledge integration was more important to decision quality when both racial and gender-diverse teams used text communication (but the importance of knowledge sharing was not affected by the communication medium).

Key words: Virtual Teams; Team Diversity; Media Synchronicity Theory; Computer Mediated Communications; Knowledge Sharing; Knowledge Integration

INTRODUCTION

Organizations are becoming more complex, with global teams — especially virtual teams drawn from different parts of the organization — also becoming more diverse (Chattopadhyay, Tluchowska, & George, 2004; Cramton, 2001; DiTomaso, Post, & Parks-Yancy, 2007; Giambatista & Bhappu, 2010; Hinds & Mortensen, 2005; Tannenbaum, Mathieu, Salas, & Cohen, 2012). Diversity can have both positive and negative effects on team decision-making (van Knippenberg & Schippers, 2007; Williams & O'Reilly, 1998). On one hand, a large body of research has shown that diversity can be a source of unique knowledge and thus has the potential to facilitate better team decision-making (Dahlin, Weingart, & Hinds, 2005; van Knippenberg, De Dreu, & Homan, 2004). On the other hand, diversity is also known to make it difficult for teams to share, use, and integrate their knowledge (van Knippenberg & Schippers, 2007) because individuals are less inclined to share and use knowledge among others who are different from themselves (Dahlin et al., 2005; Homan, van Knippenberg, van Kleef, & De Dreu, 2007). Thus, diversity offers the benefits of what Harrison and Klein (2007) term *variety* (more unique knowledge) but also creates what they term *separation* (division among members), which inhibits the sharing and integration of that knowledge (Harrison & Klein, 2007).

Communication technology has been put forth as one solution to addressing this duality of team diversity (Adrianson, 2001; Bhappu, Griffith, & Northcraft, 1997; Carte & Chidambaram, 2004; Garrison, Wakefield, Xu and Kim, 2010; Giambatista & Bhappu, 2010; Paul, Samarah, Seetharaman, Mykytn, 2004; Staples & Zhao, 2006). The use of text communication can suppress the negative effects associated with separation by reducing the salience of differences related to social categories (by reducing visual and vocal cues); at the same time text communication can facilitate team members' ability to share and use the knowledge derived from their variety (Carte & Chidambaram, 2004; Giambatista & Bhappu, 2010). Unfortunately, the empirical results have been far from conclusive. In some cases, the use of text communication has helped diverse teams overcome separation and promote variety (Bhappu et al., 1997; Zhang, Lowry, Zhou, & Fu, 2007); in some it has had no effect (Staples & Zhao, 2006); in others, it has exacerbated the problems associated with separation (Adrianson, 2001; Savicki, Kelley, & Lingenfelter, 1996); and in still others it has both helped and hindered (Giambatista & Bhappu, 2010).

We believe that resolving such inconsistencies is crucial to developing a more complete understanding of the use of communication technologies in diverse teams. We also believe these inconsistencies are caused by three limitations in past research. One, previous studies have relied on theories of communication technologies that fail to recognize both the benefits and the problems associated with text communication (Carte & Chidambaram, 2004; Giambatista & Bhappu, 2010; Savicki et al. 1996; Staples & Zhao, 2006). To address this issue, we build on media synchronicity theory (MST; Dennis, Fuller, & Valacich, 2008), which argues that text communication can improve the conveyance of knowledge[1] or sharing of knowledge but impair a team's ability to converge on a shared understanding of its meaning. Because both conveyance and convergence are necessary in most team tasks, the use of text communication could both help and hurt the performance of teams. Two, prior research has not considered the possibility that different types of diversity (e.g., race, gender) can present different challenges that the use of text communication can alleviate or exacerbate (Carte & Chidambaram, 2004; Giambatista & Bhappu, 2010). As a result, theories about text communication and diversity may have to be extended to consider the type of diversity rather than assuming that the use of communication technologies has the same impact on all types of diversity. Finally, past studies examining the use of text communication in diverse teams have examined the conveyance process (i.e. knowledge sharing) — a medium's utility in transmitting knowledge — but not the convergence process (i.e. knowledge integration) (Berdahl and Craig 1996, Bhappu et al., 1997; Giambatista & Bhappu, 2010). In this paper, we define knowledge integration as the synthesis of individual members' knowledge on a particular topic or problem in an attempt to achieve a shared, coherent meaning among all team members on that particular topic or problem (Alavi & Tiwana, 2002; Newell, Tansley, & Huang, 2004; Robert, Dennis, & Ahuja, 2008). Both knowledge sharing and integration are vital to understanding whether diverse teams benefit from their differences or succumb to them (Homan et al., 2008; Homan et al., 2007; Maznevski, 1994; van Knippenberg et al., 2004).

The central objective is to investigate whether text communication: (1) helps or hinders the way racially and

[1] MST uses the term "information" but in this paper we use the term "knowledge" because knowledge includes information (useful, organized data) as well as the additional meanings, values, and contextual interpretations of it; knowledge is information that has been processed (Alavi & Tiwana, 2002; Newell et al., 2004; Robert et al., 2008).

gender-diverse teams share and integrate knowledge and (2) determines how important knowledge sharing and integration are to decision quality in teams (see Figure 1). We focus on text communication, racial and gender diversity and decision-making for several reasons. First, text communication is one of the most commonly used forms of communication in organizations; 94% of employees use it for work purposes (Torres & Conaway, 2014), in part because text messages enable individuals to communicate in real time with others across the globe to maintain relationships and to address important problems (Fox & Rainie, 2014). Second, race and gender diversity have been identified as two particularly important types of diversity because they are found throughout most societies and are often related to inequality (Acker, 2006; Alcoff, 2005). Racial and gender diversity are relatively stable social categories that significantly shape an individual's identity (DiTomaso et al., 2007; Hogg & Terry, 2000; Howard, 2000) and have meaningful effects on people's lives (Chattopadhyay, George, & Shulman, 2008; Chattopadhyay et al., 2004; Hogg & Terry, 2000). Third, race and gender diversity are highly visible types of diversity (Alcoff, 2005; Harrison, Price, Gavin, & Florey, 2002). Text communication can suppress the visual and vocal cues that may trigger stereotyping and other negative aspects of working with team members who are visibly different (Carte & Chidambaram, 2004), so we would expect that if text communication influences diversity, the effects would be the strongest for types of diversity that are visible. Our results suggest that racial and gender diversity can also have fundamentally different impacts on teamwork. Finally, our dependent variable of interest is decision quality. Teams are often assembled with the goal of making decisions because they have greater access to diverse sources of knowledge and insight than any one individual (Robert et al., 2008). This enables us to examine both the conveyance and the convergence processes.

To test the different effects of race and gender diversity, we conducted a laboratory experiment with 46 teams performing a decision-making task. In the experiment, half of the teams used face-to-face (FTF) communication and the other half used text communication in a distributed setting. The results show that the type of diversity matters. Text communication improved both knowledge sharing (i.e. conveyance) and knowledge integration (i.e. convergence) in racially diverse teams but impaired both in gender-diverse teams. Knowledge integration was more important to decision quality when both racially and gender-diverse teams used text communication (but the importance of knowledge sharing was not affected by the communication medium).

This study makes three contributions. First, it extends the research on communication media and diversity, which has overwhelmingly concluded that text communication helps diverse teams share and integrate knowledge (Carte & Chidambaram, 2004). Instead, this study shows that text communication can actually hurt the ability of gender-diverse teams to share and integrate knowledge. Thus, differences are different: racially diverse teams react differently from gender-diverse teams when using text versus FTF communication. This is an issue that our current theories on communication media and team diversity do not take into account. We propose that research needs to move away from treating all diversity with one broad stroke and take an important step toward adding much-needed granularity to diversity research. Second, this research extends MST. MST is based on prior research that does not consider team diversity. Yet our results indicate that the utility of text communication in promoting conveyance and convergence depends on the type of team diversity. Therefore, our results call for a re-examination of our theoretical understanding of communication media relative to a team's diversity. Third, this study contributes to the research on communication media and team decision-making by showing that unlike knowledge sharing (i.e. conveyance process), knowledge integration (i.e. convergence process) has a stronger effect on decision quality when teams rely on text communication.

<<<<<<Insert Figure 1 >>>>>>

PRIOR RESEARCH AND THEORY

Team Diversity

The two most commonly discussed theoretical perspectives on diversity draw on Harrison and Klein's (2007) notions of variety and separation. Diversity as *variety* is derived from the decision-making perspective and views diversity as a source of unique knowledge (Harrison & Klein, 2007). This perspective argues that race and gender diversity offer the team more unique knowledge (Giambatista & Bhappu, 2010). Thus, team diversity (e.g., race, gender, age, personality) can provide the team with unique knowledge, which should improve team performance (van Knippenberg, Kooij-de Bode, & van Ginkel, 2010). Therefore, we would expect racial and gender to be positively associated with team's decision quality.

The second perspective on diversity, as *separation,* is derived from social categorization and similarity attraction theories (Tajfel & Turner, 1986; van Knippenberg & Schippers, 2007). These theories posit that race and

gender diversity inhibit a team's performance by reducing the sharing and acceptance of knowledge among team members (Homan et al., 2008; Homan et al., 2007). For example, social categorization theory argues that individuals place themselves and others into in-groups and out-groups, often based on characteristics such as race and gender, and rely more on in-group members than out-group members when making decisions (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). Likewise, similarity attraction theory posits that individuals often prefer and enjoy communicating more with those who are similar to them because it reinforces their own attitudes and behaviors (Pfeffer, 1983; Umphress, Smith-Crowe, Brief, Dietz, & Watkins, 2007). Thus, team members are more willing to share and use knowledge from people who are similar to them than from those who are dissimilar to them (Bhappu et al., 1997; Griffith, Fuller, & Northcraft, 1998; Sia, Tan, & Wei, 2002; van Knippenberg & van Knippenberg, 1994). Under this view, team diversity reduces the amount of knowledge that is shared and integrated, which leads to less informed and ultimately poorer decision quality (Homan et al., 2008; Homan et al., 2007; Kankanhalli, Tan & Wei, 2007).

Although the two views offer competing theoretical processes with very different impacts, they are not mutually exclusive. Depending on the team composition and stage of team development, the processes can coexist, or one process might dominate (Daniel, Agarwal, & Stewart, 2013; Giambatista & Bhappu, 2010; Harrison & Klein, 2007). As highlighted by Harrison and Klein (2007), different types of diversity can induce variety and separation processes in different strengths. For example, a team high in racial diversity might be more or less likely to experience separation processes than a team high in gender diversity. Further, newly formed teams are more likely to experience separation, because a lack of history working together means that team members do not know one another, which increases the likelihood that individuals might rely on stereotypes, whether deliberately or not (Robert, Dennis, & Hung, 2009). In general, teams with a history of successfully working together are more likely to experience the benefits of variety than the problems of separation (McLeod, Lobel, & Cox, 1996; Watson, Kumar & Michaelsen, 1993). The fundamental separation process is internal to minorities who *feel* isolated regardless of other team members' actions. As we argue below, text communication provides capabilities that change the balance between variety and separation in different ways for racial diversity and gender diversity.

