An Examination of the Use of Synchronous Computer-Mediated Communication Technology in Work Teams

Dissertation

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Abstract

The growth in virtual team use over the past ten years has brought with it a host of new team management challenges that has implications for both research and practice. This dissertation explored the impact member structural arrangement across the virtual space can have on critical team processes and team effectiveness outcomes when communications technology richness varies. It also shed light on what team processes impact team performance, members’ perceptions of social presence and affective outcomes of satisfaction in the virtual context. Theories of media richness, social presence, social identification, self-categorization, and diversity faultlines were used to derive the research hypotheses. These hypotheses focused on how the extent of member dispersion and richness of the mediating technology might affect virtual team functioning and outcomes of performance, satisfaction, and social presence perception.

A 2 (member spatial arrangement) x 2 (communication modality) experimental design was used to test the research hypotheses. Two hundred forty students participated in the study and comprised 60 four-member adhoc teams. A complex hidden profile group decision task was used during the research session. Following completion of the team task participants were asked to complete an online survey assessing their team experience. The results showed team processes of task conflict, communication, and information sharing differentially impacted the team effectiveness outcomes proposed in
the research model. The criticality of information sharing to team performance and the impact both communication and intra-team task conflict can have on members’ satisfaction and social presence perceptions were evidenced by this research. While support for the mediating and moderating relationships proposed in the research model was not found, it is premature to dismiss the conceptual relationships delineated. Other experimental manipulation and sampling limitations need to be addressed before definitive relationships between these variables can be determined. These results, study limitations, directions for future research, and practical implications are provided as a final component of this dissertation.
Dedication

Dedicated to:

Eddie, my true love and computer genius

Mom, my best friend and role model

Dad, my greatest inspiration and mentor
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CHAPTER 1: INTRODUCTION

As technological advancements continue to be made and costs for computer-mediated communications steadily decline, more and more organizations are adopting the use of web-based technologies (e.g., email, instant messaging, desktop video-mediated conferencing, shared desktop applications) to facilitate communication among distributed or spatially separated team members. Use of these technologies has helped to transform the basic structure of work enabling individuals to collaborate on projects regardless of their location in time and space – a form of work arrangement called virtual teamwork (Driskell, Radtke, & Salas, 2003). The use of virtual work teams is believed to allow organizations greater flexibility, quicker responsiveness, and adaptability as situational demands unfold (Bell & Kozlowski, 2002). Organizations can also access the most qualified individuals for a particular job irrespective of their locations (Bell & Kozlowski, 2002). Some even argue that the distinction between virtual and traditional teams is becoming less discernable as most types of teams in organizations today exhibit components of virtuality, including physical distance, technology support, and time spent apart (Griffith, Sawyer, & Neale, 2003; Kirkman & Mathieu, 2005). Consequentially, this shift in the structuring of work has made virtual team effectiveness a salient organizational concern.
A survey of Industrial-Organizational (I/O) Psychologists found technology and web-related trends as the top two factors presently impacting I/O Psychology (Waclawski, Church, & Berr, 2002). Similarly, Gartner Inc., an IT research firm, identified web-based conferencing as one of the top 10 strategic technologies likely to significantly impact companies over the next three years (Karthikeyan, 2008). Dynamic Web 2.0-style collaboration techniques including web-based social software platforms such as blogs, wikis, Voice over Internet Protocol (VoIP) conferencing, and social networking tools are also increasingly being used to connect individuals both within and between companies (Karthikeyan, 2008). When adopted in the workplace, the dynamic interactive nature of these technologies enables individuals to continuously exchange and update information necessary to perform job tasks as well as gather social information and facilitate interactions with distal collaborators. The growth in the use of web-based communications technologies in the workplace has consequentially heightened the need for research examining its use in distributed team environments. Yet in many areas, the research on virtual teams lags behind the practice.

**Problem Statement and Purpose of the Dissertation**

**Problem Statement**

Despite the appeal of and strong advocacy for its usage (e.g., Grenier & Metes, 1995; Snow, Snell, & Davison, 1996), much remains to be known as to how to effectively integrate technology in distributed teams (Grenier & Metes, 1995) to ensure optimal team functioning and minimize the negative consequences of geographic diversity (Martins, Gilson, & Maynard, 2004; Polzer, Crisp, Jarvenpaa, & Kim, 2006). One of the fundamental differences in face-to-face and virtual teams is the distinction
between the immediacy of a physically present team member and the remoteness of a virtual team member. Relatively little social psychological research, however, has examined the concept of ‘telepresence’—the use of technology to establish a sense of presence or shared space among geographically separated individuals. Sellen (1995) has found that participants perceived that visual access in mediated conversations was both important and beneficial to conversation, however, researchers have yet to fully understand how technology mediated interaction might be fundamentally different from sharing the same physical space and particularly how partial copresence of team members might significantly alter conversational behavior within the team.

In their literature review, Bell & Kozlowski (2002) note “future research would benefit from studies that employ today’s advanced synchronous technologies, such as videoconferencing and groupware…[Namely], it would be beneficial to examine how groups using these advanced forms of communication technology perform on complex dynamic tasks, such as real-time group decision-making simulations” (p.44). Answering their call, the purpose of this dissertation is threefold. First, I will use faultline theory to examine the effects of configurational dispersion diversity on virtual team outcomes of performance, process satisfaction, decision outcome satisfaction, and perceptions of social presence. It is expected that the activation of configurational faultlines will negatively affect overall team effectiveness on the assigned complex hidden profile task. Namely, it is argued that group members are likely to use differences in geographic location, just as they use differences in demographic attributes or organizational affiliations, as a basis for sub-group formation (Cramton & Hinds, 2005; Espinosa, Cummings, Wilson, & Pearce, 2003; Griffith & Neale, 2001). Second, I will attempt to
uncover the mechanism through which activated configurational faultlines exert their influence. More specifically, I argue that the relationship between activated configurational faultlines and team outcomes of performance, satisfaction, and social presence perceptions is determined, in part, by the extent and quality of communication and information sharing within the team as well as the degree of task conflict experienced among team members. It is posited that the activation of faultlines will negatively impact the quality of member communication and willingness to share information across subgroups as well as increase the likelihood of task conflict ultimately leading to poorer overall team outcomes. Finally, I will explore the moderating potential of communication modality on this relationship. Namely, richer media are expected to facilitate better team communication processes and overall effectiveness.

The present study therefore seeks to examine the following research questions related to computer-mediated communications, diversity, and virtual teams: When team members must work interdependently but remotely in a computer-mediated environment—how does degree of team member dispersion impact the nature of team processes and outcomes when team members are completely distributed verses partially distributed? Namely, how might participating in a virtual environment through computer-mediated synchronous videoconferencing affect teams advantageously and or disadvantageously and are there potential social advantages of technological mediation? A secondary objective of the research is to examine the extent to which the communications modality (e.g., audio vs. audio + video capabilities) moderates the relationship between team member configuration and interaction.
Contribution of the Dissertation

This dissertation will contribute to the virtual teams and diversity literatures in several ways. First, it will expand beyond the study of the traditional face-to-face team environment by examining member interactions in the context of a synchronous web-supported communications environment. The majority of research examining web-supported team interactions have largely been asynchronous (e.g., email) or lean interactions (instant messaging) that are restrictive in the amount of social presence they afford. Thus, the dissertation extends the literature by comparing two different virtual team configurations varying in their degree of ‘virtualness.’ This differs from related studies in that all team members irrespective of team configuration will communicate via synchronous web conferencing technology, however, for some teams all members will join the conference from different locations while other teams will be designed such that some members meet face to face while other members join the conference via a technology assisted communication device. As evidenced by recent literature reviews (e.g., Driskell et al., 2003), the majority of the existing studies use student participants supported by text-based communication. Of the studies conducted in the field, most have been limited to asynchronous email communication. In their recent literature review, Martins et al. (2004) identified the need for future virtual team research to shift away from comparisons between face-to-face and virtual teams and instead examine how the extent of team ‘virtualness’ affects virtual team functioning. Thus answering Martins et al.’s (2004) call, the present study will examine the impact of two different modalities of supporting two distinct distributed team configurations using synchronous computer mediated conferencing technology.
Second, the dissertation will examine how organizations might introduce certain efficiencies to virtual team functioning by adopting a strategic spatial structuring of team members that potentially reduces the activation of location-based faultlines. Specifically by arranging members such that there is greater homogeneity across all member locations the likelihood of subgroup formation is reduced and member identification with the group as a whole maintained. This in turn will help to facilitate better communication and information sharing among all members that is essential for learning and optimal team effectiveness (Anderson, McEwan, Bal, & Carletta, 2007). While configurational dispersion has been empirically determined a viable indicator of diversity used for self-categorization, it has only been examined in relation to intra-team trust and conflict (Polzer et al., 2006) and not processes of member communication and information sharing behaviors nor outcomes of team effectiveness. In their faultlines model, Lau & Murnighan (1998, 2005) deemed intra-team communication as a critical antecedent to member learning – a necessary condition for realizing the benefits of diversity. A logical extension of the existing research therefore is to examine what the potential impact of member spatial structuring in a virtual environment might have on member interactions and outcomes of performance, felt social presence, and satisfaction. Thus this dissertation will provide additional empirical support for the disruptive consequences of location-based faultlines on team functioning.

A final contribution of this dissertation responds to Baker’s (2002) call for more research examining satisfaction measures and group process characteristics in virtual teams. The present study will provide a more complete understanding of the potential impact team configuration and communication modality can have on team interactions
and outcomes of member satisfaction. As organizations increasingly rely on distributed teams to perform core work tasks (Hinds & Kiesler, 2002), understanding the potential impact of geographic diversity on team functioning and member affective responses to working virtually is of considerable relevance. Geographic configurations that are seemingly advantageous in concept, like those that allow collocated subgroups, may actually have unintended negative consequences (Polzer et al., 2006). Thus the present study will begin to shed light on how to better structure and support teams such that the desired team outcomes are realized and not hindered by geographic diversity.

In summary, this dissertation will contribute to the virtual teams and diversity literatures in a number of ways. Specifically, I hope to further understanding of the effects of location-based diversity on team functioning, looking beyond simple dispersion to examine the influence of subgroup formation. I will also explore the critical role of activation in faultline theory and uncover the mechanisms through which activated configurational faultlines impact team effectiveness. This acknowledges Pearsall, Ellis, and Evans’ (2008) call for more research examining the extent to which non-demographic based diversity indicators activate group faultlines. Finally, this dissertation aims to offer insight regarding how managers can organize teams to avoid potential pitfalls associated with member dispersion (characteristic of virtual teams) when attaining higher group performance, perceptions of social presence, and member satisfaction is of concern. Specifically in this dissertation I intend to examine the effects of computer-mediated communications modality and degree of team member dispersion on team processes and outcomes of team performance, member satisfaction, and social presence perceptions. It is proposed that team configuration may impact team effectiveness.
outcomes partially because of alterations in members’ communication and information sharing behaviors and that the team configuration—team processes relationship will be moderated by the communication modality used by the team. The degree of task conflict within the team is also expected to mediate the team configuration-team process relationship. The anticipated relationships are depicted in the proposed research model (Figure 1.1) below.

Figure 1.1: A Research Model: The Effects of Team Member Dispersion and Computer-Mediated Technologies on Team Processes and Outcomes.

Team configuration is believed to impact the amount and quality of communication in teams as well as the amount of conflict experienced among team members. Specifically, it is hypothesized that teams with complete distribution of members will exchange more information and report better communication processes and lower task conflict than teams where members are partially distributed. Given the use of a
hidden profile research task in this study, it then follows that teams sharing more information, exhibiting better communication processes and experiencing less intra-team conflict will display better performance, report greater member satisfaction and perceptions of social presence than teams experiencing poorer member communication and higher task conflict. Although the four outcomes to be examined are likely related, the precise natures of the relationships are not central to this study and therefore are not reflected in the research model or specific hypotheses. Finally, the team configuration—team processes relationship is expected to be moderated by the communication modality used by the team. Namely teams using a richer conferencing technology (e.g., video and audio conferencing capabilities) are expected to exhibit better communication and information sharing and lower intra-team task conflict than teams using leaner conferencing technology (e.g., audio only conferencing capabilities).

The mediating, moderating, and outcome variables examined in this study have been central to groups and teams research, however, the impact of member dispersion on virtual team functioning has only recently received empirical investigation (Polzer et al., 2006). While researchers of team effectiveness and diversity have established the existence of a relationship between member demographical characteristics and engagement in effective team processes, little prior research has extended beyond demographic-based diversity indicators (e.g., Savicki, Kelley, & Lingenfelter, 1996; Tan, Wei, Watson, Clapper, & McLean, 1998). Degree of member dispersion, however, is likely to be a salient diversity indicator in virtual teams because of the structural arrangement of members across multiple work sites. Although degree of member dispersion was not a relevant factor impacting conventional face-to-face team member
interactions and effectiveness, it is likely to impact virtual team member interactions (Bhappu, Zellmer-Bruhn, & Anand, 2001; Anderson, et al., 2007; Griffith & Neale, 2001; Martins et al., 2004). A logical extension of the groups/teams and diversity literatures therefore is to examine member dispersion as a team input that will potentially impact team functioning.

In chapter 2 the relevant literature providing the theoretical and empirical rationale for this dissertation will be reviewed. In chapter 3 the research model and testable hypotheses will be discussed. The methodology used in this experimental lab study is presented in Chapter 4. Chapter 5 contains a discussion of the results of the research. The final chapter provides a discussion of study findings, their practical and theoretical implications as well as limitations of the current research.
CHAPTER 2: LITERATURE REVIEW

Major Theoretical Approaches that Frame the Dissertation

Although research examining the impact of member geographic dispersion on virtual team functioning is a relatively new extension of the diversity and groups and teams literatures, there are several well-grounded theoretical premises that lend themselves to this dissertation including theories of social identity, self-categorization, faultlines, social presence, media richness, and media synchronicity. A social identification and categorization perspective (Williams & O’Reilly, 1998) will be employed to conceptualize and examine potential efficiencies that might be gained by strategically structuring teams such that negative consequences arising from faultline activation and subgroup formation are minimized. A general communications framework will also be followed demonstrating the importance of visible information in team interactions and the role communications technological modality plays in facilitating the communication and information sharing processes in teams. Each of these perspectives will be discussed in turn, linked to relevant literature in the areas of diversity, virtual teams, and video-mediated communication, and related to the objectives of this dissertation.

This chapter will open with a general review of the groups and teams literature and its intersection with diversity research. The chapter will then turn to discuss
technology-mediated communication in the virtual teams context. Given the volume of
research in these areas, this review is not intended to be exhaustive but rather highlight
what is currently known about the relationship between the most commonly investigated
team processes and effectiveness outcomes in the virtual context.

Groups and Teams Literature Review

Well over a half century of research in both social psychology and organizational
psychology has contributed to the substantial knowledge base on small groups and teams
that now exists. Numerous models and literature reviews on team effectiveness have been
provided and thousands of empirical studies have been conducted on teams and related
topics (Kozlowski & Ilgen, 2006; Webster & Staples, 2006). Early work in this area
focused largely on describing group dynamics (e.g., McGrath, 1964) but has since shifted
to examining specific design and management components that impact team effectiveness
(e.g., Hackman, 1987) and encompass what groups do and how they do it. As evidenced
by Webster and Staples’ (2006) integrative model of team effectiveness, a multitude of
variables have been explored within the groups and teams literature. This model
demonstrates the vastness of this literature and provides a launching point from which
this review will begin.

Thus I will open this discussion by first defining what a team is and what is meant
by the terms team processes and effectiveness. I will then delve into the literature
examining specific team inputs and processes identified in the model, giving greatest
attention to studies that have examined the relationship between team member
information sharing, communication, and conflict processes on outcomes of effectiveness
in the virtual context.
The Nature of Teams and Team Effectiveness

Several definitions of work teams have been provided in the literature with the most comprehensive of these being Kozlowski and Ilgen’s defining a team as “a) two or more individuals who b) socially interact (face-to-face or, increasingly, virtually); c) possess one or more common goals; d) are brought together to perform organizationally related tasks; e) exhibit interdependencies with respect to workflow, goals, and outcomes; f) have different roles and responsibilities; and g) are together embedded in an encompassing organizational system, with boundaries and linkages to the broader system context and task environment (Alderfer, 1977; Argote & McGrath, 1993; Hackman, 1992; Kozlowski & Bell, 2003; Kozlowski, Gully, Salas, & Cannon-Bowers, 1996; Kozlowski, Gully, Nason, & Smith, 1999; Salas, Dickinson, Converse, & Tannenbaum, 1992)” (Kozlowski & Ilgen, 2006, p.79). This definition accounts for the fact that several different types of teams are in use in contemporary organizations (see Cohen & Bailey, 1997; Devine, 2002; Driskell, Hogan, & Salas, 1987 for existing typologies) and can vary on many dimensions including but not limited to their size, composition (Campion, Mesker, & Higgs, 1993; Gladstein, 1984; Guzzo & Shea, 1992), function (Devine, 2002), member role and interdependency, organizational context and boundary permeability (Sundstrom, DeMeuse, & Futrell, 1990), and temporal distribution and scope (Bell & Kozlowski, 2002).

More recently, the globalization of organizations and changing nature of work have yielded new forms of work teams—virtual teams—that Bell and Kozlowski (2002) argue possess characteristics that distinguish them from conventional face-to-face teams. Namely, virtual team members are geographically dispersed and generally must rely on
mediating technologies to facilitate team activities (Webster & Staples, 2006). Consequentially, virtual teams transcend the usual boundaries of space and time found in conventional teams enabling them to access diverse expertise needed for complex task completion. While teams can vary in their degree of ‘virtualness’ (Kirkman & Mathieu, 2005), in the present study a virtual team is defined as a group whose members are mediated by technology with a core feature being that team members must work together on a common task while they are spatially separated (Driskell et al., 2003).