Text Communication in Diverse Teams

Text communication has several capabilities relative to FTF communication that could mitigate the problems found in diverse teams (Nunamaker, Dennis, Valacich, Vogel, & George, 1991). The first capability is parallelism, or enabling each team member to communicate simultaneously (Dennis, 1996; Nunamaker et al., 1991). Parallelism is important because it reduces the production blocking that occurs in FTF teams when two or more team members want to speak at the same time but cannot and, as a result, are denied the opportunity to speak (Carte & Chidambaram, 2004; Dennis, Hilmer, & Taylor, 1998; Diehl & Stroebe, 1987). In FTF discussions, this slows the communication process and can cause valuable knowledge to be lost when the team moves on without giving everyone a chance to share his or her knowledge (Diehl & Stroebe, 1987). Of course, following multiple parallel conversations in text communication can also be challenging. The second capability is rehearsability, or the extent to which the medium enables the sender to rehearse or edit a message before sending it (Dennis et al., 2008). Rehearsability enables message senders to better craft their messages so that they best convey the meaning that is intended. Rehearsability is particularly important in teams whose members do not share a common background (Dennis et al., 2008), such as diverse teams. The third capability is reprocessability, or the ability to enable team members to re-examine previously presented knowledge (Dennis et al., 2008). Reprocessability provides teams with a group memory that enables them to go back and reconsider previously presented knowledge they may have failed to notice or consider deeply, which may offset the challenges of following parallel conversations (Dennis et al., 2008; Robert et al., 2008; Robert & Dennis, 2005).

The fourth capability is an inability rather than a capability: text communication lacks visual and verbal cues. Individuals often pay more attention to and are persuaded by knowledge from others similar to them in terms of race and gender (Sia et al., 2002; Tajfel & Turner, 1986; van Knippenberg & van Knippenberg, 1994). This, in turn, can lead to poor decisions because knowledge from dissimilar others might be ignored (Bhappu et al., 1997; Siegel, Dubrovsky, Kiesler, & McGuire, 1986). Text communication suppresses many of the visual and vocal cues that can trigger this biased processing and, therefore, can shift the focus to the content of the knowledge presented and away from the person who presented it, thus reducing bias (Bhappu et al., 1997; Griffith et al., 1998).

Despite the intuitive appeal of the benefits of text communication, these benefits have not always

materialized for diverse teams. For example, Bhappu et al. (1997) found that in FTF teams, men and women paid more attention to and were influenced more by information from men, but this bias was reduced when men and women employed text communication. On the other hand, Adrianson (2001) found that women produced fewer messages and expressed fewer opinions in gender-diverse teams that used text communication.

Zhang et al. (2007) found that the use of text communication, in either collocated or dispersed teams, reduced the impact of majority influence in culturally diverse teams. Staples and Zhao (2006) studied the impact of text communication relative to FTF communications in culturally homogeneous and culturally diverse decision-making teams on four outcomes: satisfaction, cohesion, conflict, and decision quality. Overall, they found no main effects related to the communication medium used in any of the outcomes. However, when they examined the culturally diverse teams separately they found that decision quality significantly increased when these teams used text communication but that there were no differences in satisfaction, cohesion, or conflict.

Giambatista and Bhappu (2010) conducted two studies examining the impact of text communication on several types of team diversity: racial[2], agreeableness, and openness diversity. Study 1 examined team creativity (measured as the number of ideas generated) in teams that had a history of working together for 3 months. In FTF teams all three types of diversity had little or no relationship with creativity. In teams that used text communications, racial and openness diversity were positively related to team creativity, while agreeableness diversity was negatively related to team creativity. In study 2, they examined team creativity — measured as the rating scores of a team-produced commercial — in newly formed teams. Results indicated that in FTF teams, racial and agreeableness diversity were negatively related to team creativity, while openness diversity had a slightly positive relationship. In contrast, when teams used text communications, racial and agreeableness diversity had no relationship with creativity but openness diversity had a strong positive relationship.

One explanation for these mixed results is that the use of text communication can have both positive and negative effects on knowledge sharing and integration. For example, the lack of visual and vocal cues can promote knowledge sharing, yet many theories suggest that such cues are vital to facilitating knowledge integration (Miranda

[2] Giambatista and Bhappu (2010) used the term “ethnic diversity” instead of “racial diversity.”

& Saunders, 2003; Robert et al., 2008). This might explain why text communication reduced attention and influenced bias in gender-diverse teams (Bhappu et al., 1997); promoted information sharing in the form of ideas generated in teams that were diverse in race and openness (Giambatista & Bhappu, 2010, study 1); and reduced the impact of majority influence, which could potentially promote knowledge sharing in culturally diverse teams (Zhang et al., 2007). However, it does not explain why text communication hindered the sharing of knowledge in teams that were diverse in gender (Adrianson, 2001) and agreeableness (Giambatista & Bhappu, 2010, study 1).

If text communication impacted knowledge sharing and integration differently we could expect these effects to offset one another in tasks that require both. In fact, we found some evidence of this in prior research. The use of text communication had no impact on the relationship between racial diversity and team creativity in a task that required both knowledge sharing and integration (Giambatista & Bhappu, 2010, study 2). Similarly, the use of text communication did not lead to overall improvements in satisfaction, cohesion, conflict, and decision quality in a task requiring both the sharing and integration of knowledge; however, it did improve decision quality within highly culturally diverse teams (Staples & Zhao, 2006). The impact of text communication seems to differ by the type of diversity and the task requirements. The above analysis is far from conclusive but it provides some indication of the importance of considering the type of diversity and the task requirements (e.g., knowledge sharing or integration).

One media theory that specifically acknowledges both the positive and negative impacts associated with a particular medium relative to the task requirements is media synchronicity theory (MST). Therefore, to begin to address these issues we build on and extend MST. Unlike previous theories, Dennis et al.'s (2008) MST argues that the fit of a medium's capabilities to the particular needs of a communication task determines whether the use of that medium leads to a more effective communication process. Specifically, media differ in their capability to support two core processes of communication: conveyance and convergence. Conveyance processes involve the transmission and processing of knowledge. Conveyance processes are used to allow individuals to build their own understanding of a given situation. This entails the analyzing and individual sense-making of the knowledge. Convergence processes involve the creation of a shared meaning among individuals. This involves the discussion around each individual's interpretation of the knowledge. The convergence process has two goals. The first goal is to reach an agreement on the meaning of knowledge in order to achieve a common understanding. The second goal is to

achieve a mutual recognition that such an agreement has been reached among all parties.

MST posits that most decision-making tasks require both conveyance and convergence processes. As a result, in order to comprehend the communication effects of a medium we must understand how it facilitates and constrains both conveyance and convergence processes. In general, a medium's synchronicity determines whether it can support a conveyance or convergence process. Synchronicity is defined as "the ability to support individuals working together at the same time with a shared pattern of coordinated behavior" (Dennis et al., 2008, p. 576).

The relationship between synchronicity and the conveyance and convergence processes is determined by a medium's capabilities. According to MST, face-to-face communication has a higher level of synchronicity than text communication and therefore should better support convergence processes than text communication. Specifically, FTF communication can support more natural symbol sets such as visual and vocal cues and has a higher transmission speed compared to text communication. However, text communication, which is lower in synchronicity, should be better able to support conveyance processes than FTF communication. This is because text communication has significantly higher rehearsability and reprocessability capabilities than FTF communication. Unlike previous media theories, MST tells us that we should not expect diverse decision-making teams using text communication to outperform diverse decision-making teams using FTF communication because no one medium is best for both conveyance and convergence, which are both required for most team tasks.

Racial Diversity and Text vs. FTF Communication

We have two important assumptions about diversity and text communication. First, in order to understand the effects of text communication (versus FTF communication) in diverse teams, we need to consider how it influences conveyance and convergence. Conveyance is a two-part process: the sender encodes a message and transmits it; and the receiver decodes it and makes sense of the information it contains (Dennis et al., 2008). Convergence is the joint interpretation of this information to arrive at a shared meaning (Dennis et al., 2008), and by extension, shared agreement on actions that it warrants. Diversity research has focused on knowledge sharing and knowledge integration, which are similar to, but slightly different from, conveyance and convergence in MST. Knowledge sharing considers the encoding and transmission of information and knowledge, but not their reception, processing, or discussion. Knowledge integration includes the reception and processing of information and

knowledge, plus their joint discussion to reach shared meaning. As an aside, we note that in the original version of MST (see Dennis & Valacich, 1999), conveyance was only the encoding and transmission of information (thus matching knowledge sharing); the reception and processing of information was a separate process called *deliberation*, treated on the same theoretical level as conveyance and convergence. From a theoretical viewpoint, the placement of deliberation (whether treated separately as in the original MST, combined with conveyance as in the final version of MST, or combined with knowledge integration as in diversity research) is unimportant, as long as it *is* considered, and the definitions of constructs are clear. Here, to be consistent with the focus of this research, we adopt the terminology of diversity research and include deliberation as a part of knowledge integration.

Second, all things being equal, both racial and gender diversity, like many types of diversity, should be positively related to both knowledge sharing and integration[3] (van Knippenberg et al., 2004). However, the separation effect of diversity can hinder the sharing and integration of knowledge in diverse teams to such an extent that people in these teams often share and integrate less knowledge than those in homogeneous teams (Carte & Chidambaram, 2004; Giambatista & Bhappu, 2010). Later in this paper we discuss how the communication environment helps determine whether racial diversity leads to more or less knowledge sharing and integration.

We begin with knowledge sharing — the encoding and transmission of information. Empirical research shows that when teams work face-to-face, racial diversity is often associated with less knowledge sharing (Elsass & Graves, 1997; Kochan et al., 2003; van Knippenberg et al., 2004). Reductions in knowledge sharing are often attributed to lower participation of minorities resulting from social isolation, in that minorities see themselves as less like the other members of the team, so they feel isolated socially (Mannix & Neale, 2005; Maznevski, 1994; Shore et al., 2011). This social isolation leads minorities to believe that their knowledge is not wanted or valued so they choose not to share the knowledge they have (Dreachslin, Hunt, & Sprainer, 1999, 2000). Instead, they go along with the knowledge presented by others (Giambatista & Bhappu, 2010; Li, Karakowsky & Siegel, 1999). Social isolation can be mitigated or exacerbated by deliberate or nonconscious actions by other team members (e.g., by treating minority members differently from other team members; Dreachslin et al., 2000). We suggest that social isolation is

[3] Van Knippenberg et al. (2004) used the term “elaboration” to describe the sharing and integration of knowledge.

more likely to be felt by members of newly formed teams who lack a history of successfully working together. Although it can also be strong in dysfunctional teams, which have a history of isolating behaviors, the fundamental process is internal to minority individuals who *feel* isolated and in whom this occurs regardless of other team members' actions.

As highlighted in MST, text communication differs in three important ways from FTF communication: it provides parallelism, it allows rehearsability, and it removes visual and vocal cues (Dennis et al., 2008). Each of these is likely to influence the effects of social isolation on knowledge sharing. Parallelism and rehearsability ensure that team members do not have to compete with others for air time and can take the necessary time and attention to carefully craft a message to say exactly what they intend. This should make individuals who are less comfortable communicating with their team members (such as those feeling social isolation) more likely to contribute the knowledge they possess. The lack of visual and vocal cues means that individuals who are visibly different or speak in noticeably different ways (racial minorities often have distinct voices, see Baugh 2003; Kushins 2014) are less likely to *feel* different from other team members because their typed contributions look more similar to the contributions of others than do their contributions in FTF communication. Because this could lead to a sense of being less socially isolated, thereby reducing the effects of social isolation, racial minorities would be more likely to share knowledge in text communication than in FTF communication.