Common to any type of team is the importance of team effectiveness which is often characterized as an emergent result that unfolds across various levels (individual, dyadic, team, organization) with the passing of time. It requires members who can complete the technical portions of a team’s goal or mission as well as successfully navigate team processes (Bell, 2007). The literature on virtual teams has examined a multitude of team effectiveness variables and relationships. Martins et al.’s (2004) I-P-O Model of Virtual Team Functioning reflects the most frequently examined variables in the virtual teams literature. Consistent with dominant conceptualizing, they use an input-process-output perspective (McGrath, 1964) in their characterization of team effectiveness. Specifically, inputs refer to compositional and or design factors of the team and the context in which it operates (Hackman & Morris, 1975). In general, team inputs are thought to be related to team outcomes because they can affect the amount of skill and knowledge resources available to the team, influence the dynamic between team members, as well as the amount of effort applied to the group’s task(s) (Hackman, 1987). The main inputs that have been empirically investigated include task design, individual member characteristics (e.g., knowledge, skills, abilities, personalities), group
characteristics (e.g., group structure and design), and organizational context (e.g.,
rewards, training, organizational climate) (Martins et al., 2004). Team processes are a
dynamic representation of “how” teams achieve their outcomes (Weingart, 1997) as well
as mechanisms that inhibit them (Steiner, 1972). They represent “members’
interdependent acts that convert inputs to outcomes through cognitive, verbal, and
behavioral activities directed toward organizing task work to achieve collective goals”
(Marks, Mathieu, & Zaccaro, 2001, p.357). Team processes are believed to be impacted
by the episodic task, developmental progression or social context of the team, and the
larger organizational system or environmental context in which it is embedded (Arrow,
McGrath, & Berdal, 2000; Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Kozlowski &
Bell, 2003; Kozlowski et al., 1999; Kozlowski, et al., 1996; Kozlowski & Ilgen, 2006;
Marks et al., 2001). Commonly team processes are organized around three broad
categories including planning processes, instrumental/work interactions, and
expressive/interpersonal interactions (Guzzo & Shea, 1992; Marks et al., 2001). The
primary processes and emergent states that have been explored in the virtual teams
literature include coordination, communication and information sharing (Tannenbaum,
Beard, & Salas, 1992), participation and cooperation, divisiveness (e.g., conflict), and
trust. Interpersonal processes of affect management and social integration are also
increasingly receiving empirical investigation. Outputs represent a team’s efficiency and
effectiveness including the task and non-task consequences of a group’s functioning. The
most commonly examined team outputs include performance (Devine & Philips, 2001),
the satisfaction and attitudes of group members, and their behavioral outcomes (e.g.,
turnover, absenteeism).
A Summary of Empirical Research on Team Effectiveness

In this section I will review empirical findings related to team inputs, team processes, team outcomes, and critical moderators. I will first discuss the most commonly investigated team inputs. I will then move on to talk about team processes or mediators that have been examined in the literature followed by a review of critical team outcomes. I will conclude this section with a discussion of key moderators that have been examined in the literature.

Team Inputs

*Group Composition.* As the use of virtual teams continues to rise, the composition of work groups is becoming increasingly more heterogeneous in make-up. Consequentially, members are now faced with and must work across greater within-group differences in assumptions, motivations, knowledge bases, and working styles (Shapiro, Furst, Spreitzer, & Von Glinow, 2002) as they collectively work towards accomplishing group goals. Thus the effective management of diversity in workgroups is of increasing concern to organizations and has sparked a stream of research devoted to this topic.

Diversity as a construct can include both demographic factors (e.g., race, age) as well as non-demographic factors (e.g., education, functional background, geographic location). In the broadest sense, it encompasses all ways in which group members can differ (Jackson, May, & Whitney, 1995). Formally defined, diversity can be viewed as variation based on any attribute(s) a person or a group of individuals uses to distinguish themselves from another person or group (e.g., Harrison & Sin, 2005; Mannix & Neale, 2005; Nkomo & Cox, 1996; Williams & O’Reilly, 1998). This definition reflects the multi-faceted nature of diversity which can be viewed at the individual and or collective
levels. It acknowledges that diversity encompasses “a mixture of people with different group identities within the same social system” (Nkomo & Cox, 1996, p.339) and represents “the collective amount of differences among members within a social unit” (Harrison & Sin, 2005, p.196). This conceptualization suggests that diversity can encompass multiple categories that are relevant, salient, and critical to the self- and social identities of group members (Lau & Murnighan, 1998, 2005; Mannix & Neale, 2005). It also acknowledges the theoretical underpinnings of self-categorization (Tajfel, 1981; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) and social identity (Hogg & Abrams, 1988) theories which have strongly shaped this area of research and our understanding of the effects of diversity on group interaction and effectiveness.

Since the early work of Osborn (1957), researchers have identified the use of team-based work structures as critical to managing the complexity of work tasks with many contemporary work arrangements now being virtual in nature. Specifically, teams are posited to allow access to a heterogeneous social circle that can capitalize on the varied skills and knowledge of its members (e.g., Mohrman, Cohen, & Mohrman, 1995; Taggar, 2002; Tesluk, Farr, & Klein, 1997). Exposure to different backgrounds, approaches, and perspectives in turn is thought to stimulate crucial processes such as divergent and flexible thinking (Granovetter, 1982). Communicating and interacting with diverse others is therefore suggested to enhance team effectiveness by enabling new pathways of thought and preventing groupthink (e.g., Amabile, 1994; De Dreu & West, 2001; Jehn, 1994; Jehn, 1995; Jehn, 1997; Jehn, Northcraft, & Neale, 1999; van Knippenberg & Haslam, 2003; Watson, Kumar, & Michaelson, 1993). In particular, the information/decision-making perspective argues that informational diversity can
stimulate group members to explore differences in member knowledge, perspectives, and ideas (Jehn et al., 1999; van Knippenberg & Haslam, 2003) which potentially lead to enhanced team functioning through information elaboration and integration in their decision-making processes (Simons & Peterson, 2000; van Knippenberg, van Knippenberg, De Cremer, & Hogg, 2004).

Although some empirical evidence supports the value of diversity for team performance (e.g., Harrison, Price, Gavin, & Florey, 2002; Pelled, Eisenhardt, & Xin, 1999; Watson et al., 1993), considerable research suggests it is more likely to lead to debilitating inter-group conflict thus potentially offsetting its benefits (Jehn & Mannix, 2001; Jehn et al., 1999; Lau & Murnighan, 1998, 2005; Williams & O’Reilly, 1998). For example, increased intra-team diversity has been shown to actually hamper creativity and innovation (e.g., Ancona & Caldwell, 1992) by inducing internal friction (e.g., Argote & McGrath, 1993; Maznevski, 1994; Pelled et al., 1999) and negatively influencing the exchange of information (e.g., Bhappu, Griffith, & Northcraft, 1997; van Knippenberg et al., 2004). Members of diverse groups also reportedly experience more relationship conflict and are less satisfied than members of homogenous groups (e.g., Jehn et al., 1999; Pelled et al., 1999; Wharton & Baron, 1991). Furthermore, diversity has been shown to negatively impact team climate (e.g., Alagna, Reddy, & Collins, 1982; Chatman, Polzer, Barsade, & Neale, 1998), as well as overall group functioning.

The negative consequences of diversity are often explained by the social identification and categorization perspectives (Williams & O’Reilly, 1998) which argue groups often experience difficulties exploiting the potential of diverse perspectives and information (e.g., Bowers, Pharmer, & Salas, 2000; Webber & Donahue, 2001) because
of subgroup (even implicitly) categorizations that create “us-them” distinctions within the team. Social validation and social influence are the processes that create and maintain the boundaries defining where an “in-group” ends and an “out-group” begins (Turner, 2003). These distinctions in turn can lead to inter-subgroup bias, such as in-group favoritism or prejudice (Brewer & Brown, 1998; Turner et al., 1987) and manifest increased conflict, negative team climate, decreased satisfaction, and suboptimal group functioning (Homan et al., 2007).

There are a multitude of indicators of diversity that have been identified in the literature. These indicators have been categorized along two primary dimensions including 1) surface-level diversity indicators and 2) deep-level diversity indicators (Harrison, Price, & Bell, 1998). Surface-level diversity indicators are differences that are readily apparent including but not limited to “overt, biological characteristics that are typically reflected in physical features” (Harrison et al., 1998, p.97). These attributes are easily observable or visible to others and can include age, gender, and race/ethnicity. Deep-level diversity attributes, on the other hand, are less readily detected or perceived. Characteristically these attributes are not visible and typically include members’ personalities, attitudes, beliefs and values. Other indicators of diversity, however, such as informational/functional and status characteristics can fall into either category depending on the context (Pelled et al., 1999a) and the extent to which the environment heightens or reduces their salience (Turner et al., 1987).

One factor believed to influence the salience of diversity dimensions in virtual teams is the intra-group communications context. Some scholars argue the communications context (e.g., text-based computer-mediated communication) can limit
the extent to which even surface-level diversity indicators are detected and constrain
group functioning. Namely, it is argued that the anonymity of CMC makes it harder to
detect status cues in electronic interactions than in other forms of communication
(Dubrovsky, Kiesler, & Sethna, 1991). For example, some forms of technology-mediated
communication are touted as having the potential to breach boundaries of nationality,
race, language, status and power differentials, and ideology (e.g. Dubrovsky et al., 1991;
Jessup, Connolly, & Tansik, 1990) thereby limiting susceptibility to group influence and
pressure, social attraction, stereotyping, gender typing, and discrimination associated
with traditional boundaries (e.g., face-to-face interactions) (e.g., Dubrovsky et al., 1991;
Herring, 1993). However, empirical findings that group composition would be less salient
in a virtual context have been mixed. For example, some researchers have found status
effects on virtual interactions to be minimal (Sproull & Kiesler, 1986) and status
inequalities significantly reduced when groups used email to communicate (Dubrovsky et
al., 1991). Electronic modes of communication also have been found to enable access to
individuals of higher seniority whom would otherwise not be accessible for a meeting
(Sproull & Kiesler, 1986). However, other research indicates that group differences and
the status and power associated with them can be accentuated in anonymous computer-
mediated interactions (Spears & Lea, 1994; Straus, 1997; Weisband, Schneider, &
Connolly, 1995) such that anonymity in the CMC context may actually undermine and
enhance power differentials (Spears, Lea, Corneliussen, Postmes, & Haar, 2002).
Technology mediation has also been linked to increases in antisocial behavior in groups
or decreases in the regulatory function of social norms (e.g., Hiltz, Turoff, & Johnson,
1989; Kiesler, Siegel, & McGuire, 1984; Postmes, Spears, & Lea, 1999; see Lea, O'Shea,
Fung, & Spears, 1992; Walther, Anderson, & Park, 1994, for reviews). For example, Postmes and Spears (2002) found gender salience under conditions of anonymity led men to dominate the discussion more when topics were stereotypically associated with male interests. Spears et al. (2002) found that perceived social support for a participant’s interests conveyed through computer mediated communication influenced their publicly expressed attitudes. This effect, however, was partially reversed when the topic was more relevant to females.

While the implicit assumption of this research is that the electronic communication will help to crosscut traditional boundaries and undermine the bases of social division, it is also important to understand what new boundaries or diversity indicators might become salient as a result of the communications environment and technology used (Postmes, Spears, Lea, 1998). Researchers of team effectiveness and diversity, however, have predominantly focused on the extent to which team member characteristics such as surface- and deep-level attributes are related to members’ engagement in effective team processes as well as team goal attainment (Bell, 2007). Not until fairly recently have scholars begun to conceptualize and investigate other indicators of diversity that increase in salience in the virtual context. One such construct is geographic configurational dispersion which reflects the number of geographic locations where members reside and the number of people at each location (O’Leary & Cummings, 2002; Polzer et al., 2006). This construct is deeply rooted in the diversity literature related to faultlines (Lau & Murnighan, 1998, 2005) and provides the conceptual basis for this dissertation as described in the next section.
Configurational Dispersion as a Source of Faultline Activation. A relatively new extension of the diversity literature suggests that geographical dispersion in team members can impair team functioning through the activation of ‘faultlines’ (Polzer, et al., 2006) or “hypothetical dividing lines that split a group into subgroups based on one or more attributes” (Lau & Murnighan, 1998, p.328). Namely, team members are believed to use differences in physical location, just as they use differences in demographic categories or organizational affiliations, as a basis for self-categorization (Cramton & Hinds, 2005; Espinosa et al., 2003; Griffith & Neale, 2001; Polzer et al., 2006). Given the tendency of people to base impressions of others on readily apparent attributes (Fiske & Neuberg, 1990), it is logical that differences in spatial proximity which are easily observable might be used as a basis for categorization in groups (Martins et al., 2004; Polzer et al., 2006).

Differences in geographic boundaries are also commonly accompanied by differences in cultural background and work norms that are inherent to the worksite where an individual is situated (Cramton & Hinds, 2005; Earley & Mosakowski, 2000; Maruping & Agarwal, 2004; Polzer et al., 2006). This in turn can increase the potential number of dimensions that align and group members then use to categorize one another. As the number of diversity indicators increases and clear alignment is apparent, group faultlines are strengthened and likely to become more salient (Homan et al., 2007; Lau & Murnighan, 1998, 2005). Consequentially, an activated faultline can result in people categorizing members of their own subgroup as an in-group and viewing other subgroups as out-groups.
The literature on diversity suggests faultlines can vary in strength from weak to strong depending on the extent to which multiple diversity indicators converge within the group (Homan et al., 2007). A strong faultline is believed to occur when multiple diversity dimensions align to create a distinct intra-group division in members. The activation of a strong faultline in turn, has been found to be detrimental to overall team functioning, leading to suboptimal communication (Homan et al., 2007; Lau & Murnighan, 2005), increased intra-group conflict (Polzer et al., 2006), and lower member satisfaction (Lau & Murnighan, 2005). In Polzer et al.’s (2006) seminal study empirically investigating consequences of configurational dispersion, geographic faultlines were found to heighten conflict and reduce trust in virtual work teams. Specifically, the impact of faultlines was strongest when a team was divided into two equally sized subgroups of collocated members and when the subgroups were comprised of members with homogeneous nationality (Polzer et al., 2006). In their study comparing intra-group communicative differences in completely distributed and partially collocated teams, Anderson et al. (2007) found discussion lengths and the number of turns taken were greater in teams where at least some members shared facilities when compared to teams where members were completely dispersed. However, the extra discussion occurring in the collocated team condition was the result of more exchanges between shared site members and not members across sites. No differences in the amount of across-site discussion were found between the experimental conditions. These findings suggest that simply physically sharing facilities with other group members has the potential to alter the overall communication patterns experienced within the team.
Understanding the potential consequences of geographic diversity on team functioning is becoming increasingly more important as organizations expand operations across geographic borders and rely on virtual teams to perform core work activities (Hinds & Kiesler, 2002). Virtual teams characteristically consist of members who carry out interdependent tasks but are situated at varied locations. Given the distance, much of the communication between team members is now computer-mediated via both synchronous and asynchronous mechanisms (Cramton, 2001; Maznevski & Chudoba, 2000). Despite theorizing that technology mediated environments can help reduce or delay the detection of within group diversity dimensions that can then hinder team functioning (e.g., Hiltz & Turoff, 1978), geographic distribution of team members can still have unintended negative consequences on team outcomes (Polzer et al., 2006) when subgroup identification is strong and cross-subgroup discussion and cooperation impeded.

**Spatial Distribution of Group Members.** Computer-mediated groups often vary in their degree of configurational dispersion with one extreme where all members reside at the same location and interact face-to-face (characteristic of conventional teams) to the other extreme where all members are completely distributed such that every team member is at a different location (McGrath & Hollingshead, 1994). Between these extremes, however, there are a wide variety of hybrid configurations that vary in the number of individuals or subgroups at distinct locations (Griffith & Neale, 2001). The majority of virtual work teams generally fall into this hybrid category where there is distribution among some group members but collocation among others. For example, some computer-mediated work involves groups whose members are located in the same
room and exchange face-to-face interactions coupled with interactions via computer text. In other computer-mediated groups members are located at different places and therefore seldom have the opportunity to interact face-to-face but alternatively rely more heavily on both synchronous and asynchronous technology mediation to communicate with group members. Still other computer-mediated groups have some members who share the same physical location while other members are located elsewhere. Despite this, the extant literature on virtual teamwork has largely treated member dispersion as a dichotomous variable, discretely distinguishing between virtual and collocated teams (Jarvenpaa & Leidner, 1999; Maznevski & Chudoba, 2000; Montoya-Weiss, Massey, & Song, 2001). However, naturally occurring teams are rarely perfectly collocated or perfectly distributed with many shades of gray between these two extremes (e.g., Hoegl, Ernst, and Proserpio, 2007; Hoegl & Proserpio, 2004). Structuring work teams in this manner can increase the likelihood that divisive subgroups will form that could then potentially hamper critical team processes (Anderson et al., 2007; Polzer et al., 2006) and overall team effectiveness. Thus, answering Hoegl et al.’s, (2007) call, the present research hopes to shed light on how strategic spatial structuring of team members can reduce the negative consequences of location-based faultlines. I will examine how team configuration influences team communication and conflict processes as well as team performance, social presence perceptions and satisfaction outcomes with the aim of providing managers with recommendations for dispersed teamwork. Specifically it is argued that by arranging members such that all members are spatially separated, the likelihood of subgroup formation is reduced and member identification with the group as a whole maintained (Spears et al., 2002). Member identification alignment better ensures
consistency in member goals and objectives and helps facilitate intra-group communication, cohesion, and cooperation necessary for team effectiveness (Sumner & Hostetler, 2002).

The spatial arrangement of group members can also have a profound impact on group member perceptions of status, pattern of communications and participation within the group, emergence of leadership, and affective reactions of group members (Shaw, 1976; Kiesler & Cummings, 2002). One of the most extensively researched areas of spatial arrangement has focused on seating preferences or the relative positions of the group members. For example, several studies have found there was a stronger tendency for interactions between group members seated across from each other than persons seated adjacent to each other (e.g., Hearn, 1957; Russo, 1967; Steinzor, 1950). Russo (1967) also observed that as physical distance increased between two persons, the less friendly, acquainted, and talkative they were perceived to be by each other. Ashforth and Mael (1989) also suggest that proximity not only affects the formation of a group but also the extent to which group members identify with one another. Namely, it is believed that proximity directly cues a psychological grouping of individuals that can be used as bases for categorization (Hogg & Turner, 1985; Turner, 1984). Interestingly, simply assigning an individual to a group is sufficient to generate in-group favoritism (Brewer, 1979; Tajfel, 1982).

A related research stream has examined the impact of communication networks – the pattern of communication channels within the group, on team processes and outcomes (e.g., Bavelas, 1948). This differs from the effects of territorial orientations in that it examines the effects topological space rather than physical or geographical location of
communication channels can have on team processes and outcomes. Communication patterns typically vary in their degree of centrality representing the extent to which group members are in direct communication with one another. Namely, in highly decentralized communication networks all members are in direct contact with each other. Research by Bavelas (1948) and Leavitt (1951) found that centralized groups became organized more rapidly, demonstrated better performance on simple tasks, and a leader emerged more frequently than in decentralized groups. On the other hand, members of decentralized groups expressed greater overall satisfaction and decentralized networks were found to be more efficient (than centralized networks) when the task is more complex (Shaw, 1976). Group conformity has also been shown to be greater in decentralized communication networks than in centralized (Goldberg, 1955; Shaw, 1976).

Team Processes

A number of mediating factors have been found to contribute to virtual team effectiveness including planning, action, and interpersonal processes (Marks et al., 2001). Planning processes help focus a groups’ efforts including activities of mission analysis, goal setting, and strategy formulation. Action processes reflect what members collectively do to facilitate team outcomes, while interpersonal processes and emergent states typically govern interpersonal activities and relationships among group members. Empirical findings associated with each of these process types will now be reviewed. Given the objectives of this dissertation, greatest attention will be given to studies that have examined communication process coordination, information sharing, and conflict in groups.
Planning Processes. The development of a shared vision or mission in the virtual context is argued to be more difficult than in conventional teams because diminished member interactions make it harder for members to establish a unified sense of purpose (Blackburn, Furst, & Rosen, 2003). Virtual teams also characteristically have greater member heterogeneity, with group boundaries often spanning several time zones and exhibiting multiple cultures. This diversity in membership in turn can present obstacles to formalizing a shared group mission and strategy as well as general project management (e.g., keeping on schedule, staying on budget) as evidenced by the McDonough, Kahn, & Barczak (2001) study that found collocated teams reported significantly lower numbers of project management difficulties than virtual teams. Although research in this area is scarce, formalizing work processes and strategies has been found to be critical to virtual team effectiveness (Lurey & Raisinghani, 2001). For example, research has demonstrated a positive link between virtual team goal setting and outcomes of team cohesiveness, member commitment, team decision quality, and numbers of alternatives generated (Huang, Wei, Watson, & Tan, 2002). Warkentin and Beranek (1999) also found that planning helped improve virtual team interaction processes, trust and commitment.

Action Processes. The most commonly investigated action processes in virtual team research center around communication process coordination and information sharing (Martins et al., 2004). Although communication process coordination and information sharing are distinct constructs, collectively I will refer to them as communication throughout this dissertation. Communication commonly serves two important functions in teams including the exchange of task-related information (e.g., information sharing) as well as the development of team solutions to problems (e.g.,
communication process coordination) (Glickman, Zimmer, Montero, Guerette, Campbell, Morgan, & Salas, 1987). While several different conceptualizations have been provided in the literature, for the purpose of this dissertation communication will be defined as a “joint activity that requires coordination of both process and content between speakers and listeners” (Whittaker & O’Conaill, 1997, p.25). Consistent with this definition, I will examine two distinct but related components of communication including the content of communication and the coordination of communication processes.

The content of communication is the subject matter of the conversation – namely, what the participants talk about or infer from the interaction. This can include both verbal and non-verbal forms of information. For the purpose of this study it will be called information sharing which will directly assess what information has been exchanged among team members and the extent to which that information then influenced team decision outcomes. A component of this is content coordination, or how participants build up and maintain common beliefs and understanding about the subject matter that then contribute to the collective decisions made (Clark & Brennan, 1991; Clark & Marshall, 1981; Grosz & Sidner, 1986). The coordination of content can present challenges for both listeners and speakers alike. Listeners must continuously interpret and even infer meaning to what is spoken – conversational intentions – (Levinson, 1983; Clark & Marshall, 1981) while speakers must then determine whether the correct set of inferences was drawn by the audience. This is facilitated by establishing feedback mechanisms which allow listeners the opportunity to offer feedback about what was said (Kraut, Lewis, & Swezey, 1982; O’Conaill, Whittaker, & Wilbur, 1993), show acceptance (Clark & Schaefer, 1989) or ask for clarification (Walker & Whittaker, 1990).
(Clark & Brennan, 1991; Kraut et al., 1982; O’Conaill et al., 1993). Content coordination can also involve the exchange of social information that reflects the affective state or interpersonal attitude of the participants. It signals participants’ feelings, emotions, and attitudes toward the other conversant and to what is being discussed.

*Communication process coordination*, on the other hand, is concerned with the actual mechanisms and management of conversation in the team and the effectiveness of this process. It concerns primarily two issues (a) the set of procedures by which participants agree to begin and end entire conversations and (b) the rules that allow participants to switch roles between speaking and listening (e.g., turn-taking) (Sacks, Schegloff, & Jefferson, 1974; Walker & Whittaker, 1990). Examination of a team’s communication processes can be revealing of “what team members are trying to coordinate, how much information they need, or how difficult it is to coordinate their activity” (Kozlowski & Bell, 2003, p.354).

Communication, though essential to team effectiveness, is often times hindered in the virtual context due to reduced social context cues (Sproull & Kiesler, 1986) and the utilization of ‘weaker’ communication media (Daft & Lengel, 1984). Consequentially the overall amount of information exchanged among virtual team members is often times less than that among face-to-face team members (Bhappu et al., 1997; Siegel, Dubrovsky, Kiesler, & McGuire, 1986; Hiltz, Johnson, & Turoff, 1986; Hollingshead, 1996; Straus, 1996). This is evidenced by early works of identifiability and proximity effects in social loafing (e.g., (Harkins & Petty, 1982; Williams, Harkins, & Latane, 1981) showing group members who work face-to-face generally exerted greater effort than members working under conditions of anonymity. However, some studies have since reported no
differences in technology-mediated groups and face-to-face groups’ interactions (Jarvenpaa, Knoll, & Leider, 1998; Weisband, 1992). This is especially true for mature teams where members have an established working relationship (Alge, Wietoff, & Klein, 2003). A few studies have even found virtual members to communicate and participate more than those meeting face-to-face (Jessup & Tansik, 1991) particularly when asynchronous communications modalities were used to facilitate team discussions (Bikson & Eveland, 1990; Siegel et al., 1986; Straus, 1996). Asynchronous technologies enabled team members to contribute to team discussions at their convenience and in a context that provided greater perceived anonymity or detachment from the group. Specifically, Jessup and Tansik (1991) found group members working under distributed conditions were more likely to contribute ideas and comments, question a solution, and generate more comments than group members working face-to-face. Group members in the anonymous-dispersed condition were also found to contribute shorter comments than group members in the identified face-to-face condition. The argument is made that technology-mediation detaches group members from their contributions and thus provides an environment conducive to a freer exchange of ideas rather than a social loafing environment which provides cover for those who wish to refrain from participating. It is also posited that anonymity and or dispersion detaches and buffers members from each other providing an environment conducive to critical rather than supportive member behavior. The use of asynchronous communications technologies (e.g., email) can also enable teams to overcome production blocking experienced in groups where turn taking is required. Namely, members can contribute ideas as they occur rather than waiting for a speaker to finish before providing their input. This is
especially important for brainstorming tasks that center on diverse and abundant idea generation.

Researchers have also examined the content of information exchanged in teams. Studies of this nature typically require the use of content analysis to determine the type of information exchanged between members and the frequency of interactions. A number of factors have been determined to impact the type of information shared in groups and the investment members make in getting to know one another. These factors include a member’s status, tenure (Ahuja & Galvin, 2003), and perceived continuance in the group (e.g., Alge et al., 2003; Walther, 1994), the maturity of the team (Chidambaram, 1996), as well as the type of technology (if any) used to mediate member communications. For example, Hiltz et al., (1986) and Lebie, Rhoades, and McGrath (1996) found virtual team communications to be more task-centric than face-to-face groups. In contrast others have reported that virtual team communications are no less intimate or more task-oriented than conventional team discussions (Bordia, DiFonzo, & Chang, 1999; Walther, 1995). When compared to face-to-face interactions, virtual group interactions have also been shown to be less inhibited and are more likely to include insulting, swearing, and name-calling (Siegel et al., 1986; Sproull & Kiesler, 1986). Ahuja and Galvin (2003) also found newer members often sought information more while established members acted as information suppliers in their study examining the socialization of virtual group members. When compared to conventional team newcomers, virtual team newcomers were also more proactive in seeking information. Walther (1994) found beliefs of continuance in a group were more likely to influence the exchange of intimate information than the communication medium used.
In addition to examining the content and frequency of intra-team communication, researchers have also explored the patterns of participation in virtual teams. Several studies have found participation to be more equalized in virtual teams than in face-to-face groups (Bikson & Eveland, 1990; Kiesler, Siegel, & McGuire, 1984; Straus, 1996; Zigurs, Poole, & DeSanctis, 1988) where status cues are generally more salient. It is argued the virtual context diminishes social cues indicating differences in member status that often influence participation rates (Dubrovsky et al., 1991; Hollingshead, 1996).

Finally, several communications modalities allow teams to record member requests and or interactions (e.g., copies of emails) and monitor team activities that are not possible in face-to-face teams (Suchan & Hayzak, 2001). Project management systems enable members to continuously update and document changes in task-related inputs as well as determine who is at fault when a deadline has been missed. Information archives are also helpful for capturing knowledge of team members that can be referenced at a later date (Nemiro, 2002).

Although a host of variables have been determined to impact team communication processes (e.g., member heterogeneity, trust, cohesiveness), there is a paucity of research examining the impact of member spatial arrangement on team communicative processes. A logical extension of the existing research therefore is to examine the potential impact member spatial structuring in a virtual environment might have on member communicative interactions including the extent to which team members share unique information, ask questions, seek feedback, experiment, reflect on the results, and discuss errors or unexpected outcomes of actions (Edmondson, 1999). These types of communicative exchanges among team members help to foster critical
team learning necessary for overcoming the barriers associated with member heterogeneity that often impede team effectiveness. Recognizing the importance of member communication as a critical enabler of member learning in diverse teams (Lau & Marunighan, 2005), the present study will examine the mediating role of information sharing and communication process coordination on team outcomes of performance, satisfaction, and member perceptions of social presence.

**Interpersonal Processes.** Interpersonal processes and emergent states typically govern interpersonal activities and relationships among group members and can lay the foundation for the effectiveness of other processes. They commonly include interpersonal trust, group cohesiveness, and conflict (Martins et al., 2004). Empirical findings surrounding each of these processes will now be discussed with greatest attention given to conflict.

Trust has also been examined extensively in the groups and teams literature and is argued to be imperative to virtual team functioning (e.g., Handy, 1995; Jarvenpaa et al., 1998; Sarker, Valacich, & Sarker, 2003). A number of factors are believed to facilitate trust in distributed teams including time (Walther, 1995), communication (Jarvenpaa & Leidner, 1999), shared group identity (Kramer & Brewer, 1986; Spears, Lea, & Lee, 1990), and the ability to cope with technical and task uncertainty (Ratcheva & Vyakarnam, 2001). Member trust is also shaped by initial perceptions of ability and integrity, as well as an individual’s propensity to trust (Aubert & Kelsey, 2003; Jarvenpaa et al., 1998). Team communication has also been a strong influencer of the formation of trust in virtual teams (Jarvenpaa & Leidner, 1999) which has been positively associated with job satisfaction (Morris, Marshall, & Rainer, 2002) and improved working
relationships (Sharifi & Pawar, 2002). A shared group identity can also impact member commitment to decisions, cooperation, and levels of trust (Kramer & Brewer, 1986). Virtual team members often times suffer from lower group identity initially than face-to-face groups, however, with time this difference diminishes (Bouas & Arrow, 1996).

Group cohesiveness is another commonly examined variable in groups and teams research. The construct of cohesiveness can reflect both a members’ attraction to the group and its task (Kozlowski & Bell, 2003). Cohesiveness has been linked to a number of critical group effectiveness indicators including information exchange, member satisfaction, and performance as well as has been shown to be higher in face-to-face groups than virtual teams (Warkentin, Sayeed, & Hightower, 1997). Within virtual teams, groups exhibiting higher cohesiveness exchanged information more effectively as well as reported higher satisfaction (Chidambaram, 1996). Higher task cohesiveness has also been linked to better group performance in dispersed teams performing complex tasks (Gonzalez, Burke, Santuzzi, & Bradley, 2003) but not in virtual teams performing simple tasks (Aiello & Kolb, 1995).

Much debate remains about the impact of conflict on group processes and outcomes. Two dominant streams of thought exist within the literature. The information processing perspective argues that as task conflict intensifies in a team, members’ cognitive systems will shut down and information processing will be impeded which will contribute to lowered group performance (De Dreu & Weingart, 2003; Li & Hambrick, 2005). The presence of conflict within teams arguably takes needed resources away from completing work assignments. When team members are focused on reducing threats, increasing control and power, and building allies rather than task completion, less energy
and attention will be dedicated to optimizing task completion (Jehn, 1995; Wall & Nolan, 1986). Namely, as levels of task conflict increase, members resort to task withdrawal behaviors that have negative implications for performance on integrative tasks. In sum, the information processing perspective argues that poorly handled conflict is harmful to the success of teams and when ignored can become more dysfunctional and manifest into emotional issues and personal incompatibilities (Amason, 1996). Conflict in this state can hinder effective communication, diminish effective interactions, and undermine team performance and cohesiveness. Alternatively, Jehn (1994) argues that effectively managed task conflict is essential to team effectiveness because more alternatives are generated and evaluated prior to making a decision (e.g., Jehn & Mannix, 2001). Tjosvold (1997) suggests that when in conflict, people confront issues, learn to appreciate different perspectives necessary for good decision making and creativity. This in turn can reduce the likelihood that group decision polarization or group-think will occur which can have negative implications for team performance.

Conflict has been commonly defined as “the opposition between individuals and groups on the basis of competing interests, different identities, or differing attitudes” (Schellenberg, 1996, p.15). Three distinct kinds of conflict have been conceptualized in the literature including social or relationship, process, and task (Jehn, 1995, 1997). Relationship conflict is concerned with members’ awareness of interpersonal incompatibilities between team members including feelings of tension, friction, annoyance, frustration, irritation, and dislike (Amason, 1996; Pinkley, 1990). Process conflict (Jehn, 1997; Jehn, Northercraft, & Neale, 1999) is often conceptualized as individuals’ awareness of controversies about how tasks are carried out in an integrated
environment. Task conflict, on the other hand, reflects the extent to which members express and are aware of intra-group differences in member opinions and viewpoints regarding the collective task. Empirically, process and task conflicts have been examined with the most frequency. Drawing a distinction between types of group conflict has been important because many argue they differentially impact team processes and outcomes (e.g., McShane & Von Glinow, 2000; Robbins, 2000; Rollinson, 2002).

While researches almost uniformly agree that relationship and process conflict impact team performance and satisfaction negatively (e.g., Amason, 1996; Hinds & Bailey, 2003; Jehn & Mannix, 2001), the impact of task conflict is less clear and continues to be highly debated. For example, task conflict has been shown to be beneficial under some circumstances (e.g., Amason & Schweiger, 1997; De Dreu & Weingart, 2003; Jehn, 1994, 1997; Simons & Peterson, 2000; Schweiger, Sandberg, & Rechner, 1989), particularly when a complex or non-routine task (e.g., project teams) (Jehn, 1995; De Dreu & West, 2001) or a creativity requiring activity (e.g., for a review, see Nemeth & Staw, 1989) is being performed (e.g., Jehn, Northcraft, & Neale, 1999; Lovelace, Shapiro, & Weingart, 2001) but debilitating at other times. Others have failed to find a significant relationship between task conflict and performance (e.g., Pelled, Eisenhardt, & Xin, 1999; Kurtzberg, 2000).

The link between task conflict and team member satisfaction, on the other hand, has been much clearer. Similar to relationship conflict, task conflict within teams has been consistently linked to negative member satisfaction (e.g., Amason & Schweiger, 1997; Jehn, 1995). While both types appear to harm member satisfaction, relationship conflict has been meta-analytically shown to have a more negative effect than task
conflict (De Dreu & Weingart, 2003). The strength of the relationship between relationship and task conflict has also been shown to moderate the impact task conflict has on team performance. Namely, has been found in teams where the two conflict constructs are strongly correlated, the relationship between task conflict and team performance is negative but moderate; whereas, when the constructs are weakly correlated, the task conflict – performance relationship is small but still in the negative direction (De Dreu & Weingart, 2003). In a similar vein, within-team trust has been found to reduce the correlation between task and relationship conflict such that task conflict can run a relatively constructive course (Simons & Peterson, 2000) when trust is high. This finding is consistent with other research demonstrating that task conflict is often times more constructive when teams have a high rather than low level of psychological safety (Edmonson, 1999), when norms of openness exist (Jehn, 1997; West & Anderson, 1996), and when conflict is deliberately induced by means of a devil’s advocate (Schwenk, 1990). However, for task conflict to have any positive effects on team performance, relatively high levels of within-team trust, openness, and psychological safety must exist. Other antecedent conditions of intra-group conflict such as leadership style, demographic diversity, personal values, technology, shared social identity, and group composition (Tajfel, 1982) have also been identified in the literature. For example, while race diversity has been shown to induce relationship conflict, it has not been linked to task conflict (Pelled et al., 1999). Likewise incidences of social loafing which becomes increasingly more prevalent as team size increases, tends to exacerbate intra-group conflict (Bornstein, 2003). Finally, Deutsch (1949, 2003) suggests several factors influence whether conflict is productive or destructive to team functioning
including the presence of honest communication, an existing relationship between parties, an issue that is focused or small in magnitude, an avoidance of rigidity when regarding an issue, and a conscious focus on the more objective aspects of the conflict.