Empirical research provides some support for our arguments. As mentioned, Giambatista and Bhappu (2010) conducted two studies. In a study of teams with a history, racial diversity was positively related to knowledge sharing (i.e. idea generation) in text communication but had no relationship with knowledge sharing in FTF communication. In a second study of newly formed teams performing a task that, in part, required knowledge sharing, racial diversity was negatively related to task performance in FTF teams and had no relationship in teams using text communication. Taken together, it appears that racial diversity was associated with more knowledge sharing when teams use text communication when compared to teams that use FTF communication. Therefore:

Hypothesis 1a: The communication environment moderates the relationship between racial diversity and knowledge sharing such that racial diversity is positively related to knowledge sharing in text communication and negatively related to knowledge sharing in FTF communication.

Racial diversity in teams should be less likely to be positively associated with knowledge integration

(deliberation and convergence) when teams engage in FTF communication. Visual and vocal cues that highlight racial diversity are likely to trigger selective perception and stereotyping (Bhappu et al., 1997; Dreachslin et al., 2000), so that the knowledge and opinions from those who are different are not considered, and knowledge integration is limited (Harrison & Klein, 2007). For example, racial diversity has been found to be associated with heated interactions and emotional conflicts (Pelled, Eisenhardt, & Xin, 1999), leading to poor knowledge integration.

Compared to FTF communication (and independent of racial diversity), the use of text communication should improve deliberation (reception and processing of information) but impair convergence (development of shared meaning) (Dennis et al., 2008; DeRosa, Hantula, Kock, D'Arcy, 2004; Kock, 2009;). Reprocessability enables team members to pause to think about and deeply consider new information without missing any discussion, but the parallelism and slower transmission speed of typing makes converging on meaning more difficult (Dennis et al., 2008). Thus, the combined effect of these positive and negative influences is unclear; the net impact of text or FTF communication on knowledge integration likely depends on whether it is more important to deliberate (individually understand new information) or converge (jointly arrive at the shared meaning of the information).

However, the implications for racial diversity are much clearer. The lack of visual and vocal cues means that the differences in race among team members are less salient and thus text communication should be less likely to trigger the selective perception and stereotyping (Bhappu et al., 1997) that impair knowledge integration. Thus, racial diversity should be positively associated with knowledge integration when teams use text communication. Therefore,

Hypothesis 1b: The communication environment moderates the relationship between racial diversity and knowledge integration such that racial diversity is positively related to knowledge integration in text communication and negatively related to knowledge integration in FTF communication.

Gender Diversity and Text Communication vs. FTF Communication

There are at least two views on the effect of gender diversity in FTF teams. One view is that gender diversity, like all types of diversity, can lead to separation. For example, Jehn, Northcraft, and Neale (1999) found that team diversity (measured as a combination of age and gender) was positively related to conflict. Men tend to speak longer and interrupt more frequently (Craver, 2002; Tannen, 1994). Men tend to dominate discussions and act more assertively than women (Flynn & Ames, 2006). Men are also more likely to put forth their own opinion as fact and engage in more adversarial exchanges and are more inclined to disengage in conversations when someone

disagrees with them (Fahy, 2002; Herring, 1993, 2000). In sum, these arguments imply that gender diversity should lead to the same separation properties found with racial diversity in FTF teams.

However, new research on collective intelligence suggests that the addition of women to FTF teams leads to better performance because women are better able to read and respond to the emotions of others (Woolley, Chabris, Pentland, Hashmi, & Malone, 2010). Women tend to be less argumentative and more accepting of others' opinions (Eagly & Carli, 1981; Rancer & Baukus, 1987; Wiley & Eskilson, 1985). They frequently attempt to qualify and justify their assertions during discussions (Jeong & Davidson-Shivers, 2006), leaving open possibilities of other perspectives. They are often more open to feedback from their teammates (London, Larson, & Thisted, 1999). Further, women tend to focus their communication on maintaining good intra-team relationships (Gilligan, 1992; Maznevski, 1994), often through consensus-building (Elsass & Graves, 1997; Hess, Fuller, & Mathew, 2006) and the creation of joint gains (Koeszegi, Pesendorfer, & Stolz 2006).

Taken together, this leads to two important conclusions about gender diversity in FTF teams[4]. One, gender diversity is not necessarily associated with the same separation problems associated with racial diversity in FTF teams. In fact, prior research indicates that FTF teams are likely to benefit from higher (rather than lower) levels of gender diversity (e.g., Kochan et al., 2003). Two, if teams are to benefit from their gender diversity, we should expect that to occur when both men and women fully participate — if men or women don't participate, then the team cannot benefit from their contributions.

Gender diversity consistently has been negatively associated with knowledge sharing when teams use text communication (Herring, 2000; Lawlor, 2006; Savicki et al., 1996). Researchers have explained this result in terms of a lack of participation by women in mixed gender settings (Adrianson, 2001; Barrett & Lally, 1999; Herring, 2000; Lawlor, 2006; Savicki et al., 1996; Sussman & Tyson, 2000). From a theoretical perspective, the parallelism provided by text communication should improve knowledge sharing by women in mixed gender settings. However, empirical research suggests the opposite: women contribute fewer postings in mixed gender online settings, receive fewer responses from others, and have less control over topics (Herring, 2000; Sussman & Tyson, 2000). Likewise,

[4] Diversity as separation does not attempt to explain differences that may exist between teams of all men and teams of all women. We acknowledge that such differences may exist but are beyond the scope of this study.

research on online learning shows that women tend to send fewer messages than men and that women's messages tend to be shorter than men's (Barrett & Lally, 1999; Lawlor, 2006). Lawlor (2006) found that women shared significantly less in mixed-gender online discussion groups than they did in homogenous groups of women.

So, although text communication with parallelism *can* level the playing field by enabling men and women the same opportunities to participate, women appear to choose to participate less. Why? Text communication lacks the visual and vocal cues of FTF communication, which reduces the social cues that inhibit the aggressive behavior of men (Herring, 1996; Kiesler, Siegel & McGuire, 1984). In addition, communication through text can be often misinterpreted as being more emotionally negative than the sender intended (Byron, 2008). Both increases in the aggressive behavior of men and the propensity of receivers to view text communication as more emotionally negative can exacerbate the communication differences between men and women. The result is that text communication environments can become a setting where women in mixed gender setting often do not feel comfortable fully participating in open discussions (Barrett & Lally, 1999; Herring, 1996; Herring, 2000; Lawlor, 2006; Kiesler, Siegel & McGuire, 1984).

This brings up an intriguing question: Do we expect a majority of women to suppress a minority of men in an online environment? The answer is no. We should acknowledge that current theory related to separation (see Harrison & Klein, 2007) would suggest that a team of three women and one man would behave similarly to a team of three men and one woman (i.e. same degree of separation). The problem with this logic is that it ignores the differences in communication styles between men and women. The issue is not just what the technology enables, but also how men and women have been socialized to communicate: men are socialized to assert their opinions, and women are socialized to be less assertive (Berdahl & Craig, 1995). Because women are more open to the opinions of others (Eagly & Carli, 1981; Rancer & Baukus, 1987; Wiley & Eskilson, 1985), they would be less inclined to leverage their majority to suppress the male minority members. On the other hand, based on the communication style of men in online settings (Herring, 1996; Kiesler et al., 1984), it is likely that a male minority would still create an environment that could reduce the participation of women, relative to their composition on the team.

Berdahl and Craig (1996) found evidence that a minority of men could still disrupt or suppress a majority of women in teams; but, they also found this dependent heavily on the communication environment. They found that

even when men were in the minority, they still had more influence than the women on the team in the majority, and even more than their female minority counterparts in male-majority teams, when those teams communicated via text communications. However, this was not true in FTF teams that Berdahl and Craig (1996) studied. In fact, women in the minority had higher levels of influence than their male teammates in the majority and even more influence than their minority counterparts in FTF teams. This suggest that the presence of social cues in FTF communication helps to suppress some of the communication behavior of men enabling women to participate more during FTF team discussions. The findings of Berdahl and Craig (1996) seem to support the emerging research on collective intelligence in FTF teams. That is, we should expect gender diversity to be associated with increases in knowledge sharing in FTF teams where women are better able to leverage their ability to read and respond to the emotions of others (Woolley et al., 2010) and facilitate a supportive team environment conducive to knowledge sharing. Based on the above discussion, we hypothesize:

Hypothesis 2a: The communication environment moderates the relationship between gender diversity and knowledge sharing such that gender diversity is negatively related to knowledge sharing in text communication and positively related to knowledge sharing in FTF communication.

Knowledge integration can also be affected by the lack of visual and vocal cues in text communication because it can make it difficult for teams to converge on meaning, regardless of diversity (Dennis et al., 2008). However, this lack of visual and vocal cues is likely to make knowledge integration even more difficult in team with more gender diversity, for the reasons we mentioned — women are less likely to participate in knowledge integration for the same reasons as for knowledge sharing. Indeed, high levels of knowledge integration cannot occur without the full participation of all team members.

There is also at least one other reason gender diversity is likely to be negatively related to knowledge integration when teams use text communication. Although text communication filters out visual cues for both men and women, women are better able to pick up on subtle cues in text communication (Dennis, Kinney, & Hung, 1999; Gefen & Straub, 1997; Nowak, 2003), are more sensitive to them (Craver, 2002; Hall, 1984), and are more reliant on them (Woolley et al., 2010). In contrast, men are more likely to overlook visual and vocal cues and are less affected by their absence (Gefen & Straub, 1997; Nowak, 2003; Woolley et al., 2010). As a result, men and women who read a text message — or create it — may interpret the same message quite differently. This means that teams should

find it more difficult to achieve a shared meaning in gender diverse teams that use text communication. On the contrary, we expect the opposite to be true when teams use FTF communication. Teams engaged in FTF communication should benefit from having more gender diversity. This should be especially evident during knowledge integration. As mentioned earlier in H2a, we expect a similar situation to exist even when women are the majority.

Hypothesis 2b: The communication environment moderates the relationship between gender diversity and knowledge integration such that gender diversity is negatively related to knowledge integration in text communication and positively related to knowledge integration in FTF communication.