Comparisons between face-to-face teams and virtual teams have consistently found the conflict is more likely to occur in virtual contexts (e.g., Mortensen & Hinds, 2001). The extent and effects of conflict in virtual groups, however, is often contingent on several factors. For example, Mortensen and Hinds (2001) found having a common group identity reduced the amount of conflict experienced in virtual teams. Poole, Holmes, and DeSanctis (1991) found the effectiveness of conflict management was partially dependent upon how the mediating technologies were used as well as the management styles that were adopted (Montonya-Weiss et al., 2001). For example, collaborative conflict management styles were found to positively impact members’ satisfaction, perceptions of decision quality, and participation (Paul, Seetharaman, Samarah, & Mykytyn, 2004). Similarly, task conflicts can have positive effects on interpersonal relations, group performance, and customer satisfaction when team members perceive cooperative rather than competitive goal interdependence (Amason, 1996; De Dreu & West, 2001; Jehn, 1995; Lovelace et al., 2001; Simons & Peterson, 2000). Teams are also less likely to experience negative effects of task conflict on performance when more collaborative and less contentious communication is used when expressing disagreements (Lovelace et al., 2001). An open environment characterized by collaboration rather than contention, however, has not shown to mitigate the negative effects of relationship conflict (e.g., De Dreu & Van Vianen, 2001).
Team Outcomes

A multitude of team outcomes have been examined in the groups and teams literature. In this section I will briefly discuss the variables that were of interest in this dissertation and review the research related to outcomes of team performance, member satisfaction, and perceptions of social presence.

In this dissertation, the caliber of the team taskwork—performance—was reflected by the accuracy of the team decision outcomes. Namely, correct team decision outcomes were indicative of high team performance. Two distinct measures of member satisfaction were also examined in this study. Decision outcome satisfaction reflected team members’ satisfaction with their team’s performance. Specifically, this scale assessed the extent to which members felt the collective decision reached was correct. Process satisfaction, on the other hand, assessed the extent to which team members felt satisfied with the team’s approach and experiences during the team meeting. Namely, it assessed the extent to which members felt the team’s approach was efficient, coordinated, logical, and fair. Finally, members’ perceptions of social presence reflected the “degree of salience of the other person in an interaction and the salience of the interpersonal relationship generated by that interaction” (Burke, Aytes, Chidambaram, & Johnson, 1999, p.456).

According to Marks et al. (2001), action processes “have the greatest potential to impact the rate and caliber of team taskwork” (p.370). Some researchers even go as far as to suggest that communication effectiveness is the most important factor influencing a group’s success or failure (Hirokawa & Poole, 1996). It is therefore a logical extension of the literature to explore the mediating role of communication on the team configurational
dispersion-performance relationship. It is particularly relevant because communication in virtual teams is often hampered because of the added complexity of managing the distribution of members across multiple sites. A work team’s structural arrangement can influence the ease with which members can share information as well as the willingness of members to cooperate with others. As evidenced by prior diversity research, people often use geographic location as a basis to categorize group members. The formation of salient subgroups in turn can negatively impact members’ willingness to openly share information and engage in group discussions necessary for optimal decision making. In-group favoritism prevalent in teams where salient subgroups exist has also been shown to bias member evaluations of other group members such that ‘in-group’ members are perceived more favorably and as stronger contributors than ‘out-group’ members. Consequentially team divisiveness can influence not only the effectiveness of the team but also the satisfaction of its members.

Meta-analytic results indicate a negative and moderate satisfaction-absence relationship exists (Hackett, 1989; Harrison, Newman & Roth, 2006) suggesting that as employees’ satisfaction with their job and work environment worsen the tendency to exhibit withdrawal behaviors such as absenteeism and voluntary turnover increases. As job tasks become increasingly complex and integrative, involvement and interaction among multiple people is becoming more common and necessary to successfully accomplish job-related tasks. Consequentially workplace interactions are even more likely to influence individuals’ attitudes and behaviors (e.g., Bliese & Halverson, 1998; Salancik & Pfeffer, 1978) that can in turn impact a member’s commitment to and desire to remain with a team and or organization (Dineen, Noe, Shaw, Duffy, & Wiethoff,
As organizations increasingly rely on distributed teams to perform core work tasks (Hinds & Kiesler, 2002), understanding the potential impact of geographic diversity on team functioning and member affective responses to working virtually is of considerable relevance. The present dissertation therefore answers Baker’s (2002) call for more research examining satisfaction measures and group process characteristics in virtual teams. Although examination of the satisfaction-absence relationship is beyond the scope of this study, understanding how the structural organization of teams and internal communicative processes might impact member satisfaction is of considerable value.

**Team Effectiveness Outcomes.** Much of the literature on virtual teams has been devoted to examining the relationship between the effects of communications modality (Baker, 2002) and virtual member interactions on affective (e.g., member satisfaction) and team performance outcomes (e.g., speed of decision, decision quality). The empirical results, at best, can be described as mixed. Some variance in the findings, however, can be explained by differences in team tasks, team composition, mediating technologies used, and types of teams examined (e.g., Cappel & Windsor, 2000). For example, member satisfaction has been found to be lower in virtual teams than in face-to-face teams (Jessup & Tansik, 1991; Straus, 1996; Thompson & Coovert, 2002). This was evidenced in Graetz, Boyle, Kimble, Thompson and Garloch’s (1998) study which found teams that used electronic chat reported higher levels of frustration than teams using rich communication modalities. It is posited that members conversing through text only technologies likely experienced greater mental demands and had to exert significantly more effort to compensate for the limitations of the lean mediating communications device that was used. However, for complex decision tasks, computer-mediated group
members have reported higher satisfaction with group processes, in part, because the technology allows for the consideration of more ideas and voting rounds giving members more opportunity to contribute to and be involved in team decisions (Valacich & Schwenk, 1995). Similarly, virtual groups performing brainstorming tasks reported higher satisfaction than their face-to-face counterparts because the technology enabled the exchange of more ideas (Gallupe, Brent, Alan, Cooper, & Valacich, 1992). This in turn can contribute to higher team performance outcomes.

When considering performance in virtual teams, considerable evidence has shown members interacting virtually typically require more time to complete group tasks (e.g., Cappel & Windsor, 2000; Daly, 1993; Graetz et al., 1998; Hollingshead, 1996; Straus, 1996; Weisband, 1992). The amount of time required for interactions can also be influenced by the mediating technology used and or the type of task being performed. For example, Graetz et al. (1998) found that electronic chat groups needed significantly more time to reach a decision than groups working face-to-face or in a teleconferencing context. Electronic chat groups also consistently performed poorer than teams using richer communications modalities. Similarly, Weisband (1992) and Siegel et al. (1986) found electronically-mediated groups working on choice-dilemma and decision tasks required more time to reach a group consensus required for task completion than groups interacting face-to-face.

Empirical evidence of the effects of virtualness on the quality of a team’s decision, however, has been mixed. Some studies have shown no performance quality differences between virtual and face-to-face teams (e.g., Cappel & Windsor, 2000; Potter & Balthazard, 2002; Straus & McGrath, 1994) despite often times higher levels of
agreement in face-to-face groups (e.g., Adrianson & Hjelmquist, 1991; Hiltz et al., 1986). Other researchers, however, have found face-to-face teams to outperform virtual teams (e.g., Andres, 2002; McDonough et al., 2001; Straus & McGrath, 1994). Counter to this, some have found virtual teams to produce better work (Jarvenpaa et al., 1998; Summer & Hostetler, 2002), make more effective decisions (Sumner & Hostetler, 2002; Schmidt, Montoya-Weiss, & Massey, 2001), and generate higher quality and more unique ideas (Valacich, George, Nunamaker, & Vogel, 1994). Virtual teams are posited to outperform face-to-face teams because conferencing affords opportunities for handling evaluative tasks more effectively than face-to-face meetings. Computer conferencing, for example, can facilitate better group decision outcomes because of broader member participation, expression of a wider range of opinions, and greater analysis (Sumner & Hostetler, 2002). It can also lower time pressures and create psychological distance between members needed to engage in more open, candid expressions of opinions. Computer mediation, however, can be problematic because it takes more time to exchange and clarify messages, is more difficult to coordinate and clarify ideas, and often times requires more time to reach a consensus and arrive at a decision (Sumner & Hostetler, 2002).

The type of task a group performed also has been found to be a critical influencer of group behavior and performance (e.g., Bavelas, 1950; Hackman & Morris, 1975; McGrath, 1984). A number of task typologies (e.g., Hackman, 1969, McGrath, 1984) have been proposed in the psychological, communication, and information sharing literatures and help define how tasks can be classified, distinguished, and related to various group processes. Hackman and colleagues (Hackman, Jones, & McGrath, 1975; Hackman & Morris, 1975) define three types of team tasks including 1) production or the
generation of ideas, 2) *discussion* which involves the evaluation of issues, and 3) *problem-solving* which requires the specification of a course of action. Alternatively, McGrath (1984) proposes a circumplex model that differentiates tasks along two dimensions including 1) demand for cooperation versus competition and 2) cognitive versus behavioral activities. McGrath and associates predict a relationship between task type, the medium used to perform a task, and indicators of group performance and member satisfaction. The research on task type and team performance concludes that the fit of the technology to tasks influences team performance (Fuller & Dennis, 2004). Some empirical evidence suggests that teams perform better (Chidambaram & Jones, 1993), have a higher level of member knowledge exchange (Massey & Montoya-Weiss, 2000), trust and satisfaction (Anson, Bostrom, & Wynne, 1995) when the technology fits the task being performed. Other research, however, has found little support for the task-technology fit relationship (Dennis, 1996; Zigurs, Poole, & DeSanctis, 1988).

**Communications Context as a Critical Moderator of the Team Input-Team Process Relationship**

Given the discrepancy in empirical findings on virtual team performance, researchers have explored a wide range of contingency factors posited to moderate the relationship between team inputs and team processes. One of the most commonly explored moderators includes communications contexts or modalities (Martins et al., 2004).

*Computer-Mediated Communications Contexts.* Although a host of technologies are available to manage team activities, more and more organizations are adopting the use
of web-based technologies (e.g., email, instant messaging, desktop video-mediated conferencing) to facilitate communication among distributed or spatially separated team members. Use of the web offers a variety of cost effective and efficient ways for individuals from different locations to conjointly work on projects while never actually meeting face to face. The most common computer-mediated environments in use include real-time audio/video (e.g., videoconference), audio-only (e.g., telephones, conference calls), text-only real-time electronic dialogue (e.g., computer chat), and email. These communication environments can vary considerably in the communication capabilities they enable and the synchronicity (Riopelle, Gluesing, Alcordo, Baba, Britt, et al., 2003) and social richness they provide (e.g., Clark & Brennan, 1991) as summarized in Table 2.1.

Clark & Brennan (1991) have identified six characteristics of communications environments that influence the nature of interactions among group members including: copresence (group members share the same physical location), visibility (group members can see one another), audibility (group members can hear one another), cotemporality (communication can be received and processed at the approximate time it is sent), simultaneity (group members can send and receive messages simultaneously), and sequentiality (group members’ speaking turns stay in sequence). Using these criteria, in some technology-mediated communication environments such as real-time videoconferencing, interaction capabilities are almost identical to that available in face-to-face interactions; for example, with the exception of sharing the same physical location, real-time videoconferencing is similar to face-to-face environments in that it enables groups members to see and hear one another, receive messages as they are
produced, and send and receive information simultaneously and in sequence. Other
communication environments, however, such as e-mail or computer chat are restricted to
text-based only communication and lose certain capabilities like visibility and audibility
that are characteristics of face-to-face interactions. While audio-only communications
environments are generally richer in that they allow for audibility, cotemporality,
simultaneity, and sequentiality among team members, they are still limited in that they do
not afford visibility necessary for the conveyance of non-verbal feedback (e.g., head
nods). Consequentially, the type of communication environment implemented can have a
significant and varied impact on team member interactions.

<table>
<thead>
<tr>
<th>Type of Environment</th>
<th>Copresence</th>
<th>Visibility</th>
<th>Audibility</th>
<th>Cotemporality</th>
<th>Simultaneity</th>
<th>Sequentiality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Real-time audio/video</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Audio-only</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Real-time electronic dialogue, text-only</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Email</td>
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</tr>
</tbody>
</table>

Table 2.1: Comparison of Face-to-Face and Mediated Environments.


Given the wide array of web-based technologies used in contemporary
organizations, I will limit my focus to two forms of synchronous computer-mediated
conferencing technologies including VoIP video web-conferencing and VoIP audio-only
web-conferencing. Computer mediated video- and audio-conferencing are relatively close to each other on the richness continuum, hence there is less contrast between them than there is between face-to-face and text-based communications. Nonetheless, comparing the two is appropriate for several reasons. First, both modalities are in widespread use in organizations. Second, the expense differences in using one versus the other is becoming increasingly less as technological advancements continue to be made. Consequentially cost differences should no longer be a determining factor for adopting one over the other. Third, video conferencing when compared to audio conferencing now requires little added infrastructure and is therefore accessible to most anyone with a desktop computer. Finally, recent technological advancements have improved the quality of video-conferencing experiences such that problems of delays and lip-synchronization are now minimal.

Prior Research on Technology Mediated Communications in Teams. The field of video-mediated communication (VMC) is well represented in the literature; however, integration of research findings across studies has proven problematic. Although researchers themselves tend to be systematic in their work, there is little systematicity or cohesion across VMC studies, resulting in a body of works that is unusually diverse (Sellen, 1995). While several studies in this area have yielded disparate results, it is more often the case that results cannot be compared because they address different aspects of video-mediated communication (Finn, Sellen, & Wilbur, 1997). For example, some studies compare VMC with face-to-face, whereas others compare VMC with a condition in which there is no video channel or other visual component. Other research manipulates parameters impacting the efficacy of a system such as its synchronicity (Riopelle et al.,
of video and voice, and the allowance for eye contact and degree of gaze awareness. The kind of group, task to be performed, and general situation and or environment can also impact that efficacy of using video technology (Olson & Olson, 2000). Given the inherent differences in variables and research interests and the variance in methodologies used, it is not surprising that some studies have concluded that the use of a video-mediated technology has no effect on task performance or user satisfaction (e.g., Chapanis, Ochsman, Parrish, & Weeks, 1972; Gale, 1989) while other work has found it beneficial to group communication processes and outcomes of user experience (Olson, Olson, & Meader, 1995; Rutter, Stephenson, & Dewey, 1981). Despite these differences, a recurring focus of much of this research has been on communication – namely, how well member-member communication is supported by a system, how communication is altered by use of the system, and how that communication is then characterized (Finn, Sellen, & Wilbur, 1997).

The Role and Function of Visible Information in Member Communication. Face-to-face interactions versus technology-mediated interactions can differ considerably. Group members that share the same physical space and interact face-to-face can observe and interpret with greater ease other group members’ nonverbal forms of communication including their responsive nods and gestures, facial expressions, eye contact, and posture. Group members can also hear others’ tone and timing of speech, observe response patterns, and experience the immediacy of interacting with another person. These types of contextual cues and interactive experiences provide critical information about the individual (e.g., emotions, attitudes, and reactions) with which one is interacting, how the message is being conveyed, and the success with which that message is conveyed.
(Driskell et al., 2003). It can help group members to determine when to speak, when to listen, how transitions will be made between these roles, and when to initiate or end a communication episode (Rudman, Hertz, Marshall, & Dykstra-Erickson, 1997; Whittaker & O’Conaill, 1997). Visual feedback cues also enable members to better infer the emotional stance, affect, and motive of other group members to what is being discussed, how positive or negative others are feeling, whether others need help as evidenced by their expression of frustration or confusion, and whether a mutual understanding has been reached (O’Malley, Langton, Anderson, Doherty-Sneddon, & Bruce, 1996). Finally, visual feedback is also important in helping team members to gage other members’ level of attention and concentration. Groups’ whose members are dispersed may lose some of these communicative capabilities particularly when the communications modality used lacks a visual channel. This in turn can hinder the establishment and maintenance of mutual beliefs and common knowledge between group members that can facilitate member social integration, cohesion, and cooperation (Whittaker & O’Conaill, 1997).

There is a variety of ways in which video when compared to audio-only has been found to support and enhance collaboration in teams. In their study, Isaacs and Tang (1997) found six distinct benefits video supplies to the communication context. First, it has been found to enhance the users’ experience. Namely, people reportedly liked seeing each other when they interact as opposed to simply hearing another participant’s voice (Gale, 1990; Rudman et al., 1997). This in turn has been shown to influence the users’ feelings of satisfaction with the experience and their willingness to cooperate with other team members and contribute to team discussion. Second, a video channel allows for
interpretation of visible information present during interactions such as gestures, gazes, posture, pauses, and facial expressions that allows members to better judge when to speak, a sense of the group’s reaction to what was spoken, and adjust their remarks accordingly (Rudman et al., 1997). Third, video is suggested to enable distributed conversations that would not otherwise occur. Namely, group members have been found to be more willing to discuss sensitive or private issues over the video then they were over the phone when the discussant was not visible. Fourth, the use of video provides awareness that allows distributed members to see the size of the audience, when group members either leave or join the meeting, and the level of the participants’ responsiveness. This helps speakers to tailor their interaction style for the meeting (Isaacs & Tang, 1997; Isaacs, Whittaker, Frohlich, & O’Conaill, 1997). Fifth, video facilitates identity formation. Finally, video creates focus that ensures people are engaged in the conversation and not performing other tasks that would divert their attention from the meeting (Nardi, Kuchinsky, Whittaker, Leichner, & Schwarz, 1997).