Effects on Decision Quality

Both knowledge sharing and knowledge integration (i.e. conveyance and convergence) are positively related to decision quality because both are needed for most decision-making tasks (Dennis et al., 2008). Teams are often more effective at decision-making than individuals because teams have access to more diverse knowledge than any one individual acting alone. In a team, each member brings unique knowledge and viewpoints that are unknown to other members (Robert et al., 2008), but this knowledge can only affect team performance if it is shared (Dennis, 1996). Likewise, knowledge integration is important because it enables teams to arrive at a shared meaning of the knowledge (Robert et al., 2008) by merging multiple interpretations (Mathieu, Goodwin, Heffner, Salas, & Cannon-Bowers, 2000). This, in turn, allows team members to derive more meaning from communication (Kraut, Fussell, Brennan, & Seigel, 2002). This shared meaning also enriches further communication of knowledge because members have a common, shared understanding from which to draw (Mathieu et al., 2000; Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2005). This common understanding is vital to enabling teams to leverage their knowledge for higher performance. In fact, the concept of common or shared understanding has been used throughout research to explain effective team decision-making (Kraut et al., 2002; Mathieu et al., 2005; Robert et al., 2008). Research has consistently shown that teams are more likely to make better decisions when members share their unique knowledge and integrate other team members' knowledge that is relevant and important to a decision (Dahlin et al., 2005; Dennis, 1996; Robert et al., 2008; van Knippenberg et al., 2004). When team members are not able to effectively share their unique knowledge or integrate others' knowledge to reach a shared understanding of its meaning, the team's decision quality is limited (Dennis, 1996; Robert et al., 2008; Stasser & Titus, 1985).

The fundamental mechanisms in theories of technology-mediated communication have posited that the use of technology impacts decision quality by indirectly or directly supporting either or both knowledge sharing and integration processes (Carte & Chidambaram, 2004; Dennis, 1996; Dubrovsky, Kiesler, & Sethna, 1991; Kiesler & Sproull, 1992). Indeed, both knowledge sharing and integration have been linked to team outcomes such as software quality, creativity, product innovation, and decision quality (Hilmer & Dennis, 2001; Homan et al., 2008; Kearny, Gebert, & Voelpel, 2009; Lin & Chen, 2006; Robert et al., 2008; Tiwana, 2004; Tiwana & McClean, 2005). Thus:

Hypothesis 3: Knowledge (a) sharing and (b) integration are positively related to decision quality.

The importance of knowledge sharing to decision quality should vary by the communication environment. Knowledge sharing should have a stronger impact on decision quality in teams that communicate with text, for two reasons. First, the rehearsability provided by text communications increases the clarity of the knowledge shared. Rehearsability enables senders to craft a more coherent and concise message before it is sent (Dennis et al., 2008; Robert & Dennis, 2005). Second, reprocessability increases the opportunity for shared knowledge to be elaborated on by the entire team (Carte & Chidambaram, 2004; Dennis et al., 2008). It does this by enabling members to go back and reconsider knowledge presented earlier, so less of the knowledge shared is lost to the team. As a result, the same level of knowledge sharing is likely to lead to better decision quality when teams use text communications.

A recent meta-analysis provides some empirical evidence to support our theoretical arguments: Mesmer-Magnus, DeChurch, Jimenez-Rodriguez, Wildman, and Shuffler (2011) examined 94 studies involving 5,595 teams and compared the impact of knowledge sharing across teams that used FTF with teams that used text communication. They discovered that knowledge sharing was more important to the performance of teams that employed text communication than it was to the performance of teams using FTF communication. Therefore, we propose that knowledge sharing is likely to have a stronger relationship to performance in teams using text communication than in teams using FTF communication. Thus:

Hypothesis 4a: The relationship between knowledge sharing and decision quality is stronger when teams use text communication than when they communicate in FTF settings.

Similarly, the importance of knowledge integration to decision quality should also vary by the communication environment. We argue that knowledge integration is more important to decision-making when teams use text

communication because although it is more susceptible to process losses (Robert, et al. 2008; Stasser & Titus, 1985), once a certain level of knowledge integration has occurred, teams can better leverage the reprocessability provided by text communications for more effective decision-making. Teams often struggle to take advantage of their knowledge in both FTF and text communications due to dual task interference. Dual task interference occurs when team members have to both contribute their own knowledge and process their teammate's knowledge during team communications, which leads to lower decision quality (Heninger et al., 2006). Given the benefits of reprocessability a certain level of shared meaning should be more valuable to teams that communicate using text. The communication archives not only allow teams the opportunity to go back and discover missed knowledge but also to revisit and recalled previously forgotten knowledge (Dennis et al., 2008; Robert & Dennis, 2005). This is particularly important because even knowledge that has already been integrated can be hard to retain with the limited short term memory of humans. Thus, reprocessability provides a ready reference to aid memory and recall of knowledge. This reduces the cognitive load and enables teams to better leverage their shared meaning to make more effective decisions (Miranda & Saunders, 2003; Robert et al., 2008). Therefore, knowledge integration should have a stronger relationship with decision quality when teams communicate using text rather than in FTF settings. Thus:

Hypothesis 4b: The relationship between knowledge integration and decision quality is stronger when teams use text communication than when they communicate in FTF settings.

METHOD

To investigate these effects, we conducted an experimental laboratory study. The study involved randomly assigning 46 teams to perform a task through either text or FTF communication. We captured racial and gender diversity by using a survey, and knowledge sharing and integration by coding the team discussions. We measured the performance outcome (decision quality) as the objective team score on the task.

Participants

The participants were junior-level business school students from a large state university. This experiment was important to the students because it was part of their coursework and they received course credit for participating in the study. However, their performance was not graded. Previous researchers such as Homan and colleagues (2008) have used similar subjects for diversity studies. We initially recruited 184 people to participate; we included the 172 people who completed all parts of the study. There were 46 teams, ranging from three to five

members, with a mean of four members. Ages ranged 20–29 years, with an average of 21.4 years. Thirty-four percent of the participants were women, resulting in 26 teams (57%) with mixed genders. The racial breakdown was 25.0% Asian, 1.0% black, 1.2% Hispanic, 70.8% white, and 2.0% other. As such, 29.2% of the subjects were non-white, resulting in 29 teams (63%) having some racial diversity. The gender and racial diversity of each team is given in Appendix A. In addition, six of the participants were international students: five were from Asia and one from Europe. As such, 3.5% of the students were non-Americans.

Many experimental studies have used ad-hoc teams with no history and no expectation of future collaboration. However, many diversity scholars have shown that the impact of diversity changes after relationships have been built among members (Carte & Chidambaram, 2004; Harrison et al., 2002; McLeod et al., 1996; Watson et al., 1993). Therefore, we used teams that had a history of working together for 6–8 weeks prior to the experiment and expected to work together for 4–7 weeks after the experiment. Thus, this experiment provided a snapshot in the middle of these intact operating teams.

Task

We asked teams to select students from a set of 10 applicants to admit to their university (see Appendix B). We chose this task because every member of the team had experience with the university admissions process, having successfully navigated it themselves (see Dennis, 1996; Fuller & Dennis, 2009). The task was a hidden-profile task, as defined by Stasser (1992), and would be classified as an intellective task. Hidden-profile tasks are designed to mimic a situation in which all team members have specialized unique information that is important to the team's decision. A hidden-profile task is highly interdependent because each team member has unique information known only to him or her that is important to the team's decision, so that decision quality depends on the extent to which teams share and use all their members' unique information (Dennis, 1996; Robert et al., 2008; Stasser, 1992). Intellective tasks are decision tasks that have a correct answer (Stasser, 1992). In a hidden-profile task, each team member receives common information known to everyone, some shared information known by at least two members, and some unique information known only to him or her (Table 1). Teams that had three or five members received the same set of information as four-member teams; the distribution of information across team members was slightly different, but the basic pattern of common, shared, and unique information was essentially the same. Teams were

given an hour to complete the task.

<<<<<<Insert Table 1 >>>>>>

Independent Variables

Communication medium: The communication medium was manipulated between FTF and synchronous text discussion. We randomly assigned teams to one of two treatments, FTF or text discussion, with 23 teams assigned to each treatment. In the FTF treatment, team members sat around a table and engaged in verbal discussion. They were given a notepad to record any knowledge they thought to be important. In the text-discussion treatment, team members worked in separate rooms and communicated only through synchronous text discussion to better simulate a team working from separate offices without verbal or visual cues. The Sakai course-management software chat room was used for this treatment. The software was similar to most text-discussion software; team members entered text in one window and could read the comments of others in another window. Team members were able to scroll up and down to read any previous message and could also see the name of the person who contributed each comment. The communication medium was treated as a dummy variable, using a 0 to represent FTF communication and a 1 to represent text discussion.

Gender and racial diversity: We used a population standard deviation recommended by Harrison and Klein (2007) to measure gender and racial diversity. As a validity check we also ran the analysis with gender and racial diversity measured as Blau's (1977) index. The statistical results were the same.

***Controls*:** We included several control variables, including team size and grade point average (GPA). Team size was measured by the number of team members and GPA was the mean self-reported GPA of the team members. Research has found that variance in individual traits such as attitudes toward teamwork and emotional intelligence can significantly predict team outcomes (van Knippenberg et al., 2010). In particular, research has linked emotional intelligence to the performance of diverse teams (Lillis & Tian, 2009; Wang, 2015). We included the standard deviations for such traits in the model. Items measuring attitude toward teamwork included "It is better to work in teams to accomplish a task rather than as an individual" and "Learning to work within a team environment is important." We measured emotional intelligence using a self-report survey from Tett, Fox, and Wang (2005). Team members could also differ in their experience with text-discussion systems, so text-discussion experience was used

as a control variable. We measured experience with text-discussion systems using items taken from Fuller and Dennis (2009).

Dependent Measures

We measured knowledge sharing (conveyance) and knowledge integration (convergence) using audio and text recordings. Two raters independently listened to the audio recordings and read the text and coded the extent of knowledge sharing and knowledge integration. The rating scheme employed a 7-point scale that was designed to measure the actual knowledge sharing and knowledge integration during team discussions. Both raters were shown the distribution of knowledge related to each decision (Table 1). The raters focused on how much of the information presented in Table 1 along with the participants' opinions and perspectives on the information was actually shared and used.

In doing so, we clearly distinguished between information and knowledge relative to our task. Information represents the facts that were given to each team member. In our task, the information was the facts about each candidate for admission. Each team member was given unique information about each candidate. Knowledge, in contrast, consists of information as well as the additional meaning, values, and contextual interpretations of it (Alavi & Tiwana, 2002; Newell et al., 2004; Robert et al., 2008). In our task, knowledge included a team member's opinion and perspective regarding the information. For instance, sharing that a candidate for admission had a GPA of 3.2 would be an example of sharing information. Sharing that a candidate for admission had a GPA of 3.2 and that this was a relatively high GPA in reference to the college preparation courses the student had taken would be an example of sharing knowledge. Diverse knowledge would be the unique knowledge, which includes the meaning, values and contextual interpretation of the fact, from each team member. An example of arriving at a shared meaning would be the degree to which all team members came to agree that a GPA of 3.2 was indeed relatively high in reference to the set of courses the student took. Knowledge integration, in our study, would be the degree to which team members were able to synthesize their knowledge to reach a shared and coherent understanding regarding the qualifications of each candidate and the criteria that should be used to evaluate him/her for admission.

The coding used a scheme that was similar to the approach of van Knippenberg et al. (2010); similar coding schemes have been used in other studies examining knowledge integration in distribution knowledge tasks (e.g.,

Homan et al., 2007; Kooij-de Bode, van Knippenberg, & van Ginkel, 2008; van Ginkel & van Knippenberg, 2009; van Knippenberg et al., 2010). The raters assessed "the degree to which members in this team shared knowledge to reach a solution" to obtain a measure of knowledge sharing. They assessed "the degree to which team members integrated knowledge to reach a shared meaning or understanding" to obtain a measure of knowledge integration. Appendix C provides an example of knowledge sharing and integration. A score of 7 was given for a high measure of knowledge sharing and integration while a score of 1 was given for low measures of both. Both raters coded all the team discussions, resulting in 100% overlap. The raters were doctoral students in a communications program. Both raters were trained and experienced in analyzing team discussions. The inter-rater reliability was .92 for knowledge sharing and .88 for knowledge integration.

The primary performance measure was decision quality as measured by the number of correct decisions the team made. The task required the teams to admit or reject each of the 10 applicants. Two admissions officers from the same university that the subjects attended verified the task. Each admissions officer independently identified which applicants should be admitted and rejected. The two admissions officers had 80% agreement prior to resolving their differences. Decision quality was measured by the number of admits/rejects that matched the experts' decisions and the team received 1 point for every correct selection. Team scores could range from a 10, which was the highest, to a 0, which was the lowest.

Procedures

Teams were formed in the second week of the 15-week semester and worked together to complete several assignments prior to the lab experiment. The experiment was conducted between the sixth and eighth weeks of class. All team members completed a survey measuring their attitude toward teamwork and their emotional intelligence 6–10 days before participating in the experiment. The experimental behavioral laboratory had eight individual rooms and two large breakout rooms, which enabled us to manipulate and control the team settings.

Team members were welcomed and briefed in the open lab and then placed into separate breakout rooms. When team members were in the breakout rooms, they could not see one another or communicate verbally. Each team member was given the task and worked alone in the breakout room to make an individual decision about each applicant. After every team member made an individual decision, team discussion began. Half of the teams were

randomly assigned to the FTF treatment and half were assigned to the synchronous text communication treatment. Teams assigned to the text-discussion treatment were trained on the software and then used it from their individual breakout rooms to discuss the task. Teams assigned to the FTF treatment moved into the open lab and sat around a table; when the FTF teams made their decision, members returned to their individual breakout rooms. All team members were then debriefed and released. The mean task time was 25 minutes.

ANALYSIS AND RESULTS

Construct Validities and Reliabilities

Knowledge sharing, knowledge integration, decision quality, communication medium, team size, gender diversity, and racial diversity were all measured at the team level. The factor loadings for attitude toward teamwork, text-discussion experience and team identification are presented in Table 2. The means, standard deviations, and correlation matrix are in Table 3. Cronbach's alpha for the items measuring attitude toward teamwork were .82 and .87 for text-discussion experience, indicating adequate reliability. Because team membership was not expected to influence attitude toward teamwork or text-discussion experience, we did not use intraclass correlation coefficients.

<<<<<<Insert Table 2 >>>>>>

<<<<<<Insert Table 3 >>>>>>

Control Variables Results

We used several control variables to reduce the possibility of alternative explanations. These included a measure of team ability (team GPA), team size, national diversity, text discussion experience, attitude toward teamwork, and emotional intelligence. Text discussion experience was significant in all models explaining knowledge sharing and integration (see Table 4). This clearly demonstrates the importance of including text discussion experience as a control when examining communication processes online. Text discussion experience, emotional intelligence, and team size were the only significant control variables in the final model predicting decision quality (see Table 5). In particular, our measure of emotional intelligence was significant in every model involving racial and gender diversity. This further highlights the important role of emotional intelligence in the performance of diverse teams.

Structural Model Results

The research model (see Figure 1) was tested with PLS Graph 3.0. All continuous variables involved in the interactions were standardized (z-scores; Aiken & West, 1991; Chin, Marcolin, & Newsted, 2003). The final variance explained for knowledge sharing was .46 ($F_{8, 38}$ = 3.89, p<.01) and for knowledge integration.45 ($F_{8, 38}$ = 3.78, p<.01), and decision quality .55 ($F_{13, 33}$ = 3.26, p<.01). The final model included all direct and indirect effects. Tables 4 and 5 display the results for knowledge integration and decision quality. We checked for multicollinearity and found that no variance inflation factor (VIF) approached the value of 10 (Cohen, Cohen, West, & Aiken, 2003; Hair, Black, Babin, & Anderson, 2010; Neter, Kutner, Nachtsheim, & Wasserman, 1996).

<<<<<<Insert Table 4 >>>>>>

<<<<<<Insert Table 5 >>>>>>

Tests of Hypotheses

H1a and H1b, which state that the impact of racial diversity on knowledge sharing and knowledge integration is moderated by communication medium, were partially supported. The moderation between racial diversity and communication medium was significant for knowledge sharing (β=.51; p<.05) and knowledge integration (β=.44; p<.01). Racial diversity were positively associated with knowledge sharing (see Figure 2) and knowledge integration (see Figure 3) in teams using text communication but had little effect in teams using FTF communication. To determine whether the slopes differed significantly from zero, we conducted a simple slope test. The slopes for FTF communication for both knowledge sharing (β= -.20; p>.05) and knowledge integration (β= -.15; p>.05) were not significant. However, the slopes for knowledge sharing (β= .31; p<.05) and knowledge integration (β= .34; p<.05) for text communication were significantly different from zero.

<<<<<<Insert Figure 2 here >>>>>>

<<<<<<Insert Figure 3 here>>>>>>

H2a and H2b, which state that the impact of gender diversity on knowledge sharing and knowledge integration is moderated by the communication medium, were supported. The moderation between gender diversity and communication medium on knowledge sharing (β= -.55; p<.01) and knowledge integration (β= -.59; p<.01) was significant. Gender diversity was positively related to knowledge sharing (Figure 4) and knowledge integration (Figure

5) when teams communicated by FTF communication. However, gender diversity was negatively related to knowledge sharing and knowledge integration when teams communicated using text communication. We conducted a simple slope test to determine whether the slopes differed significantly from zero. The slopes representing the FTF communication for knowledge sharing (β= .32; p<.05) and integration (β= .34; p<.05) were significantly different from zero, as were the slopes representing text communication for knowledge sharing (β= -.27; p<.05) and knowledge integration (β= -.31 p<.05). The addition of both moderation effects significantly increased the variance explained in knowledge sharing by 16% (F=5.48; p<.001) and in knowledge integration by 20% (F=6.5; p<.001).

<<<<<<Insert Figure 4 here >>>>>>

<<<<<<Insert Figure 5 here>>>>>>

H3a and H3b, which state that knowledge sharing and knowledge integration would be positively associated with decision quality, were supported. We found main effects for knowledge sharing (β=.27; p<.05) and knowledge integration (β=.25; p<.05) on decision quality. H4a and H4b, which state that the impact of knowledge sharing and knowledge integration on decision quality is moderated by the communication medium, were partly supported. The moderation between knowledge integration and the communication medium (H4b) was significant (β=.59; p<.01) but the moderation between knowledge sharing and communication medium (H4a) was not (β=.07; p>.05). The moderation effect added 8% additional variance explained (F=7.27; p<.001). As predicted, knowledge integration had a stronger, more positive impact on decision quality in teams using text communication than in teams using FTF communication (see Figure 6). We tested both slopes to determine whether they differed significantly from zero. The slope of the FTF line was significant (β= .31 p<.05), as was the slope for text communication (β= .59 p<.001).

<<<<<<Insert Figure 6 here >>>>>>

DISCUSSION

The objective of this study was to understand whether text communication: (1) helps or hinders the way racially and gender-diverse teams share and integrate knowledge and (2) determines how important knowledge sharing and integration are to decision quality in teams. Our results suggest that text communication helps teams overcome the problems associated with their racial diversity but exacerbates the problems with their gender diversity. On the other hand, FTF communications in this study aided teams in meeting the challenges with their gender

diversity but seemed to have no effect on their racial diversity. This effect was, in part, a result of both knowledge sharing and knowledge integration. Racial diversity in teams that used text communication was positively associated with knowledge sharing and integration. However, for gender diversity the opposite was true. Gender diversity was positively associated with knowledge sharing and integration in FTF teams but not so in teams that used text communications. Further, we found that knowledge integration was more important to decision quality when teams used text communication than when teams communicated face-to-face.

First, this study extends the research on communication media and team diversity. Previous research has consistently proposed that text communication should help diverse teams by suppressing the problems associated with separation (Carte & Chidambaram, 2004; Staples & Zhao, 2006). Similar to previous studies we found that text communication improves knowledge sharing (conveyance) for racially diverse teams (Giambatista & Bhappu, 2010) and decreases it for gender-diverse teams (Adrianson, 2001). However, unlike previous studies, we provide a theoretical explanation as to why we would expect such differences to occur based on both communication theory and empirical evidence derived from such theory. Thus, we identify that differences are different, and we provide an explanation as to why. In doing so, we help to explain the inconsistent results in past research on team diversity and communication technologies.

Our results demonstrate the need for researchers to theorize about how communication environments impact the effects of different types of diversity rather than assuming that communication media impact all types of diversity in similar ways. The idea that theories on team diversity and communication technology should be based on the specific type of diversity is an important element that current theories lack. We should also consider the possibility that not only can the same communication medium impact each type of diversity differently, but each type of communication medium (e.g., synchronous and asynchronous) might moderate each type of diversity differently. We believe more theory development and testing are needed to begin to fully comprehend the role of the communication medium on the effects of team diversity.

Second, unlike many studies of communications media, we examined knowledge integration as well as knowledge sharing. Knowledge integration is an important communication process needed to allow teams to fully leverage their diversity (Maznevski, 1994; van Knippenberg et al., 2004). Previous studies focusing on knowledge

sharing alone failed to capture a key component in understanding the effects of both communication medium and team diversity. The inclusion of knowledge integration allowed us to see how text communication can facilitate meaning within racially diverse teams while inhibiting it in gender-diverse teams relative to FTF communication. Thus, we identified one more important communication process that text communication alters in diverse teams. In so doing, this study went further than simply determining when team diversity matters — it explored the more important question of *why* team diversity matters. By examining both communication processes, this study unfolded the issues and concerns underlying specific types of team diversity, which are often linked to the willingness to share and derive meaning from knowledge.

Third, our findings extend MST. In this study, we examined instances of MST's conveyance and convergence processes, which we refer to as knowledge sharing and knowledge integration, respectively. The results of our study indicate that the capability of text communication to promote conveyance and convergence is dependent on a team's diversity. In racially diverse teams, text communication provided a better medium for conveyance and convergence than FTF communication. Racially diverse teams shared more knowledge and achieved better shared-meaning by seeming to avoid the negative stereotyping triggered by visual and vocal cues found in FTF communication. In gender-diverse teams, however, FTF communication provided better conveyance and convergence than text communication because it provided both visual and vocal cues that better accommodated the differences in communication styles between men and women. Both findings run counter to what was predicted by MST. We should also note that MST does not take into account the potential influence of team diversity. As such, our findings call for a re-examination of our theoretical understanding of MST relative to a team's diversity.

Fourth, our study contributes to the research on communication technologies in general by demonstrating that convergence becomes more important to decision quality when teams employ text communication. Although research has recognized both the importance of and the difficulty of deriving meaning in text communication (Dennis et al., 2008; Lin & Chen, 2006; Miranda & Saunders, 2003; Robert et al., 2008), our study complements and extends this research by showing that knowledge integration becomes more important to decision quality when teams communicate through text communication. As a result, our findings go beyond the current research on both knowledge sharing and knowledge integration in teams that use text communication versus FTF communication.