However, other evidence on the value of adding video capabilities on team performance has been mixed. Several studies have found that distribution of team members tends to impair team interaction in comparison to face-to-face interaction. For example, computer-mediated interaction has been found to increase the time needed for team members to come to a decision and related to decreases in member satisfaction (McLeod, 1992). Cohesiveness has also been shown to be lower in virtual teams than face-to-face teams (Warkentin et al., 1999a). Other results, however, have been conflicting. Some scholars report that status distinctions among team members were reduced in computer-mediated groups (Dubrovsky et al., 1991), while others have found
little evidence of status equalization (Weisband et al., 1995). Some scholars have reported a greater incidence of uninhibited behavior in computer-mediated groups (Doherty-Sneddon & McAuley, 2000; Siegel et al., 1986), but others have failed to find these differences (Walther & Burgoon, 1992). Following their review of the literature, Whittaker and O'Conaill (1997) concluded “the benefits of adding a visual communication modality to voice have in general shown few objective improvements” (p.24). Their conclusions may, however, be misleading in that the primary focus in past studies has been on task outcomes. Alternatively, Doherty-Sneddon et al., (1997) suggest a more useful evaluation of team communication requires consideration of not only outcomes but also the team’s communicative process. For example, they found that the structure of communication among team members varied across conditions with the visual channel especially useful to speakers for facilitating conversational flow.
CHAPTER 3: CONCEPTUAL MODEL AND HYPOTHESES DEVELOPMENT

Figure 2 presents the conceptual model for this dissertation. It displays the effect configurational dispersion was expected to have on team processes of information sharing, communication, and conflict and outputs of team performance, member satisfaction, and perceptions of social presence. Also depicted in this model, is the moderating influence of communications modality on the team configuration—team processes relationship. I will now turn to look at the proposed relationships between these variables and derive specific hypotheses from the conceptual model. The provided rationale for each is based on the theoretical and empirical work reviewed in Chapter 2.

Figure 3.1: Proposed Research Model.
Hypotheses

Relationship between Configurational Geographic Dispersion and Team Processes

The faultline model (Lau & Murnighan, 1998, 2005) and research on social identity contend that individuals who identify with a group characteristically favor fellow in-group members more than individuals of out-groups (Abrams, Wetherell, Cochrane, Hoggs, & Turner, 1990). Biased in-group favoritism, stereotyping, and hostility towards the out-group in turn can heighten conflict and dislike between members, and contribute to decreased cohesion and social integration within the team (Jehn, 1995; Mackie, Devos, & Smith, 2000; Pelled, 1996; Webber & Donahue, 2001) as well as reduce individuals’ motivations to contribute to the group as a whole. When faultlines exist, group members are more likely to communicate and share information within rather than across their subgroups (Lau & Murnighan, 2005) and reduce the safety of a group’s psychological environment. The existence of strong faultlines also increases the likelihood for intra-team conflict (Polzer et al., 2006) which can be particularly debilitating when team tasks are complex, integrative, and require the unique contribution of all group members (e.g., decision making tasks) (e.g., Gibson & Vermeulen, 2003). Cross-subgroup interactions are often times misconstrued and what might have otherwise been intended as a constructive critique is instead interpreted as an attack (Bartel, 2001). Disagreement between subgroups can have the same effects as threats from an out-group (e.g., Sherif & Sherif, 1953), resulting in the accentuation of subgroup boundaries, biases, and differentiation that can erode a team’s processes and outcomes.

Virtual teams are inherently prone to strong subgroup formation because of the structural arrangement of team members across multiple locations. Consequentially,
member location often becomes a salient category by which team members group others (Polzer et al., 2006). Just as diversity attributes of demography, skills, personality, and values can lead to faultline activation (Lau & Murnighan, 2005) and group conflict (Jehn, 1995; Pelled, 1996) in collocated groups, configurational dispersion is expected to be a signification predictor of conflict in virtual teams where members are dispersed across multiple sites (Polzer et al., 2006). This is particularly true for distributed teams where some members share facilities while other members are located elsewhere. Virtual teams comprised of some members that meet face to face and others that communicate via technology are more prone to the activation of location-based subgroups than distributed teams where members are completely and uniformly dispersed. Consistent with Ashforth and Mael (1989), it is posited that member identification with proximal members will likely supersede identification with the team as a whole. Subgroup identification can in turn accentuate members’ awareness of the subgroup’s boundary and feelings of belongingness and loyalty. This can be especially problematic for teams where subgroup members’ norms, beliefs, and goals differ from those held by ‘out-group’ members and identification with the team as a whole impeded. The faultline model also suggests and research on interindividual-intergroup discontinuity has shown that interactions between groups tend to be more competitive than interactions between individuals (Insko, Schopler, Hoyle, Dardis, & Graetz, 1990). Extending this to dispersed teams, it is argued that more problems are likely to occur when subgroups, rather than individuals, reside at different sites. In the current study it is therefore believed that fully dispersed teams will have the weakest basis for subgroup formation because all team members reside at a
unique location thereby eliminating subgroup formation based on member proximity. It is therefore hypothesized that:

**Hypothesis 1:** Degree of collocation will be negatively related to communication quality.

**Hypothesis 2:** Degree of collocation will be negatively related to information sharing.

**Hypothesis 3:** Degree of collocation will be positively related to conflict.

**Moderating Effects of Communications Technology Modality**

For all virtual teams, processes are the glue that joins members together and allows the team to operate in a coherent manner. Geographic distribution and active faultlines can put stresses and strains on the team joints, and technologically-mediated communication lines are a means for relieving those stresses and strains. The naturalistic feel and or richness provided by the mediating technology can impact the ease with which members can collectively communicate, share information, and respond to conflict when it arises. Media naturalness theory (Kock, 2002) and media richness theory (Daft & Lengel, & Trevino, 1987) conjointly suggest that communication technologies vary considerably in the richness they afford, with some better suited for certain task types than others. For complex group decision making tasks, richer communication modalities that provide a visual channel are posited to offer more relief and help in reducing member ambiguity and uncertainty as well as heighten member awareness of distal conversational partners (Anderson, O'Malley, Doherty-Sneddon, Langton, Newlands, & Mullin, 1997; Olson et al., 1997). In turn, conflict arising from member uncertainty and misconstrual is reduced. When a visual channel is provided, members use the visual cues to judge that
communication is proceeding smoothly (Anderson et al., 1997). Visual cues can help to establish a sense of social co-presence that makes members feel more at ease with conversational partners and feel comfortable to ask for additional information or help in a shared task (Anderson et al., 1997). Visibility of other members also enables members to tell how other group members were reacting to things said, resolve disagreements, and persuade others about their ideas (Olson et al., 1997). As a result, the use of leaner communication modalities in remote groups will likely be linked to lower quality decisions (Minneman & Bly, 1991).

Richer communication modalities, especially when they include real time audio and visual capability, also allow the team members to “see” more of the personalities of more of the participating team members. Certainly, collocated team members have a great opportunity to “get to know” their fellow collocated team members, and distributed team members are aware that the collocated team members have that opportunity (Sellen & Harper, 1997). Absent a rich communication modality, both sets of team members may feel somewhat disconnected from the other (Kock, 2002) thereby increasing the likelihood of conflict (Lau & Murnighan, 1998, 2005; Polzer et al., 2006). The collocates know that they are closer to their fellow collocates because they are consciously and subconsciously aware of their similarities due to proximity. The collocates may also tend to view the distributed team members as outsiders because they do not share the location unique characteristics. Similarly, the distributed team members are aware of the “close- knittedness” of the collocates, and often feel like they are outsiders (Mane, 1997). Consequentially there should be a greater bond between distributed members because they all share “distributed-ness,” than there is between collocates and distributed
members (Postmes, Spears, & Lea, 2002; Spears et al., 2002). Richer communication modalities allow all team members to observe more similarities among themselves and feel closer because they can make the observation. Similarly, all team members can observe apparent differences between each other. Being aware of differences allows members to judge whether the differences are substantial or whether they are merely cosmetic. Understanding substantial differences allows members to make adjustments in their interactions that minimize the effect of the differences. They may not change the differences, but they can minimize the effects. Along the same line of reasoning, once team members recognize that differences are merely cosmetic, they can confidently ignore the differences as irrelevant to their interactions.

Since richer media are those that facilitate the immediate exchange of a wider range of communication cues it follows that in a decision making situation a decision can be made where more participants in the decision process feel that their input are being transmitted to the decision maker(s). Likewise, the decision maker(s) feel that they are getting more and better input from the team when they have a richer communication modality. With both those making input to decisions, and those operating on the input, feeling that the communication system is indeed facilitating a decision they all agree with then they should report greater satisfaction with the decision process and collective outcomes (Minneman & Bly, 1991). A leaner communication modality would leave some team members feeling that they perhaps did not get an adequate opportunity to present information to the decision maker(s), and the decision maker(s) might feel like some of the team members are not being as supportive as others. In a richer communication context not only is information transfer enhanced, but the opportunity for feedback is also
enhanced. The team members can learn the reaction of the decision maker(s) to the input more readily and thereby have a better opportunity to adjust their inputs if they feel that the decision maker(s) did not thoroughly understand the input (Anderson et al., 1997). Likewise, once a decision is made, the richer communication modality affords a better opportunity to gauge the team members’ reaction to the decision (Anderson et al., 1997). The decision maker has a better chance of determining if there will be resistance to (or maybe grudging acceptance of) a decision and whether a better explanation or even modification of the decision will yield better acceptance. The decision maker can also better determine if there is enthusiastic acceptance of a decision and feel confident that the team can move on to other issues. Teams where members feel like they are an important part of the decision process, and where decision makers feel like team members readily understand and accept decisions, are likely to actively contribute to group discussion. Conversely, in leaner communication modalities where team members and decision makers have uncertainties regarding other group members and the decision process the team members are likely to feel less willing to cooperate and be communicative during group discussions. It is therefore hypothesized that:

**Hypothesis 4:** Communication modality will moderate the relationship between dispersion and communication.

**Hypothesis 5:** Communication modality will moderate the relationship between dispersion and information sharing.

**Hypothesis 6:** Communication modality will moderate the relationship between dispersion and team conflict.
Relationship between Team Processes and Outcomes

In Marks et al.’s (2001) taxonomic formulation of team processes, information sharing, communication, and conflict are critical components of team goal setting, strategy formulation, monitoring progress towards group goals, team monitoring and backup, and system monitoring. Team communication and information sharing ensures each team member dependent on other team members will receive the necessary components for him or her to continue with an assigned task (Moye & Langfred, 2004). Task conflict, alternatively, could positively or negatively impact team performance outcomes. However, in this context where team members have no prior relationship and no anticipation of continuance with the team, heightened levels of conflict will likely hinder the communicative processes and interactions among team members if not constructively managed (Gladstein, 1984; Wall & Nolan, 1986). While the discouragement or absence of task conflict might result in competing ideas not being shared or detected, high levels of task conflict can result in increases in member withdrawal and dissatisfaction that can be detrimental to group performance and the retention of key members (Jehn, 1995; Li & Hambrick, 2005). Accordingly, in the present study it is expected that as conflict intensifies members’ cognitive system will shut down, information processing will be impeded thereby resulting in lowered performance. High levels of task conflict are also expected to drive members apart and consequentially result in lowered overall team performance (Li & Hambrick, 2005). Members will grow wearisome of the within group tension and withdraw from participating (Amason, 1996; Jehn, 1994). Behavioral disintegration characterized by reductions in interactions, member contributions, and rigid mechanical decision-making
(Hambrick, Li, Xin, & Tsui, 2001), will likely then lead to poorer team decision making and overall performance.

Likewise, team communication, information sharing, and the management of conflict allows each team member to transmit whatever it is that other team members need in order to accomplish their task. Even more fundamentally, team communication and information sharing allows each team member to identify what he or she needs from other team members, and what he or she is expected to provide to other team members. If all team members can identify their requirements and responsibilities, and if all team members have a capability to receive what they need and to send what needs to be sent, then negative consequences of conflict will likely not arise and the team task should be completed satisfactorily if effective pooling and integration of each member’s shared knowledge occurs (Stasser & Stewart, 1992; Stasser & Titus, 1985, 1987).

Consequentially the team will then be judged to have performed well. If there is misunderstanding of requirements or responsibilities regarding a task, if requirements or responsibilities cannot be satisfied, or if information is not exchanged or appropriately integrated then the team will likely not accomplish its goal, and its performance will be judged to be less than successful. As conflict among members erodes their motivation, confidence, and morale (Marks et al., 2001) this can negatively impact team performance. Communication and information sharing among team members identifies and clarifies requirements, responsibilities, and information necessary for making informed decisions and the carrying out of responsibilities. Thus, communication, information sharing, and conflict are expected to be related to team performance.
**Hypothesis 7:** Team communication will be positively related to team performance.

**Hypothesis 8:** Team information sharing will be positively related to team performance.

**Hypothesis 9:** Team conflict will be negatively related to team performance.

Communication acts as a significant dimension of group development and helps facilitate a shared contextual understanding among participants (e.g., Daft, Lengel, & Trevino, 1987; McGrath, 1964). As a team member, each individual serves as a communicator functioning as both a transmitter and a receiver of information. When a team member is acting as a transmitter there is an expectation that the other team members are receiving the transmission. The transmitter can get positive feedback, negative feedback, or neutral feedback as in simple acknowledgement of the reception of the information. The feedback is assurance that the team member transmitting the information is indeed a member of the team and is given an awareness of the presence of the other team members. When a team member is acting as a receiver of information, his participation in the team is acknowledged by the other team members. The other team members are aware of the receiver’s presence just by virtue of the fact that they send information to the receiver. They are further aware of the receiver’s presence in that they expect feedback – positive, negative, or neutral – from the receiver. The receiver’s obligation to provide feedback is positive evidence of awareness of the receiver’s participation in the team activities. When a team is communicating and sharing information there is an endless loop of acknowledgement and awareness of every other
team member’s presence (Hambrick, 1994) which has implications for members’ satisfaction with the process and collective decisions reached.

Empirical research has found conflict can negatively affect team outcomes (De Dreu & Weingart, 2003). It is argued that as emotionality increases and distracts members from the task at hand (Jehn & Bendersky, 2003), member satisfaction (and team performance outcomes) are often then compromised (Greer & Jehn, 2007). Conflict can manifest negative behaviors such as raised voices, hostility toward others, threats, and intimidation (Yang & Mossholder, 2004). These negative interactions in turn can contribute to more conflict and negative interpersonal attributions thus creating a cycle of hostilities and conflict escalation (e.g., Janssen, van de Vliert, & Veenstra, 1999). Negative emotions and hostilities arising from conflicts may in turn interfere with intra-team task discussions (e.g., Jehn & Bendersky, 2003). This is evidenced by past research showing negative affect often times interfere with effective team task discussions and decision making (Staw & Barsade, 1993). As frustrations from conflict heighten, individuals will likely become more disagreeable and dispute the ideas of other group members as a means to undermine them (e.g., Desivilya & Yagil, 2005; Jehn, 1995; Pelled et al., 1999). Lower compliance (Milberg & Clark, 1988), withdrawal behaviors, and distorted perceptions of other’s ideas about the task will also likely ensue (Eisenhardt & Bourgeois, 1988). All of these factors in turn impact members’ satisfaction with each other and the team experience as a whole.

Task conflict can be detrimental for members’ satisfaction with the team experience and outcomes when it produces tensions, antagonism, and distracts members from performing the task at hand (e.g., DeChurch et al., 2007; De Dreu & Weingart,
The negative reactions associated with conflict arouse uncomfortable feelings and dejection among members which inhibits their ability to enjoy each other and their work in the group. Task conflict is likely to be particularly problematic for teams that are performing difficult tasks (e.g., decision making tasks) (De Dreu & Weingart, 2003). Given the use of a complex hidden profile decision making task in the present study, it is expected that:

**Hypothesis 10:** Team communication will be positively related to satisfaction with team processes.

**Hypothesis 11:** Team information sharing will be positively related to satisfaction with team processes.

**Hypothesis 12:** Team conflict will be negatively related to satisfaction with team processes.

**Hypothesis 13:** Team communication will be positively related to satisfaction with the team decision outcomes.

**Hypothesis 14:** Team information sharing will be positively related to satisfaction with the team decision outcomes.

**Hypothesis 15:** Team conflict will be negatively related to satisfaction with the team decision outcomes.

In the virtual context, people often times become deindividuated because of the working arrangement (Spears et al., 2002). When collocated team members communicate with the entire team, they may or may not get formal feedback on their communication from the distributed members. If the delivered product is of the expected quality, the team member may not get any positive feedback from the distributed members of the team.
other than a receipt acknowledgement. Distributed team members understand that the acknowledgement is the acknowledgement of their social presence. It does not define anyone as an individual, but rather as a team member. On the other hand, fellow collocates will generally, at least informally, acknowledge another’s contribution to the overall process. They are present, they see the individual’s efforts, they might have encouraged the fellow collocate to overcome some challenges, or they might have informally assisted the fellow collocate. A collocate’s contribution to the overall team is often viewed as a reflection of the performance of the collocates as a unit, so there is a tendency to form a group with common interests. Being in the same location also affords the new group members to pursue mutual interests outside the confines of the overall team (Hewstone, Islam, & Judd, 1993). Distributed members do not have the opportunity to regularly pursue interests with other distributed members, so they do not view the team as a social outlet. Being collocated allows team members to observe the personality of fellow collocates, and in so doing can modify their behavior to accommodate the different personalities they may encounter locally (Edmondson, 1999). Modifying your behavior based on interactions with others, and seeing others modify their behavior based on interactions with you leads to a sense of social presence. So, both environment and process are conducive to a greater sense of social presence for collocates. Managers of programs who feel that some level of social presence is advantageous to the successful execution of their program will often schedule periodic team gatherings whose purpose is both team (work) oriented and also has a social content. For collocates who have been in the same location for a significant period of time there is an obvious sharing of experiences and customs that will be in effect regardless of team assignments. In this
situation the feeling of social presence for collocates is actually starting at a higher level than for distributed team members, and team behavior may have little to do with how these collocates feel about social presence.

**Hypothesis 16:** Team communication will be positively related to perceived social presence.

**Hypothesis 17:** Team information sharing will be positively related to perceived social presence.

**Hypothesis 18:** Team conflict will be negatively related to social presence.

**Mediation Hypotheses**

Team effectiveness requires building on, combining, and critically improving each member’s ideas through open interaction (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Pearsall et al., 2008). Sharing unique information is a critical component of this process especially when it requires challenging majority opinions and forcing members to rethink old beliefs (Nemeth, 1986). The benefits of divergent thinking can thus only emerge when all members participate, the flow of ideas between them is not hampered (De Dreu & West, 2001; Nemeth & Staw, 1989), and conflict is effectively managed. Subgroup identification, however, is often stronger than identification with the entire group and can result in favoritism for the ‘in-group’ over the ‘out-group’. Virtual teams where some members are distributed and others collocated are especially prone to the formation of salient subgroups. When activated, however, Pearsall et al. (2008) suggest that faultlines will cause inter-subgroup communication to break down, intra-team conflict to heighten, and overall member participation to lessen. When team members interpret communications and member interactions through a subgroup lens,
doubts and misinterpretations often increase thereby limiting the effective exchange of unique and critical information and consequentially team learning and effectiveness. The degradation of psychological safety and group learning in turn can have a grave impact on member satisfaction, social presence perceptions, and group performance. Consequentially the sharing of unique information and experiences critical to optimal complex decision making will be stifled potentially leading to poorer team decision outcomes. Likewise, the integration of unique information when it is shared will also likely decrease. So, the probability that configurationally dispersed team performance would be adversely affected is greater without adequate communications and data sharing to compensate for the lack of in situ communications. The better the communications, information sharing, and integration of unique information the higher the probability that dispersed team members will perform well, and the more confidence the team members will have in their team performance. The uncertainties begat by dispersion are ameliorated by the breadth of information shared and thus the performance is not handicapped by either real or imagined uncertainties. It is therefore hypothesized that:

**Hypothesis 19:** Team communications, information sharing, and team conflict will fully mediate the relationship between configurational dispersion and team performance.

Team communications and information sharing are critical to the success of a team (Hirokawa & Poole, 1996) regardless of whether it is collocated or dispersed. When teams are collocated, team members can establish both formal and informal communications networks that allow them to accomplish their tasks and be satisfied with the process and outcomes attained. When team members are dispersed, the opportunity
for informal communication and information sharing is greatly reduced. In order for the configurationally dispersed teams to perform coherently, the communication system and information sharing should be sufficiently robust to mimic, or at least closely approximate, the formal and informal communication networks of collocated teams. When the team communications and information sharing are sufficiently robust such that team members are not hindered by configurational dispersion, then the members will likely be more satisfied with the team processes and the outcomes that were reached (e.g., Anderson et al., 1997, Olson et al., 1997). When the communications and information sharing are sufficiently robust that team members feel that they are full members of the team with all the attendant rights and responsibilities of team membership they will exhibit satisfaction with the process and the experience (e.g., Anderson et al., 1997). Conversely, when the communications and information sharing are not sufficiently robust, and team members feel that they must compensate for a lack of communication or information, then the team members will be less satisfied with the team processes. When team members feel that their team membership is diminished by less than robust communications and information sharing, then they will feel like inferior members of the team, and will be less satisfied with the team process and the outcomes reached.

Conflict between team members is also likely to heighten when there is greater member heterogeneity in member distribution. Namely, differences in member spatial configurations will likely result in tension between members because of real or perceived differences (De Dreu, Harinck, & Van Vianen, 1999; Wall & Callister, 1995). Consequentially as conflict intensifies and arousal increases, cognitive load will also increase thereby interfering with group members’ cognitive flexibility and creative
thinking (Carnevale & Probst, 1998). This in turn will likely negatively impact member satisfaction with the team experience. Intra-team conflict, regardless of type, can cause tension, antagonism, and unhappiness among group members. A member’s normal reaction to any form of disagreement and questioning is generally frustration and dissatisfaction regardless of how advantageous the outcome of the confrontation (e.g., Ross, 1989). It is therefore hypothesized:

**Hypothesis 20:** Team communications, information sharing, and team conflict will fully mediate the relationship between configurational dispersion and member satisfaction with the process.

Satisfaction with a decision outcome is related to how much a decision affects a team member, how well the team member thinks the decision maker understands the impact of the decision on the team member, how well the team member may make input to the decision maker, and how well the decision maker acknowledges the input of the team member. In any team there is an opportunity for any of these conditions to be compromised, and there is even greater opportunity for configurationally dispersed teams. In configurationally dispersed teams there is not only the opportunity for actually compromising the conditions, but there is the opportunity for the apparent compromising of the conditions. Either real or apparent compromised conditions will lead to less satisfaction with decision outcomes. For dispersed teams there is a greater possibility that a subset of team members will act together for a specific decision without consideration of input from distributed members. Disregarding a member’s contribution to the decision process in turn will likely reduce satisfaction with the outcome irrespective of the ultimate favorability of the outcome. Thus, it is expected that configurational dispersion
can have an impact on outcome satisfaction through group processes even without
knowledge of the decision outcome. However, when that outcome is known, the effects
may be even stronger.

The amount of team communications, information sharing, and conflict affect
each of the conditions that a team member considers during the decision process. The
team members make inputs to the decision process through communication and
information sharing, and the decision authority acknowledges receipt of information
through communication with the team members. The decision authority can communicate
the decision and share the rationale with team members in a robust communications and
information sharing environment. All the conditions regarding being a part of the
decision process are therefore addressed. Certainly, for favorable decisions, the team
members are satisfied with the decision outcome. Even for decisions that are not
particularly favorable, the team members know that they have been part of the process
and the decision is not arbitrary and capricious. Team members will be more satisfied
with unfavorable decisions when they feel like their input has not been ignored, and they
receive an explanation for the decision. So, in either the case of favorable decisions or in
the case of unfavorable decisions, communications and information sharing lead to a
greater satisfaction with decision outcomes along with the minimization of conflict in the
team. It is therefore hypothesis that:

**Hypothesis 21:** Team communications, information sharing, and team conflict
will fully mediate the relationship between configurational dispersion and satisfaction
with the decision outcome.
Configurational dispersion and perceived social presence begin as orthogonal entities. Team members are completely independent of each other in the beginning. Team members share nothing but assignment to a common task. In order to accomplish the task as a team they must understand each others’ roles and responsibilities, and they must be confident that all the other team members have the same understanding. Team members communicate and share data about their understandings, and receive feedback from other members about the same. Team membership is by acceptance from other team members, and for configurationally dispersed teams the granting and receiving of membership is essentially achieved through binary communication and information sharing. Perception of being a team member is not an isolated incident, but a continuum whereby there is reinforcement of the perception over time by other team members. This perception reinforcement comes when team members communicate and share data and minimize conflict thereby indicating a continuing commitment to the relationship. The perception is also reinforced when a team member communicates and shares data with the team and the team acknowledges the communication and data sharing. Absent communication and information sharing and the effective management of this process a team member does not know if he is still a member of the team. So, team membership affirmation bestows a sense of social presence, and communication, data sharing, and minimization of conflict are essential to the affirmation of team membership.

Communication dropouts and lack of information sharing or disregarding shared information especially when it is conflicting, raises doubts in team members’ minds about their team membership. Since configurationally dispersed teams have less robust informal communication and information sharing networks the possibility for inadvertent
communication dropout is greater and configurationally dispersed members are more
dependent on deliberate communication and information sharing for a feeling of
inclusion. Consider that when one team member seems to go silent during a
communication session because there is either no data transmitted or feedback given, the
first reaction of the other team members is that they have lost communication with the
silent team member and that member is probably no longer present. They do not think in
terms of having lost a communication link, but rather that they have lost the person.
Team members have a presence when they communicate, and they are aware of the
presence of other team members when there is communication. Distance also increases
the likelihood for the occurrence of conflict. When conflict arises, this influences how
positively the experience will be perceived by a member which has implications on social
presence perceptions. Social presence of configurationally dispersed team members is
both positively affected by team communications and information sharing and negatively
affected by a lack thereof, whether intentional or unintentional. It is therefore
hypothesized that:

**Hypothesis 22:** Team communications, information sharing, and conflict will
fully mediate the relationship between configurational dispersion and perceived
social presence.
CHAPTER 4: STATEMENT OF METHODOLOGY

Participants

Participants for this study were students of a large Midwestern university. Students were recruited from upper-level undergraduate business courses in the areas of Human Resources Management, Organizational Behavior, and International Business. Most upper-level undergraduate students are assigned team projects as part of their curriculum and have experience using computer-mediated technologies and thus represent a valid subject pool for this study. Participants were given the opportunity to earn extra credit in exchange for their participation in this study, and in compliance with IRB regulations, those choosing not to participate were offered an alternative means for earning extra credit points (e.g., completing a questionnaire for an unrelated study, writing a trend-analysis paper, etc.). The final sample size following data cleaning was 60 teams.

To better understand who participated in this study, several demographic variables were collected and reported including the participant’s: 1) age, 2) sex, 3) ethnicity, 4) prior relationship with other team members, and 5) prior experience using CMC technologies. Participants in this sample were found to be predominately 18-25 years old (91%) with the remaining portion of the sample reportedly between the ages of 26-30. The sex of the sample was relatively evenly split with 55% of the sample being male and 45% being female. The ethnicity of the participants was largely white, non-
Hispanic (77%) but also consisted of 4% African American, 7% Asian, 1% Hispanic, 2% Multi-ethnic, and 9% other. As anticipated, the majority of participants had never met their other team members prior to the study (87%) or did not know them well (5%) nor had worked on a team together (2%). A handful of participants were friends with at least one of the other team members (6%) or had worked in a team together in the past (1%). Experience levels with technology varied among participants. The majority of participants reported a very high comfort level with technology (69%) or only requiring minimal assistance when using technology (29%). Only 2% reported needing a lot of assistance.

Participant Recruitment Strategy

Participant recruitment for this study occurred during the 2008-2009 academic school year. Students were invited to participate in the study during an in-class recruitment session. Only students of classes for which instructor approval had been obtained were invited to participate. Given instructor permission, the recruitment protocol was also posted on the course website. During the recruitment session, students were provided with a description of the study and directed to register online if interested in participating. This was the same information provided in the recruitment protocol. At the registration site, students were given various dates and time slots and asked to indicate when they would be available to participate in the study. They were asked to indicate the course they were currently enrolled in (so as to reward extra credit) and provide an email address at which they could be contacted. This personally identifying information (e.g., email address) was only used for communication purposes and not linked to participant survey responses in any way. After the need for correspondence ceased, all participant
email addresses were responsibly destroyed. Once participants had been assigned to a
team, an email was sent with the date, time, and location for the study. A reminder email
with the same information was also sent one day prior to their scheduled time slot. For
each trial at least six participants were secured to ensure the necessary number of
participants (4) were present for the experiment to take place. In cases where there were
more participants than needed, the extra individuals were asked to complete a non-related
research task or participate in a separate study during the scheduled session.

Study Design and Research Task Description

An existing hidden profile task was chosen for use in this study. This task was
adopted from Schulz-Hardt, Brodbeck, Mojzisch, Kerschreiter, and Frey (2006) and
materials for it are provided in the Appendix. As is characteristic of most hidden profile
scenarios, the superior decision alternative was hidden from group members as they
considered their pre-discussion information. Groups that effectively pooled information
therefore should have had a distinct advantage over individual decision makers. This type
of task has long been used in research examining group decision making and information
sharing behaviors (Brodbeck, Kerschreiter, Mojzisch, Frey, & Schulz-Hardt, 2002) and
was determined most appropriate given the objectives and hypothesized relationships in
this study. Namely, a hidden profile scenario by design allowed for a more direct and
objective assessment of the impact of group information sharing on collective decision
outcomes which has been theoretically and empirically supported in the literature (e.g.,
Stasser & Stewart, 1992; Stasser & Titus, 1985; Wittenbaum, Hubbell, & Zuckerman,
1999). Differences in member information sets, a component of hidden profile scenarios,
are also characteristic of naturally occurring teams whose members often have varied
knowledge and expertise to contribute to the group. In adopting an experimental task that mimics naturally occurring environments, the generalizability of the study results to teams outside the laboratory is strengthened. The differences in member information sets also generated differences in members’ predissent decisions which can help to overcome problems associated with group conformity or premature consensus that in turn can negatively impact decision making in teams when alternative viable solutions are not considered. The differences in member information sets ensured at least a minimal amount of intra-team task conflict existed within the teams which can help to initiate critical group discussion. Given task conflict, intra-team communication and information sharing were central to the research model, the use of a hidden profile research task was determined more appropriate than other types of experimental tasks (e.g., brainstorming) for investigating the hypothesized relationships.

Participants in this study were randomly assigned to one of four experimental conditions involving two manipulations and a single hidden profile condition. The within groups factor was the uniquely-held information. The two between-groups factors were communication modality and configurational dispersion. The same hidden profile research task was assigned to all teams, however, due to the nature of hidden profiles the information provided to individual team members varied such that members were given unique task-relevant information that differed from that given to other members of their team. While this study involved intra-team differences in information distribution, unlike some hidden profile exercises there were no inter-team differences in task conditions. Thus known biases in collective information sharing (e.g., spending disproportionately more time discussing commonly held rather than uniquely held information during group
decision tasks) should be constant across all teams. Efforts, however, were made to minimize the occurrence of information sampling biases inherent to decision teams through the use of a solvable research task (e.g., Campbell and Stasser; 2006; Stasser & Stewart, 1992), having no designated time constraints (e.g., Campbell and Stasser, 2006), and selecting a research task that generated intra-team cognitive conflict (Devine, 1999; Tjosvold, 1985).

Following is a general description of the research task used in this study. This hidden profile task dealt with an airline company looking for a new pilot for international flights. The participants comprised a committee responsible for personnel selection at this airline company. There were four candidates named A, B, C, and D respectively from which team members chose for the position. These applicants were currently employees of the company. In the full information set, each of the candidates was characterized by 10 attributes that were either positive or negative. These 40 attributes had been validated in prior studies (Schulz-Hardt et al., 2006) and were unambiguously positive or negative and comparable in importance and strength. An example positive attribute is “[The candidate] is able to concentrate very well over long periods of time.” An example of a negative attribute is “[The candidate] is regarded as a know-it-all.” To ensure credibility of candidacy and the selection process, inclusion of extremely negative attributes was avoided.

The distribution of information ensured that the four candidates received attributes of similar strength and importance such that the number of positive and negative attributes per candidate should have determined their ranking. In the full information set, Candidate C was the best choice. This candidate (C) had seven positive
and three negative attributes, whereas the other candidates (A, B, and D) had four positive and six negative attributes.

Given the hidden profile condition of this study, each member received only a subset of the candidate information. For Candidates A, B, and D, all positive attributes were commonly shared but the remaining negative attributes were uniquely distributed amongst team members. Thus, prior to discussion, each team member received four commonly-known positive attributes and two uniquely-known negative attributes about these candidates. In contrast, all negative attributes and only one positive attribute about Candidate C was distributed to all team members, with the other six positive attributes uniquely distributed between members. For Candidate C, each group member had three positive and three negative attributes prior to discussion. Given the pre-discussion distribution of information, it was expected that team members should initially prefer Candidate A, B, or D. However, assuming effective information exchange between the members occurred during the meeting, in the end Candidate C should have been determined best suited for the position collectively by the team.

Treatments

There were two treatment conditions for this study including the 1) configurational dispersion of team members and 2) the communication modality through which members communicated during the team meeting. Each of these treatments will now be discussed in more detail.

The configurational dispersion of team members involved the manipulation of member distribution or dispersion across multiple locations (e.g., Burke et al., 1999; Polzer et al., 2006; O’Leary and Cummings, 2002). There were two distinct
configurations, varying in their degree of dispersion that were manipulated in this study. Based on O’Leary and Cummings (2002) conceptualization, both the number (percent of team members who are present at a site with one or no other team members) and balance of people per site (reflected by the standard deviation of members per site divided by the size of the team) indicate the degree of dispersion of a work group. While the overall team size (n=4) remained constant across conditions, the spatial arrangement determining physical proximity of team members varied. For example, in the fully distributed condition, all four members resided at a unique location and therefore degree of member physical proximity was constant across all sites. In the other condition, however, two members physically shared a facility with each other while the other two team members were situated at unique locations during the group meeting and only had remote access to the team. Under these conditions, the number of members sharing a location varied thus creating variance in member physical proximity and differences in the balance of people per site.

I manipulated configurational dispersion—the degree of team member distribution—by assigning participants to one of two conditions. Teams in the fully distributed condition were comprised of four members who each resided at a unique location. For the partially distributed condition, teams were comprised of four members that were dispersed over three unique locations. Two locations had one member each while the third location had two members. As such, teams differed in that they had members at three or four different locations. The various team configurations are visually represented in Figure 4.1. In this figure, the circles represent individual group members,
boxes represent separate locations, and the lines represent two-way communication channels.

Figure 4.1: Team Member Configurations in Partially and Fully Distributed Experimental Conditions.

The second manipulation of this study involved the communication modality team members used during the team meeting. This manipulation was intended to demonstrate how the use of different synchronous communication media in multi-party conferences moderated the relationship between team spatial arrangements and team process outcomes. Two modalities, varying in social richness afforded, were selected for manipulation in this study. While all conferencing was computer mediated (thus ensuring uniformity in audio quality across treatment conditions), half of the teams had voice and video capabilities while the remaining half had voice-only functionality during the team meeting. Pilot groups were run to test the technology and gage the validity of the manipulation.
Procedure

Data collection occurred during a single session. Participants signed up for a session and thus were assigned to a team based on their indicated availability and scheduling preferences. Those sessions/teams were then randomly assigned to experimental conditions.

Students were asked to meet in the lobby outside of the elevator on the 3rd floor of Mason Hall. Prior to starting the study, participants signed-in so that extra credit could be awarded, completed a written consent form reiterating their rights as a research subject (e.g., confidentiality of responses, early termination of the research session without punishment, skipping of questionnaire items, etc.) and indicated their agreement with the consent information.