We should also note that we found that knowledge sharing is as important to decision quality in text communication as it is in FTF communication. Our results are somewhat different from the findings of recent work by Mesmer-Magnus et al. (2011), who found that knowledge sharing, a conveyance process, is more important to the success of teams that employ text communication than to teams using FTF communication. However, our study differs from theirs in two important ways: (1) their study was a meta-analysis, and (2) it did not include a measure of convergence. In addition, our nonsignificant results could also be due to low power.

Finally, although team composition matters to decision-making, it is less clear the extent to which communication media matter for decision-making in less diverse teams. Research has found that teams using FTF communication often outperform teams using text communication (see two meta-analyses: Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002; Dennis & Wixom, 2002). In our study, the difference was not significant (FTF=5.38 vs. VT=4.77, t=1.8; p<.10). But when the moderation effects of the communication medium with racial and gender diversity were added, clear patterns emerged (Figures 2, 3, 4, & 5). It became clear that the performance differences were mainly a result of team composition; as such, one has to wonder to what extent medium matters for less diverse teams. Similarly, Staples and Zhao (2006) found that the use of text communication did not improve decision quality in culturally homogeneous teams over that of culturally homogeneous teams that used FTF communication. However, text communication did improve decision quality for culturally diverse teams over that of their culturally diverse FTF counterparts. In other words, the use of text communication seemed to improve decision quality for culturally diverse teams but not for culturally homogeneous teams.

Yet in our study, the use of text communication seemed to actually hurt racially homogeneous teams, and a study by Phillips, Northcraft, and Neale (2006) may explain why. They found that racially homogeneous teams actually discussed less information when reaching a decision than racially diverse teams. They suggested that people in racially homogeneous teams assumed that they had similar information and similar perspectives on that information. In our study, the use of text communication in racially homogeneous teams seemed to discourage discussion (i.e. knowledge sharing and knowledge integration). Yet, in racially diverse teams the use of text communication seemed to spur further discussion. The use of text communication seems to heighten both behaviors. Phillips et al. (2006) did not examine the impact of gender diversity. The use of text communication actually improved

both knowledge sharing and knowledge integration for gender-*homogeneous* teams. This finding is indirectly supported by Savicki et al. (1996), who found that women-only groups (i.e., gender-homogeneous teams) produced more messages than their gender-diverse counterparts during online discussions. This suggests that the impact of text communication may not only be different for racially and gender-diverse teams but also for racially and gender-homogeneous teams. Taken together, our study and prior research suggest that the effects of text communication have important implications for both homogeneous and diverse teams.

Implications for Practice

In practice, teams typically have access to a variety of media and are composed of a mixture of gender and racial diversity. How should organizations get the most out of their diverse teams? Virtual communication (such as text discussion or email) is dominant in many distributed teams (Staples, Wong, & Cameron, 2004; Staples & Zhao, 2006). As such, organizations may want to provide guidance on how best to use virtual communication.

Our results suggest that for teams high in gender diversity, text virtual communication (e.g., text chat, email) might not be as effective as other options. For these teams, organizations should encourage FTF meetings or the use of video or audio conferencing. Of course, text communication might be necessary for efficient communication, especially when there are no convenient times for synchronous meetings, but members of teams high in gender diversity need to be aware that text communication can create problems as compared to FTF communication, even for teams whose members are known to one another and have a history of working together.

The opposite may be true for teams high in racial diversity. For these teams, text communication should be used as one component of group discussion when making important decisions. Even for collocated teams, text communication would be expected to help in decision-making. Virtual communication tools designed for same-time, same-place use should be used to improve decision quality (e.g., Dennis, 1996). This again applies to established teams whose members know one another. Just because members are known doesn't mean that racial divisions can't unknowingly creep into FTF discussions.

The challenge, then, is for teams high in both racial and gender diversity. Organizations may recommend the use of various types of media to counterbalance the competing problems and benefits experienced as a result of racial diversity and gender diversity. This means not only ensuring that virtual teams have access to many types of

communication technologies, but also ensuring that they use them.

Limitations and Future Studies

Like all research, this study has limitations. One, the study employed an experimental design using student participants that enabled researchers to enhance internal validity through control and use of objective outcome measures that are comparable across teams (Homan et al., 2008). As Lee and Baskerville (2003) concluded, one does not generalize from empirical data; instead, empirical data are used to test theory and then the theory is generalized to other contexts. Thus, the question is not whether the population we used is similar to other populations; the question is whether this population is appropriate for testing this theory. The next question is, what are the important boundary conditions in the theory itself that limit its applicability to some other specific context and population? This is an important question because situations in the real world are as diverse as the differences between the lab and the field (e.g., marketing employees creating advertising, accountants conducting an audit, members of a parole board deciding on clemency, executives of a Japanese firm buying real estate in Los Angeles, military officers from different countries and services making a command decision in Afghanistan, and so on).

We note that our study largely examined two races: Caucasian and Asian Americans. There are other races such as African Americans and Hispanic Americans that may or may not present differences that did not arise in this study. Although experimental design presents researchers with a strong base from which to draw causal inferences, questions regarding the validity of our theory for other contexts can only be answered through careful theoretical considerations and replication in other settings (Colquitt, 2008). To triangulate and extend our findings, similar studies should be conducted in the field, and could add richness by examining perceptions of diversity. There may also be value in examining interventions that could reduce the negative effects of diversity and accentuate its positive effects. Studies could assess the extent to which these measures are effective in improving team outcomes.

Two, this study examined only race and gender diversity, although there are many other types of diversity. We chose race and gender for two reasons. First, the benefits associated with using virtual communication have centered, in part, on the ability of text communication media to reduce the social presence of visibly different others (Adrianson, 2001; Savicki et al., 1996). Race and gender diversity are two highly visible types of diversity and thus offer a good opportunity to test the benefits of text communication. Second, race and gender diversity represent two

of the most common types of diversity and have often been studied in FTF settings (Horwitz & Horwitz, 2007). As a result, there is a lot of research on which to anchor our own. Nonetheless, future studies should be conducted to determine the impact of other types of diversity, such as differences in culture.

Three, another limitation of this study is related to the theoretical approach we took in examining the effects of racial and gender diversity. We conceptualized and operationalized gender and racial diversity as separation and discussed the potential benefits associated with variety for each. However, Harrison and Klein (2007) also suggested that racial and gender diversity can be viewed as disparity. We focused on decision-making in teams of peers. We did not capture measures of status that would enable us to examine disparity. Future studies could be designed to understand the effects of conceptualizing and operationalizing racial and gender diversity as disparity.

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Table 1. Task Information Distribution (Taken from Fuller & Dennis, 2009)

Element	Team Member 1	Team Member 2	Team Member 3	Team Member 4
SAT Math	X	X	X	X
SAT Verbal	X	X	X	X
GPA Overall	X	X	X	X
Letter of Recommendation	X		X	
Extracurricular Activities		X		X
Hometown Type	X		X	
Parents' Academic Background		X		X
Parents' Alumni Status	X		X	
Required Coursework Completed		X		X
Academic GPA	X			
Grade Trend		X		
Rank in School			X	
High School Quality				X
In-state Student	X			
College Credit Courses		X		

Table 2 Factor Loadings

	Text Discussion Experience	Attitude Toward Teamwork
I am very knowledgeable about instant messaging or chat software.	**.89**	.11
I understand how to use instant messaging or chat software.	**.89**	.10
I frequently use instant messaging or chat software.	**.92**	.09
It is better to work in teams to accomplish a task rather than as an individual.	.16	**.88**
Learning to work within a team environment is important.	.10	**.70**
Working in teams can be a pleasant experience	.11	**.78**

Extraction Method: Principal Component Analysis.

a. Rotation converged in 4 iterations.

Table 3. Means, Standard Deviations and Correlations

Variable	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10
1. Text Discussion Experience	6.19	0.56	(0.91)									
2. Knowledge Integration	4.04	0.57	0.27	(NA)								
3. Knowledge Sharing	4.43	0.45	0.22	0.20	(NA)							
4. Decision Quality	5.16	1.13	0.08	0.36 *	0.38 **	(NA)						
5. Gender Diversity	0.27	0.22	-0.02	0.15	0.05	0.14	(NA)					
6. National Diversity	0.04	0.08	-0.14	-0.03	0.10	-0.06	0.37 *	(NA)				
7. Racial Diversity	0.28	0.22	-0.10	0.08	-0.05	0.07	0.25	0.31 *	(.71)			
8. Standard Deviation Attitude	0.69	0.31	-0.27	0.10	0.04	0.26	0.04	0.12	0.15	(NA)		
9. Standard Deviation E.I.	0.42	0.21	-0.17	-0.15	-0.12	0.08	-0.08	0.07	0.33 *	0.07	(NA)	
10. Team GPA	3.41	0.27	-0.14	-0.01	0.11	0.18	-0.18	0.14	0.11	-0.21	0.08	(NA)
11. Team Size	3.89	0.61	0.12	-0.12	0.16	-0.12	-0.06	0.00	-0.03	-0.27	0.07	-0.13

Notes: N = 46; *p<.05; **p<.01; Square root of average variance extracted along diagonals
Emotional Intelligence (EI); Grade Point Average (GPA)

Table 4. Results of PLS Analysis for Knowledge Sharing and Integration

Factor	Knowledge Sharing			Knowledge Integration		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
National Diversity	0.14	0.12	0.14	0.03	-0.07	0.01
Team Size	0.03	0.03	0.11	-0.20 *	-0.16	-0.15
Text Discussion Experience	0.30 ***	0.37 **	0.27 **	0.33 ***	0.33 **	0.31 **
R^2	**10%**			**18%**		
$F_{(3, 42)}$	1.50			3.00 *		
Communication Environment		-0.46 **	-0.29		-0.11 **	-0.12
Racial Diversity		-0.07	-0.20 *		-0.10	-0.10
Gender Diversity		-0.05	0.30		0.16	0.30 *
R^2		**29%**			**23%**	
$F_{(6, 40)}$		2.7 *			1.94	
Change in R^2		**19%** **			**5%**	
Racial Diversity X Communication Environment			0.51 **			0.44 **
Gender Diversity X Communication Environment			-0.55 **			-0.59 **
R^2			**45%**			**43%**
$F_{(8, 38)}$			3.89 **			3.5 **
Change in R^2			**16%** ***			**20%** ***

n=46; Standardized regression coefficients are reported.