Once consent was obtained, participants were taken to their locations and seated at a research station. Each station was equipped with a computer with Internet connectivity and was set up with the appropriate communications technology necessary for the assigned treatment condition. Each terminal was identical in the technologies and settings (e.g., volume, web camera and microphone placement, image quality) that were used and the distance that participants sat from the computer. This helped to ensure uniformity across the various sites in an effort to reduce unwanted variance arising from spatially perceived or technology-induced quality differences.

A hard copy document with directions, the candidate profiles for the hidden profile decision task, and the tool participants used to evaluate each candidate was supplied at the research station. All other materials were made available online. The instruction document included a description of the decision case, basic information about
the airline company and selection situation, instructions for the three phases of the study (discussion preparation, team discussion and decision making, post decision survey), and the candidate information which contained participant-specific information needed for the hidden profile team task (e.g., unique information) and the information evaluation questionnaire. The online materials included the post decision survey. The candidate information contained a description of each of the four candidates A, B, C, and D which were characterized by six attributes. Three different versions of this information sheet were distributed. Members of the team that were collocated always received identical candidate information sheets. Members that were distributed sometimes received the same candidate information as another distributed member but not always. The versions did not differ with regard to the number of positive and negative attributes about the candidates, but they did vary with regard to the specific unshared items that the participant received. When integrated, the combination of these profiles contained the full candidate information needed to reach an optimal decision outcome.

Once seated, participants reviewed a document including the purpose of the task, instructions for accessing the pre-dissent research tasks, and explaining the procedure for the group research task. This document was placed at each research terminal prior to participant arrival. Individual member conferencing capabilities needed for the group research task were activated but not used until after the directions had been read, and the individual task and pre-descent questionnaires completed as described next.

After individually reviewing the decision case and candidate information sheet, participants were asked to copy the candidate attributes onto the information evaluation questionnaire and rated each of the attributes with regard to how positive or negative it
was for the suitability of the particular candidate. Participants were also asked on a separate questionnaire which of the candidates they individually preferred prior to entering the team conference. Following completion of the pre-descent questionnaire, the participants were instructed to un-mute the conferencing technology and indicate to distributed team members that they were ready to proceed with the group task.

Once all team members completed the pre-descent questionnaires, participants began the hidden profile group research task. No time limit was given to complete the team task. By design I opted not to place known time restrictions on the deliberation process because it has been shown to increase the likelihood of common information sharing (CIS) biases during group decision tasks (Campbell & Stasser, 2006; Larson, Foster-Fishman, & Keys, 1994). Once a final decision was reached, participants electronically recorded their candidate choice on the decision outcome questionnaire as well as answered questions about the team experience. Participants who shared facilities with other team members were encouraged not to discuss their responses when completing study questionnaires.

The final online questionnaire assessed participant’s demographical information as well as their recall of shared information, the quality of the team’s communication process, degree of intra-team task conflict, satisfaction with their team’s information sharing process, satisfaction with the team’s decision outcome, and felt social presence. The specific scales selected for use in this study will be discussed in more detail in the Measures section of this chapter.

The online questionnaire and storing of participant data for this study was generated and or maintained through Qualtrics. This service is provided to faculty and
graduate students of the college of business. Qualtrics provides secure password protected data collection and storing services. The system maintains all data behind a firewall and is accessible only to members of the research team possessing a valid user id and password. All survey data was collected using the College of Business computers under a generic user account created for the purpose of this study. These measures helped to ensure the anonymity and protection of the human subject’s identity.

Under both the video and audio-only conditions, ooVoo was used to facilitate the synchronous team communication. ooVoo is a web-hosted conferencing service that connects users in online meetings, training, and events through a web-provided solution. This service was selected because it provided a secure SSL encrypted environment and an easily implemented and managed solution that was compatible with existing Microsoft technologies used on campus computers. ooVoo also cost effectively provided the necessary functionality needed for this study and did not require setting up a host server. Microsoft LifeCam VX-1000 web cameras were also installed at each location and provided both visual and audio capabilities needed during conferencing. Under the audio-only conferencing condition, the microphone on the web camera was used for audio purposes but the video capabilities were manually disabled by a member of the research team prior to participant arrival. Microsoft LifeCam VX-1000 offered a high quality 640x480 pixel resolution and 44,100 Hz sound quality (equivalent to a compact disc).

The general procedure for setting up a conference via ooVoo is outlined below.

1) Accessible through Internet Explorer, a member of the research team set up a meeting via ooVoo’s web-based account management interface.
2) A web-link to the meeting was generated and opened by a member of the research team via ooVoo Client on all participants’ computers.
3) All cameras were connected to the computers by a member of the research team and enabled by ooVoo Client.
4) A member of the research team opened the video window for each webcam and arranged them on the screen such that the size for each window was the same and identically ordered on all computers. This ensured uniformity in the display viewed by participants across all sites.
5) A member of the research team ensured each webcam is located in the same position across all sites, in focus, and sound enabled.

Measures

Existing validated measures were adopted for all proposed variables with only slight alterations made in wording when necessary. All scales selected for use in this study were worded to ensure assessment and interpretation at the team-level. Any changes that were made to the existing scales are discussed below. All measures and original scales from which items were adapted are provided in the Appendices.

Intra-Team Information Sharing

Upon completion of the research tasks, participants were asked to indicate the extent of information sharing that occurred in their teams. The information sharing measure provided participants with a checklist of 40 candidate attributes asking them to identify which attributes were mentioned about each candidate during the team meeting. Respondents reported either candidate A, B, C, D, or none for each attribute. An example candidate attribute was “has excellent depth perception.” This checklist of attributes was originally created by Schulz-Hardt et al. (2006) for use with the hidden profile research task that was selected for this dissertation. Sharing of ‘unique’ information during hidden profile research tasks have been shown to improve the quality of collective decision outcomes in teams (e.g., Devine, 1999). Using an attribute recall checklist allowed for objective assessment of the extent to which uniquely-held candidate information was
shared during the team meeting with all members. Individual scores on this measure were determined by creating a sum for each team member of the number of hidden attributes correctly identified. That is, the number of attributes attributed to the correct candidate even though that information was not on that team member’s initial candidate profile sheet.

**Team Communication Quality**

Team communication assessed the overall quality of the team communications process and was measured using three items from Gibson & Vermeulen (2003). An example item from this scale is “everyone had a chance to express their opinion.” A 5-point Likert response scale was supplied with anchors “strongly disagree” to “strongly agree.” Gibson and Vermeulen (2003) reported a Cronbach alpha for this scale of .89.

**Process Satisfaction**

Process satisfaction assessed the extent to which team members felt satisfied with the team processes or approach and experiences during the team meeting. It was measured with Green and Taber’s (1980) five-item scale with anchors of completely satisfying to completely dissatisfying. Participants were asked to rate several different attributes on a 7-point Likert scale reflecting their opinion of the problem solving process used in their team. An example attribute pair asked participants to rate the extent to which they felt their team’s approach was “efficient” verses “inefficient.” The reported reliability of this scale in Green and Taber (1980) was .88.

**Decision Outcome Satisfaction**

Satisfaction with the decision outcome was assessed using Green and Taber’s (1980) 5-item scale. Participants were asked to indicate using on a 7-point Likert scale
(with anchors completely satisfying to completely dissatisfying) their satisfaction with their team’s overall performance and decision outcome. An example item from this scale is: “How satisfied are you with the quality of your group’s decision.” Green and Taber (1980) reported the reliability of this scale to be .88.

Intra-Team Task Conflict

Intra-team task conflict, which assessed participants’ awareness of group member differences in viewpoints and opinion about the group task, was measured in this study using three items from Jehn and Mannix’s (2001) conflict scale. The items from this scale are based on an earlier measure used by Jehn (1995) and Shah and Jehn (1993) used to assess intra-team conflict. An example item is “How much conflict of ideas was there in your team?” Jehn and Mannix (2001) reported a Cronbach alpha of .94.

Team Performance

Team performance was objectively determined from the team’s decision outcome which was dichotomously coded (choice of optimal candidate = 1, choice of one of the suboptimal candidates =0).

Perceived Social Presence

Social presence was assessed using a combination of two existing scales. Gefen and Straub’s (1997) five item social presence scale along with three additional items reflected in Burke et al. (1999) social presence measure were adapted for use in this study. Minor word and or format changes were made to both scales to ensure their appropriateness for use in this research context. For example, Gefen and Straub’s (1997) scale was originally intended to measure respondents’ social presence perceptions of a website but given the scope of this study was altered to measure participants’ social
presence perceptions of the general meeting environment instead. Burke et al. (1999) asked participants to rank opposing attributes on a continuum reflecting their perception of the meeting environment. Instead of this original structure, I created attribute statements that mimicked the format used by Gefen and Straub. This ensured continuity in format as well as offered an opportunity to add reversely coded items to the measure. Using a 7-point Likert scale with anchors ‘very strongly agree’ to ‘very strongly disagree,’ participants were asked to assess various characteristics about the meeting environment intended to capture their feelings and attitudes towards the experience. An example item from this scale is “there was a sense of human contact during our team meeting.”

Control Variables and Open Ended Feedback

In an effort to reduce alternative explanations, I controlled for an individual’s history with members of the assigned team, experience using communications technology, and demographic differences. These variables could potentially influence conflict, intra-team communication, and information sharing processes and therefore were controlled.

Considering the participant pool is comprised of students from multiple classes within the college of business ranging in size from 120-250 students, participants were not likely to have previously worked in a team together. Prior shared team experiences, however, are possible and could potentially influence member interactions and therefore were controlled in this study. Thus an individual’s history with a teammate was assessed using a scale asking participants to indicate the extent to which they knew other members on the team prior to this study. This scale assessed how many team members knew each
other prior to involvement in this study as well as the type of interactions they have had in the past.

Participants’ experience using technology assessed the extent to which group members felt comfortable using technology. Prior experience using these tools could potentially influence general team processes and member satisfaction outcomes and therefore were controlled.

The extent to which the manipulations in the study worked was also assessed by a single item asking participants to indicate via what configuration they participated in the conference. It assessed the extent to which participants were aware of the configurational arrangement of other group members. Specifically, participants were asked to indicate whether other team members were collocated or not. An open-ended item also invited participants to indicate any other factors that influenced their behaviors during the team portion of the research task.

Data Analysis

An experimental design was adopted for this study. The independent or manipulated variables included team configuration (e.g., degree of member distribution) and synchronous communication medium (e.g., voice only vs. video and voice capabilities). These were the manipulated between-groups factors in this experiment. The dependent variables for examination included the team process mediation variables of conflict, communication, and information sharing and output variables of team performance, member perceptions of social presence, and member satisfaction with team processes and decision outcome. Existing validated scales were used to measure each
variable where possible and Cronbach Alphas for each scale were calculated and are reported in Chapter 5 to establish measure reliability.

All variables in this study were either directly measured at (e.g., performance) or aggregated to the team level. To ensure the appropriateness of aggregation, two independent tests were performed. Each scale was initially assessed using the rwg(j) test recommended by James, Demaree, and Wolf (1984). An acceptable interrater agreement was determined thus providing initial support for the aggregation (Yammarino & Markham, 1992). As a secondary check, ICC(1) and ICC(2) were calculated for each scale. Given the tests generated acceptable results, this indicated the necessary condition that between-group variance was higher than within-group variance thereby confirming that aggregation of team responses was acceptable. An overview of the rwg(j), ICC(1) and ICC(2) found in this study are provided in Chapter 5. Subsequent analyses were then performed using each team’s average score for the reported team-level variables. It should be noted that the team performance measure used in this study did not require aggregation because it was a group consensus measure reported at the team level.

Given the anticipated small sample size and concerns over having sufficient power to perform structural equation modeling, multiple regression analysis was used to test the hypothesized relationships. Tests of mediation were conducted using Kenny, Kashy, and Bolger’s (1998) recommended technique. The steps for this procedure were as follows: First, it must be shown that the input variable of configurational dispersion was correlated with the outcome variables of performance, satisfaction, and social presence perceptions. In the regression equation, the outcome variables represented the criterion variables while the input variable of configurational dispersion acted as a
predictor. This step established whether main effects existed and that an effect may be mediated. While this step is implied if steps 2 and 3 below are met, it is still recognized as a critical step in Kenny et al.’s (1998) test of mediation. Step 2 determined whether the input variable of configurational dispersion was correlated with the mediators of conflict, communication, and information sharing. Again, configurational dispersion was treated as a predictor variable in the regression equation but the process variables were now treated as the outcome variables with the intent to demonstrate there was a relationship between these variables. Step 3 established whether the mediator variables affected the outcome variables as predicted. To do this both the input and process variables examined in this study were entered as predictors in the regression equation and the outcome variables as the criterion. The input variable, however, was controlled thus establishing the true effect of the mediators on the outcomes. Although James and Brett (1984) argue that it is unnecessary to control for the input variable in this step, Baron and Kenny have deemed it necessary when partial and not full mediation is anticipated. If all three steps are met, this confirms that partial mediation exists. Different from Baron and Kenny (1986), all of these steps are stated in terms of zero and nonzero coefficients and not in terms of statistical significance that can be misleading with small sample sizes. In addition to the Kenny et al. (1998) test of mediation, a Sobel test was conducted to determine the existence of mediation. The moderated hypotheses were evaluated consistent with recommendations of Aiken & West (1991). Variables were scale centered to reduce the threat of multi-collinearity among the interaction terms and their components. The changes in variance and beta weights across the regression steps are reported in Chapter 5.
Power Analysis

An a priori power analysis was conducted for the various hypotheses delineated in Chapter 3. A conventional level of power (.80) at an alpha level of .05 was targeted. The means for estimating the necessary sample sizes for various effect sizes is provided by Cohen, Cohen, West, and Aiken (2003). Given a designated alpha level, effect size, and power, sample sizes can be determined. Sample sizes are reported to detect small ($f^2=.02$), moderate ($f^2=.15$), and large ($f^2=.35$) effects according to Cohen et al.’s (2003) standards. Following Cohen et al.’s (2003) procedures, the power analysis results for each hypothesis will now be discussed.

Hypotheses 1-3 and 7-18 propose regression of one dependent variable on one independent variable. Cohen et al. (2003) use $f^2$ to denote population effect sizes. It equals the explained variance ($R^2$) divided by the unexplained variance ($1-R^2$). These values are .02, .13, and .26 respectively for the total $R^2$. To detect small, moderate, and large effect sizes according to Cohen et al.’s (2003) standards, the study needs an $N$ of 395 (small effects), 54 (moderate effects), and 24 (large effects) respectively. For hypotheses 1-3 and 7-18, only a moderate or large effect would be detected with the study’s sample size of $n=60$. For hypotheses 4-6 one dependent variable will be regressed on three independent variables. To detect small, moderate, and large effects, the study requires sample sizes of 549, 77, and 35. Given the study sample size of $n=60$, only a large effect would be detectable in testing hypotheses 4-6. Hypotheses 19-22 propose regression of one dependent variable on four independent variables. To detect small, moderate, and large effect sizes would require sample sizes of 602 (small effects), 85
(moderate effects), and 39 (large effects). Consequentially for hypotheses 19-22 only large effects would be detectible with a sample size of n=60.
CHAPTER 5: RESULTS

This chapter will report the results of the hypothesized relationships proposed in Chapter 3. I will first report the preliminary data analyses including descriptive statistics, missing data, scale reliability checks, the manipulation check, and indicators supporting team aggregation that were conducted before reporting the primary study results.

Preliminary Analyses

In preparation for testing the study’s hypothesized relationships, several preliminary analyses were conducted to ensure 1) the manipulation of member dispersion was successful, 2) acceptable scale reliabilities existed, and 3) aggregation of variables to the team level was appropriate. Descriptive statistics for all study variables and the rate of missing data are also provided in this section.

Manipulation Check

For this experiment teams were manipulated to vary along two fronts including 1) how members were physically distributed (e.g., team dispersion) and 2) the type of communication technology used by the team during the assigned decision task (e.g., communication modality). For the team dispersion manipulation, there were two distinct member arrangements. Approximately half of the teams examined experienced condition 1 which involved complete distribution of members. Under this condition all team members were located in different offices across the Fisher campus and could only access
other team members via computer mediation. Alternatively, the remaining teams experienced condition 2 which involved partial distribution of members. Under this condition some members were collocated while other team members were only accessible via computer mediation.

To verify that the manipulation of member spatial arrangement worked, participants were asked in a survey (“Please indicate which member configuration you experienced during the group.” Response options included 1= all members of my team were located at different sites, -1=some members of my team shared the same site) to indicate the degree of member dispersion experienced by their team during the experiment. An independent samples t-test was then conducted to verify that the planned manipulation worked. The results for this t-test are displayed in table 5.1 below. As evidenced by the t-test results, the planned manipulation was successful indicating that participants correctly identified the experimental condition they experienced 99.97% (8 out of 240 individuals misidentified their condition) of the time. For all teams, the majority if not all members correctly indicated experiencing the assigned experimental condition and therefore all teams were retained in the dataset for inclusion in later analyses.

For the second manipulation in this study involving communication modality, no systematic analyses were deemed necessary to verify that the manipulation worked. Team communication condition was manipulated by the researcher who randomly assigned teams to one of two conditions differing only in the functionality that was used by the team during the decision task. Under the first condition, teams used web-based
videoconferencing to coordinate team members, whereas under the second condition teams used audio-only conferencing technology.

<table>
<thead>
<tr>
<th>Completely Distributed Mean</th>
<th>Partially Distributed Mean</th>
<th>t</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
<th>Mean Diff.</th>
<th>Std. Error Difference</th>
<th>95% C.I. of Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances</td>
<td>.9187</td>
<td>-.9304</td>
<td>37.21</td>
<td>23</td>
<td>.000</td>
<td>1.859</td>
<td>.050</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>Lower 1.751 Upper 1.947</td>
</tr>
</tbody>
</table>

Table 5.1: Team Dispersion Manipulation Check.