†p<.10;*p<.05; **p<.01;**p,.001***

Table 5. Results of PLS Analysis for Decision Quality

Factor	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Text Discussion Experience	0.24	*	0.24	*	0.24	*	0.17		0.05		0.25	*
Std. Attitude toward Teamwork	0.40	**	0.40	**	0.31	**	0.32	**	0.08		0.17	
Std. Emotional Intelligence	0.08		0.16	*	0.11	*	0.14		0.24	*	0.17	**
Team GPA	0.31	**	0.36	*	0.26		0.24	*	0.13		0.05	
Team Size	-0.01		-0.06	*	-0.06		-0.09		-0.20	*	-0.14	†
National Diversity	-0.11		-0.18		-0.12		-0.08		-0.18		-0.17	
R^2	**20%**											
$F_{(6, 40)}$	1.8	†										
Communication Medium			-0.32	**	-0.36	**	-0.35	**	-0.34	**	-0.50	**
Racial Diversity			-0.07		-0.24	*					-0.42	*
Gender Diversity			0.27	**	0.40	**					0.46	*
R^2			**34%**									
$F_{(9, 39)}$			2.20	*								
Change in R^2			**14%**	**								
Racial Diversity X Communication Medium					0.34	**					0.27	*
Gender Diversity X Communication Medium					-0.31	*					-0.28	
R^2					**38%**							
$F_{(11, 29)}$					2.65	*						
Change in R^2					**4%**	*						
Knowledge Integration							0.25	*	0.20		0.32	*
Knowledge Sharing							0.27	*	0.25	*	0.31	*
Knowledge Integration X Communication Medium									0.49	**	0.45	***
Knowledge Sharing X Communication Medium									0.01		0.09	
R^2							**35%**	**	**43%**	**	**53%**	***
$F_{(9, 37)}$							2.07	*				
$F_{(11, 35)}$									2.33	*		
$F_{(13, 33)}$											2.5	*
Change in R^2									**8%**	*	**15%**	* [a]

n=46; Standardized regression coefficients are reported.

†p<.10; *p<.05; **p<.01; ***p<.001

Note a: Difference between Model 6 and Model 3

Figure 1. Theoretical Model

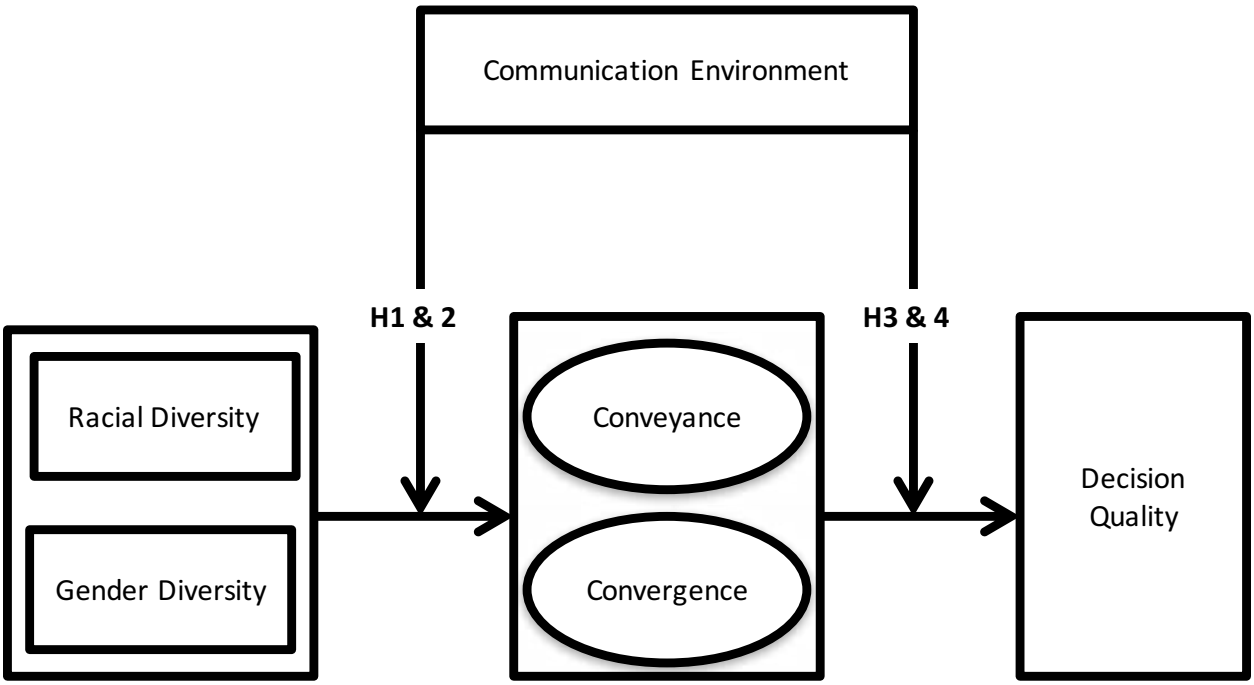


Figure 2. Communication Medium Moderates Racial Diversity's Impact on Knowledge Sharing

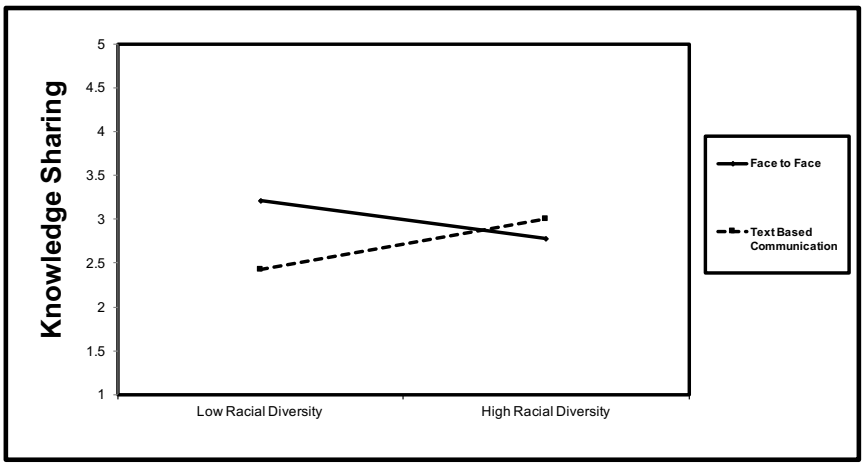


Figure 3. Communication Medium Moderates Racial Diversity's Impact on Knowledge Integration

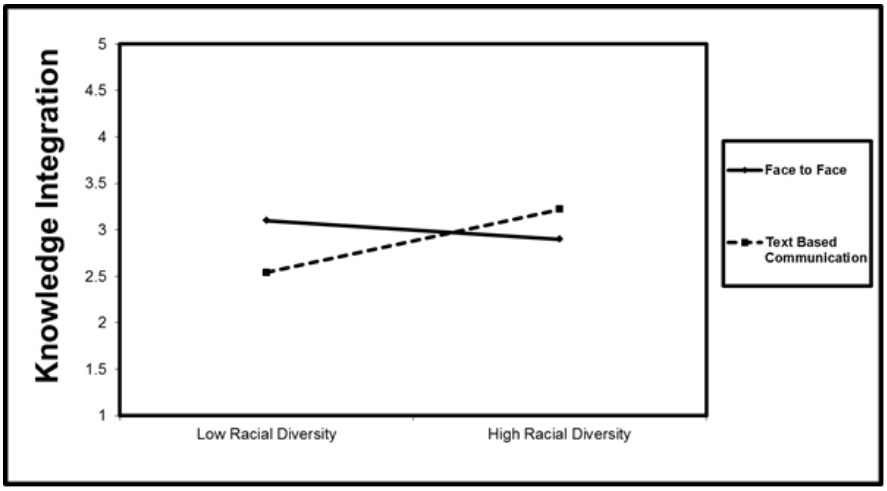


Figure 4. Communication Medium Moderates Gender Diversity's Impact on Knowledge Sharing

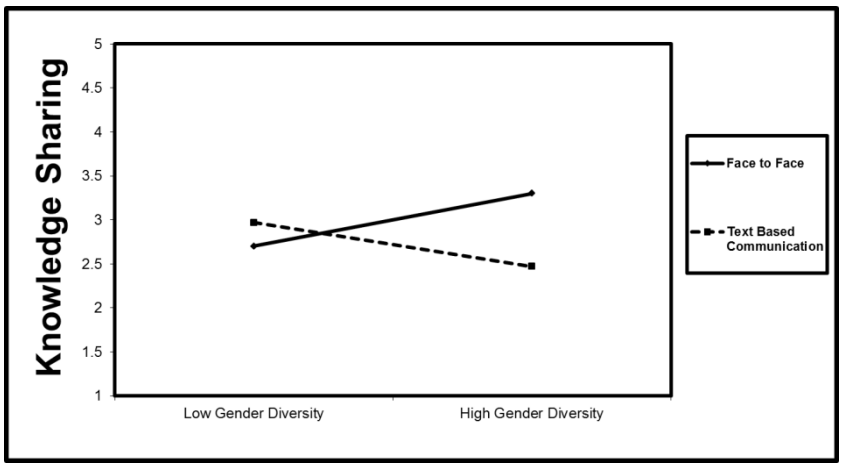


Figure 5. Communication Medium Moderates Gender Diversity's Impact on Knowledge Integration

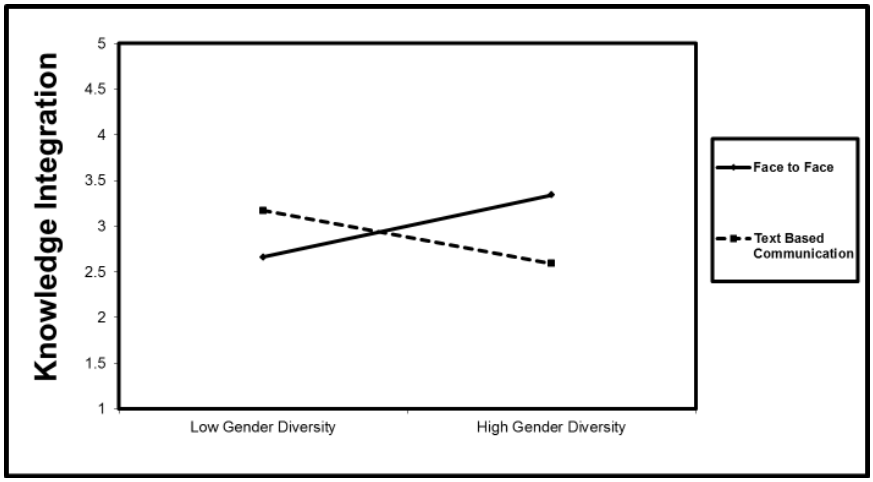
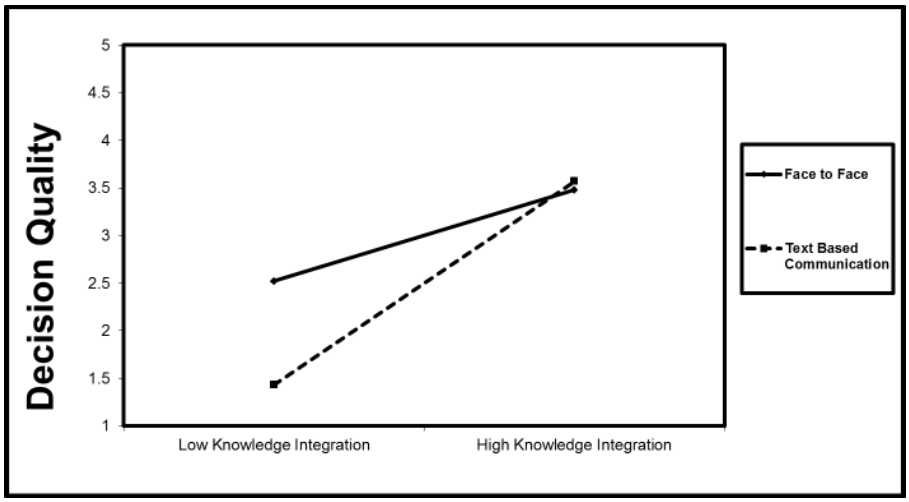


Figure 6. Moderation of Convergence's (Knowledge Integration's) Impact on Decision Quality



Appendix A. Breakdown of Diversity in Teams

		Asian	Black	Hispanic	White	Other	Men	Women
	Team Member 1				1		1	
	Team Member 2	1						1
	Team Member 3	1					1	
1	Team Member 4				1		1	
	Team Member 1				1			1
	Team Member 2				1			1
	Team Member 3				1			1
2	Team Member 4				1		1	
	Team Member 1				1			1
	Team Member 2				1			1
	Team Member 3				1			1
	Team Member 4				1		1	
3	Team Member 5				1		1	
	Team Member 1				1			1
	Team Member 2				1			1
	Team Member 3				1		1	
	Team Member 4				1			1
4	Team Member 5				1		1	
	Team Member 1				1		1	
	Team Member 2	1					1	
	Team Member 3				1			1
5	Team Member 4				1		1	
	Team Member 1				1			1
	Team Member 2	1						1
	Team Member 3	1					1	
6	Team Member 4	1						1
	Team Member 1				1		1	
	Team Member 2				1		1	
	Team Member 3				1		1	
7	Team Member 4				1		1	
	Team Member 1				1		1	
	Team Member 2				1		1	
	Team Member 3				1		1	
8	Team Member 4				1		1	
	Team Member 1	1						1
	Team Member 2	1					1	
9	Team Member 3	1						1

	Team Member 4	1						1
	Team Member 1				1		1	
	Team Member 2				1		1	
	Team Member 3				1		1	
10	Team Member 4	1						1
	Team Member 1	1						1
	Team Member 2				1		1	
	Team Member 3				1			1
11	Team Member 4				1		1	
	Team Member 1				1		1	
	Team Member 2				1		1	
	Team Member 3				1		1	
12	Team Member 4				1		1	
	Team Member 1				1		1	
	Team Member 2				1		1	
	Team Member 3				1		1	
13	Team Member 4				1		1	
	Team Member 1				1			1
	Team Member 2	1						1
14	Team Member 3				1		1	
	Team Member 1				1			1
	Team Member 2				1			1
	Team Member 3				1			1
15	Team Member 4				1			1
	Team Member 1				1		1	
	Team Member 2	1					1	
16	Team Member 3				1		1	
	Team Member 1				1		1	
	Team Member 2	1					1	
	Team Member 3	1					1	
17	Team Member 4				1		1	
	Team Member 1	1					1	
	Team Member 2				1		1	
18	Team Member 3				1			1
	Team Member 1	1					1	
	Team Member 2				1			1
	Team Member 3				1			1
19	Team Member 4	1					1	

	Team Member 1				1		1	
	Team Member 2	1						1
	Team Member 3				1		1	
20	Team Member 4	1					1	
	Team Member 1				1			1
	Team Member 2				1			1
	Team Member 3				1			1
21	Team Member 4					1		1
	Team Member 1				1			1
	Team Member 2				1		1	
	Team Member 3				1		1	
22	Team Member 4				1		1	
	Team Member 1				1		1	
	Team Member 2				1		1	
23	Team Member 3	1					1	
	Team Member 1				1		1	
	Team Member 2				1		1	
	Team Member 3				1		1	
24	Team Member 4				1		1	
	Team Member 1	1						1
	Team Member 2				1			1
	Team Member 3				1			1
	Team Member 4				1			1
25	Team Member 5				1			1
	Team Member 1				1		1	
	Team Member 2				1		1	
	Team Member 3				1		1	
26	Team Member 4				1		1	
	Team Member 1				1			1
	Team Member 2					1	1	
	Team Member 3				1			1
27	Team Member 4				1		1	
	Team Member 1				1		1	
	Team Member 2	1						1
	Team Member 3	1					1	
28	Team Member 4	1						1
	Team Member 1					1	1	
	Team Member 2	1						1
29	Team Member 3	1						1

	Team Member 4	1						1
	Team Member 5				1			1
	Team Member 1				1			1
	Team Member 2				1		1	
	Team Member 3	1					1	
	Team Member 4	1					1	
30	Team Member 5				1		1	
	Team Member 1				1		1	
	Team Member 2				1		1	
	Team Member 3				1		1	
31	Team Member 4				1		1	
	Team Member 1				1			1
	Team Member 2			1			1	
	Team Member 3				1		1	
32	Team Member 4				1			1
	Team Member 1				1		1	
	Team Member 2				1		1	
33	Team Member 3				1		1	
	Team Member 1				1		1	
	Team Member 2				1			1
	Team Member 3				1		1	
34	Team Member 4				1		1	
	Team Member 1				1			1
	Team Member 2				1		1	
35	Team Member 3	1					1	
	Team Member 1				1		1	
	Team Member 2	1						1
	Team Member 3				1		1	
	Team Member 4	1					1	
36	Team Member 4			1			1	
	Team Member 1	1						1
	Team Member 2					1	1	
	Team Member 3				1		1	
37	Team Member 4				1		1	
	Team Member 1				1		1	
	Team Member 2				1		1	
	Team Member 3				1		1	
38	Team Member 4	1					1	
39	Team Member 1				1		1	

	Team Member 2				1			1
	Team Member 3	1					1	
	Team Member 4				1		1	
	Team Member 1				1		1	
	Team Member 2				1		1	
40	Team Member 3				1		1	
	Team Member 1				1		1	
	Team Member 2	1						1
	Team Member 3	1					1	
41	Team Member 4	1					1	
	Team Member 1				1		1	
	Team Member 2				1		1	
	Team Member 3				1		1	
42	Team Member 4	1					1	
	Team Member 1	1						1
	Team Member 2	1						1
	Team Member 3				1		1	
43	Team Member 4				1		1	
	Team Member 1				1			1
	Team Member 2				1		1	
	Team Member 3				1		1	
44	Team Member 4				1		1	
	Team Member 1				1		1	
	Team Member 2				1		1	
	Team Member 3				1		1	
45	Team Member 4				1		1	
	Team Member 1				1		1	
	Team Member 2	1					1	
	Team Member 3				1		1	
	Team Member 4				1		1	
46	Team Member 5		1				1	

Appendix B. Task Details

TASK INSTRUCTIONS

You are a member of an admissions team who is to determine which students should be admitted to _____ University this fall. You can admit as many students as you want, but the admissions team is judged on the quality of the students selected.

The goal of this admissions process is to *admit students who* ***are most likely to be successful*** at _____ University.

1) First, working alone, identify which students you would select for admission.
2) Then, working together, please identify which students should be selected for admission.

Note: academic courses include courses in math, English, natural and social sciences. Not included are courses such as health, physical education, music appreciation, art.

[A subset of information regarding each student is presented. The subset differs based on Table 1. An example subset is presented below:]

STUDENT INFORMATION

Robbie Roberts — He scored a 500 on the SAT Math and 470 on the SAT Verbal. He has an overall GPA of 3.0. You received a letter of recommendation from his manager at the local bank where he works. He comes from a small rural town and his parents did not go to _____ University. He has an academic GPA of 2.9. His high school is located in _____.

Emma Edwards — scored a 500 on the SAT Math and 500 on the SAT Verbal. She has an overall GPA of 3.0. She has taken all required courses. She received a high school education. Her high school ranks as average.

Andrew Anderson — scored a 500 on the SAT Math and 470 on the SAT Verbal. He has an overall GPA of 3.0. You received a letter of recommendation from his guidance counselor. He comes from a small rural town and both parents did not go to _____ University. He graduated in the middle of his class.

Grace Gibson — scored a 470 on the SAT Math and 500 on the SAT Verbal. She has an overall GPA of 3.1. She has taken all required courses. Both her parents graduated from _____ University. Her high school ranks as average.

Mike McIntosh — scored a 500 on the SAT Math and 520 on the SAT Verbal. He has an overall GPA of 3. You received a letter of recommendation from his neighbor. He comes from a small rural town and his father has graduated from _____ University. His has an academic GPA of 2.7. His high school is located in the _____.

Dorothy Davidson — scored a 450 on the SAT Math and 520 on the SAT Verbal. She has an overall GPA of 3.0. You received a letter of recommendation from her neighbor. She comes from a large urban city. She has an academic GPA of 2.8. Her high school is not located in _____.

Tom Taylor — scored a 550 on the SAT Math and 420 on the SAT Verbal. He has an overall GPA of 2.9. He has taken all required courses. Both of his parents received a high school education. He took history for college credit. His grades have been constant throughout his high school years.

Kelly Kennedy — scored a 450 on the SAT Math and 550 on the SAT Verbal. She has an overall GPA of 3.0. She has taken all required courses. Her mom graduated from college. Her high school ranks as average.

Shaun Sanders — scored a 475 on the SAT Math and 500 on the SAT Verbal. He has an overall GPA of 2.9. You received a letter of recommendation from the manager of the restaurant he works at. He comes from a small rural

town and both of his parents graduated from _____ University. His has an academic GPA of 2.8. His high school is located in _____.

Joyce James — scored a 470 on the SAT Math and 520 on the SAT Verbal. She has an overall GPA of 3.0. You received a letter of recommendation from her manager at a local grocery store that she works at. She comes from a large urban city and both her parents did not go to _____ University. She has an academic GPA of 2.7. Her high school is located in _____

Appendix C. Examples of High and Low Knowledge Sharing and Integration

Examples of Knowledge Sharing
Below is an example of low knowledge sharing
JM: extracurricular activities? EL: GPA=3.0 LB: Academic GPA = ? JM: 520 475 LB: Rec letter from church pastor JM: academic gpa? EL: grade trend? In this example, we see little information shared and little if any of their views and opinions about the information shared.
Below is an example of high knowledge sharing
ME : Dropping grades aren't good but extracurricular activities are CL: her neighbor wrote a recommendation. how unprofessional... DH: she had a good gpa 3.1 MG: treasurer and math club...what a devoted student.. CL: based on her academic GPA 2.8 she was average... ME: her SAT was solid above a 1100 I think In this example, we see much more information shared along with their views and opinions about the information shared.

Examples of Knowledge Integration
Below is an example of low knowledge integration
RE: 1020, 2.9, he's in some clubs DP: I object to his 2.9 GPA GB: 520,500,2.9 overall, middle of class, letter of rec, urban RE: But a 3.1 academic? WM: 3.1 academic... is also low GB: I disagree ... WM: I would prefer a higher academic GPA with a 2.9 overall GPA GB: Anything above 3.0 for academic is good DP: still too low for me WM: we are not going to agree let's just vote.. In this example, we see little agreement about what is or is not a good overall and/or academic grade point average (GPA).
Below is an example of high knowledge integration
SF: guys, the overall is 3.0 and academic is 2.9 SF: his high school rank is low. DD: But it was a high quality high school so that balances out for me? SL: that works CL: agree SF: math 500 verbal 470…. good? DD: anything over 1050 is ok, lower maybe an issue SL: that makes sense In this example, we see agreement about how important the academic GPA is relative to the overall GPA, the importance of class rank relative to the quality of high school, and what is or is not a good SAT score.