Data Checks and Cleaning

As an initial step to preparing the data for analysis, the data set was scanned for completeness and coherence. With the exception of the manipulated variables (team dispersion and communication modality data), all data was electronically captured using a web-based survey. Although electronic collection of data helps to reduce the likelihood of error introduced by manual data entry, in compliance with IRB protocol, participants were allowed to skip any survey item they did not wish to answer thus resulting in some missing data. The missing data were determined to be random failures to complete all of the survey items (e.g., the participant might have completed only 4 out of 5 of the process satisfaction measure items) and not due to some systematic problem with the data collection procedure or scales used. Overall, there was an extremely high level of complete data and accuracy in the dataset. The total amount of missing data among the
primary study variables was assessed revealing that only .14 percent of the data were missing (13 out of 9600 possible data points). Given the already small sample size and difficulties inherent to collecting and aggregating data to the team level, use of listwise or pairwise deletion was deemed too stringent of an approach when dealing with individual missing data points. Alternatively within subject within scale mean substitution was used when no response was given for a scale item. No participant was found to skip more than one item comprising a measure further justifying using a within subject mean substitution approach.

The data was also examined to ensure that the assigned hidden profile research task worked as planned. Namely, a team was eliminated from the dataset if its members’ predissent candidate choices were all candidate C. No teams were found to unanimously choose candidate C prior to the team meeting, however, 28% of the participants reported C as their top candidate choice prior to the team conference. All other participants picked Candidate A (23 %), Candidate B (12%) or Candidate D (37%) for hiring,

**Scale Reliability**

To determine measure reliability, Cronbach alphas were examined for the scales used in the study at both the individual and group levels. The alphas when considering all individual observations ranged from .760 to .875. Whereas when group means were considered the coefficient alphas ranged from .787 to .904. A summary of the reliability estimates for all scale variables is reported in Table 5.2. Given that reliability estimates at both the individual and group levels were found to be at least $\alpha \geq .7$, and existing validated measures were used, it was determined that sufficient scale reliability existed without modifying any of the measures. Cronbach alphas were calculated for all
measures (see Table 5.2) except for information sharing and performance. These variables were assessed with measures that were objective and either did not contain multiple items (e.g., performance) or the correlation and variance between the items was not meaningful (e.g., information sharing) and therefore calculation of a reliability statistic was not appropriate.

<table>
<thead>
<tr>
<th>Constructs</th>
<th># of Scale Items</th>
<th>Individual Data α</th>
<th>Group Mean α</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>3</td>
<td>.831</td>
<td>.829</td>
</tr>
<tr>
<td>Information Sharing</td>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
<tr>
<td>Conflict</td>
<td>3</td>
<td>.875</td>
<td>.904</td>
</tr>
<tr>
<td><strong>Dependent Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process Satisfaction</td>
<td>5</td>
<td>.873</td>
<td>.884</td>
</tr>
<tr>
<td>Outcomes Satisfaction</td>
<td>5</td>
<td>.760</td>
<td>.787</td>
</tr>
<tr>
<td>Performance</td>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
<tr>
<td>Perceived Social Presence</td>
<td>7</td>
<td>.828</td>
<td>.879</td>
</tr>
</tbody>
</table>

Table 5.2: Cronbach Alphas for Self-Report Measures.

**Data Aggregation**

Due to the design of the study and the nature of the constructs examined, the majority of the data was collected at the individual level and then aggregated to the team level. Several steps were taken to avoid aggregation biases and confusion over levels of analysis (e.g., George & James, 1993; Goodman et al., 1987; Roberts, Hulin, & Rousseau, 1978; Rousseau, 1985). First, all self report measures were comprised of scale
items written to reflect the team level and team referents (Rousseau, 1985; Van de Ven & Ferry, 1980). Second, survey instructions clearly indicated that the characteristics being considered were team phenomenon. Finally, in acknowledgement that shifting levels of analysis may alter the psychometric properties and the meaning of variables (Sirotnik, 1980), several analyses were conducted to justify that aggregated scores reflected team level attributes. To demonstrate adequate within-team agreement rwg(j) (James, Demaree, & Wolf, 1993) was calculated. To demonstrate the relative amount of between-team verses within-team variance across the entire sample of teams, intraclass correlations were generated including both ICC(1) and ICC(2) (James, 1982) for the process and dependent scale variables.

To be able to aggregate to the team level, it must first be established that ratings from individual team members are interchangeable or provide essentially the same rating (Kozlowski & Hattrup, 1992). The rwg(j) index, contrary to the ICC(1) and ICC(2), only reflects the extent of within-team variability and not between-team variability. It was calculated using James et al. (1993) equation which compares the observed group variance to the expected random variance. It is generally accepted that sufficient intra-group agreement exists if the mean rwg(j) equals or exceeds .7. The overall rwg(j) averaged across all groups were found to range from .87 to .97 in this study. The average rwg(j) values for all aggregated measures are provided in Table 5.3. Given sufficient agreement was found to exist, ICC(1) and ICC(2) were then computed for each variable. The ICC(1) estimates the proportion of the total variance of the measure that is explained by team membership (Bliese, 2000). The larger ICC(1), the more alike or interchangeable the raters are said to be (James, 1982). An ICC(1) level greater than .12 indicates
sufficient within-group variance compared to between-group variance to conclude there is a noticeable group effect. ICC(2) is a reliability measurement that reflects the extent to which group means within a sample are reliable. ICC(2) values are commonly considered acceptable if they equal or exceed .7 (when team sizes are large), indicating that between-group variability on the measure is large. However, given the teams examined in this study only contain 4 members, the expected ICC(2) will be much smaller than .7 (Klein & Kozlowski, 2000; James, 1982). The ICC(1) and ICC(2) for all variables, as shown in Table 5.3, were found to be acceptable and the F statistic significant at the p<.05 level, therefore aggregation to the team level was deemed appropriate.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Rwg</th>
<th>ICC(1)</th>
<th>ICC(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>.974</td>
<td>.365</td>
<td>.700</td>
</tr>
<tr>
<td>Information Sharing</td>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
<tr>
<td>Conflict</td>
<td>.970</td>
<td>.257</td>
<td>.601</td>
</tr>
<tr>
<td><strong>Dependent Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process Satisfaction</td>
<td>.935</td>
<td>.189</td>
<td>.500</td>
</tr>
<tr>
<td>Outcomes Satis.</td>
<td>.872</td>
<td>.120</td>
<td>.400</td>
</tr>
<tr>
<td>Performance</td>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
<tr>
<td>Perceived Presence</td>
<td>.937</td>
<td>.142</td>
<td>.401</td>
</tr>
</tbody>
</table>

Table 5.3: Summary of rwg, ICC(1) and ICC(2) for Aggregated Measures.
Table 5.4 presents the number of groups per treatment condition and the corresponding team-level means and standard deviations. Table 5.5 present the means, standard deviations, and correlations for the primary and control variables examined in this study. All variables except for team performance were assessed at the individual level using self report measures and then aggregated to the team level. Several control variables including member relations, experience with technology, gender, age, and ethnicity were also assessed for their relationship with the nine primary study variables. The aggregated control variables possess configural properties, as they reflect the configuration of individuals’ characteristics among team members (Kozlowski & Klein, 2000). Because these are configural and not shared group variables, intra-group agreement is not relevant for the control variables. Of the control variables assessed, gender (coded 1=male, 2=female) was found to be positively related to both team performance and member perceptions of social presence; information sharing was found to be negatively related to member relations (coded 1-5 with low numbers indicating no prior working relationship existed between the members and higher number indicating a relationship between at least 2 team members of the team existed prior to the study); and ethnicity (coded 1=African American, 2=Asian, 3=White non-Hispanic , 4=Hispanic, 5=Native American , 6=Multi-ethnic, 7=Other) was found to be negatively related to team dispersion. No other significant bivariate correlations were found to exist between the control and primary study variables. Therefore, only gender, member relations, and ethnicity were controlled for where appropriate in the testing of the hypotheses. The final

Descriptive Statistics

Table 5.4 presents the number of groups per treatment condition and the corresponding team-level means and standard deviations. Table 5.5 present the means, standard deviations, and correlations for the primary and control variables examined in this study. All variables except for team performance were assessed at the individual level using self report measures and then aggregated to the team level. Several control variables including member relations, experience with technology, gender, age, and ethnicity were also assessed for their relationship with the nine primary study variables. The aggregated control variables possess configural properties, as they reflect the configuration of individuals’ characteristics among team members (Kozlowski & Klein, 2000). Because these are configural and not shared group variables, intra-group agreement is not relevant for the control variables. Of the control variables assessed, gender (coded 1=male, 2=female) was found to be positively related to both team performance and member perceptions of social presence; information sharing was found to be negatively related to member relations (coded 1-5 with low numbers indicating no prior working relationship existed between the members and higher number indicating a relationship between at least 2 team members of the team existed prior to the study); and ethnicity (coded 1=African American, 2=Asian, 3=White non-Hispanic , 4=Hispanic, 5=Native American , 6=Multi-ethnic, 7=Other) was found to be negatively related to team dispersion. No other significant bivariate correlations were found to exist between the control and primary study variables. Therefore, only gender, member relations, and ethnicity were controlled for where appropriate in the testing of the hypotheses. The final
decision choice distribution for the teams examined in this study were Candidate A = 14.7%, Candidate B = 3.3%, Candidate C = 45.5%, and Candidate D = 36.5%.

### Experimental Condition

<table>
<thead>
<tr>
<th>Process Variables</th>
<th>Completely Distributed, Video Condition</th>
<th>Completely Distributed, Audio-only Condition</th>
<th>Partially Distributed, Video Condition</th>
<th>Partially Distributed, Audio-only Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>6.239 (.508)</td>
<td>6.187 (.558)</td>
<td>6.008 (.867)</td>
<td>6.233 (.562)</td>
</tr>
<tr>
<td>Information Sharing</td>
<td>21.600 (17.012)</td>
<td>13.133 (10.446)</td>
<td>21.000 (18.217)</td>
<td>12.923 (9.349)</td>
</tr>
<tr>
<td>Conflict</td>
<td>1.816 (.299)</td>
<td>1.652 (.296)</td>
<td>1.727 (.356)</td>
<td>1.732 (.302)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Process Satisfaction</th>
<th>Outcome Satisfaction</th>
<th>Social Presence</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.770 (.299)</td>
<td>6.017 (.376)</td>
<td>4.688 (.499)</td>
<td>.400 (507)</td>
</tr>
<tr>
<td></td>
<td>6.267 (.459)</td>
<td>6.117 (.389)</td>
<td>4.730 (.499)</td>
<td>.467 (.516)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.574 (.612)</td>
<td>.412 (.507)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.450 (.502)</td>
</tr>
</tbody>
</table>

Table 5.4: Means and Standard Deviations for Primary Study Variables under Each Experimental Condition.

N= 60 teams
Table 5.5: Means, Standard Deviations, and Inter-Correlations of Control and Study Variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
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<td>1. Gender</td>
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<td>-0.07</td>
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<td>9. Information Share</td>
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<td>-0.08</td>
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<td>.13</td>
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<td>.02</td>
<td>-.12</td>
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<td>-.40**</td>
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<td>13. Outcome Satis.</td>
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<td>-0.09</td>
<td>.05</td>
<td>-.08</td>
<td>.43**</td>
<td>.28*</td>
<td>-.43**</td>
<td>.30*</td>
<td>.62**</td>
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<td>14. Social Presence Perceptions</td>
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<td>.01</td>
<td>.06</td>
<td>.05</td>
<td>-.11</td>
<td>.58**</td>
<td>.13</td>
<td>-.36**</td>
<td>.15</td>
<td>.63**</td>
<td>.51**</td>
<td>1</td>
</tr>
</tbody>
</table>

N=60 teams
**Correlation is significant at the .01 level (2-tailed)
*Correlation is signification at the .05 level (2-tailed)
a Dummy coded variables. Completely distributed teams were coded 1, partially distributed teams were coded -1; teams using video conferencing technology were coded 1, teams using audio-only conferencing technology were coded -1; teams with high performance were coded 1, teams with low performance were coded 0; gender was coded 1 for males and 2 for females; ethnicity was coded 1=African American, 2=Asian, 3=White non-Hispanic , 4=Hispanic, 5=Native American , 6=Multi-ethnic, 7=Other; member relations was coded 1-5 with low numbers indicating no prior working relationship existed between the members and higher number indicating a relationship between at least 2 team members of the team existed prior to the study.
Tests of Hypotheses

Main Effects of Team Dispersion on Process Variables (Hypotheses 1-3)

Hypotheses 1-3 predicted that degree of member collocation would relate to team communication, information sharing, and conflict. More specifically, teams with complete member dispersion were expected to report better intra-team communication, information sharing, and lower levels of conflict than teams with partial member dispersion. Table 5.6 displays the results of the regression analyses used to investigate the hypothesized relationships. As the initial step of the regression analysis, the control variables were entered; team dispersion was then entered in step 2. The relationship between member dispersion and team communication after partialling out the effect of ethnicity was not found to be significant at the p < .05 or .01 levels (β=.030, ΔR²=.002). Similarly, support was not found for hypothesis 2 (β=.049, ΔR²=.002) examining the relationship between team dispersion and information sharing while controlling for member ethnicity and relationship with other team members. Nor was support found for hypothesis 3 (β=.070, ΔR²=.005) examining the relationship between team dispersion and conflict while controlling for ethnicity. In sum, support for hypotheses 1-3 was not found.
<table>
<thead>
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<th>Dependent Variable</th>
<th>Step</th>
<th>Predictors</th>
<th>Total $R^2$</th>
<th>Adjusted $R^2$</th>
<th>$\Delta R^2$</th>
<th>$\beta$</th>
<th>Sig $\beta$</th>
<th>F</th>
<th>Sig</th>
<th>F change</th>
<th>Sig F change</th>
<th>df</th>
</tr>
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<td>.011</td>
<td>.028</td>
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<td>a</td>
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<td>.201</td>
<td>1.672</td>
<td>.201</td>
<td>1.58</td>
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<td>2</td>
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<td>-.004</td>
<td>.002</td>
<td>.046</td>
<td>.883</td>
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<td>.119</td>
<td>.731</td>
<td>1.57</td>
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</tr>
<tr>
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<td>Controls</td>
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<td>.040</td>
<td>.072</td>
<td>a</td>
<td>a</td>
<td>2.224</td>
<td>.117</td>
<td>2.224</td>
<td>.117</td>
<td>2.57</td>
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<tr>
<td></td>
<td>2</td>
<td>Team Dispersion</td>
<td>.074</td>
<td>.025</td>
<td>.002</td>
<td>.049</td>
<td>1.502</td>
<td>.224</td>
<td>.126</td>
<td>.724</td>
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<td>.041</td>
<td>.057</td>
<td>a</td>
<td>a</td>
<td>3.536</td>
<td>.065</td>
<td>3.536</td>
<td>.065</td>
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<td></td>
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<td>.029</td>
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<td>1.887</td>
<td>.161</td>
<td>.282</td>
<td>.597</td>
<td>1.57</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.6: Results of regressing Communication (H1), Information Sharing (H2), and Conflict (H3) on Member Dispersion.

a Individual betas for each of the control variables are not relevant to the hypothesis test and thus are not included in the table.
Moderating Effect of Communication Modality on the Relationship between Team Dispersion and Process Variables (Hypotheses 4-6)

Hypotheses 4-6 predicted that the type of communication modality used during the team meeting will influence the relationship between team dispersion and team processes of communication, information sharing, and conflict. Specifically it was predicted that team dispersion’s relationship with team communication (hypothesis 4), information sharing (hypothesis 5), and conflict (hypothesis 6) would be strengthened when a richer communication device (e.g., video conferencing) was used during the team meeting and relatively weaker when leaner technology (e.g., audio-only conferencing) was employed. To examine the potential relationships between these constructs, moderated multiple regression analyses were conducted. The results of these analyses are presented in Tables 5.7.

The following steps were taken to test these hypotheses. First, the categorical independent variable of team dispersion was centered and dummy coded to reflect whether the team experienced complete (1) or partial (-1) distribution of its members. The moderating variable of communication modality likewise was centered and dummy coded depending on whether the team used a rich (1) or lean (-1) communication technology device during the team meeting. Variable centering was conducted as an initial step to help to reduce problems associated with multicollinearity in the interaction term. Second, an interaction term was calculated from the cross product of team dispersion and communication modality. Third, hierarchical multiple regression analysis was conducted. The control variables were entered as an initial step to partial out any idiosyncratic effects that might influence the overall regression model.
modality and team dispersion were then entered in block two of the analysis and the interaction term of team dispersion and communication modality was entered last.

The interaction between communication modality and team dispersion was not found to meaningfully influence communication ($\beta = .325, \Delta R^2 = .017$), information sharing ($\beta = .039, \Delta R^2 = .001$), or conflict ($\beta = .103, \Delta R^2 = .010$) within the team at the $p < .05$ level of significance. This means that richness or type of communication medium used during the team meeting did not affect the link between team dispersion and the processes of communication, information sharing, and team conflict. The statistically non-significant effect size reflected by the very low adjusted $R^2$ values as well as the low $F$ values further confirmed no meaningful relationship between these variables was detected. Support for hypotheses 4-6 therefore was not found. Although not formally hypothesized, a significant main effect between communication modality and information sharing was found ($\beta = .257, \Delta R^2 = .064, p<.05$). Namely, teams using a richer communication modality (e.g., video technology) were found on average to share more information than teams using a leaner communication modality (e.g., voice-only technology).
Table 5.7: Regression Results Testing for Interaction of Member Dispersion and Communication Modality on Team Communication (hypothesis 4), Information Sharing (hypothesis 5), and Conflict (Hypothesis 6).

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Step</th>
<th>Predictors</th>
<th>Total $R^2$</th>
<th>Adjusted $R^2$</th>
<th>$\Delta R^2$</th>
<th>$\beta$</th>
<th>Sig $\beta$</th>
<th>F</th>
<th>Sig F change</th>
<th>F change</th>
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<td>.011</td>
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<td>1.672</td>
<td>.201</td>
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<td>.201</td>
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<tr>
<td></td>
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<td>-.019</td>
<td>.005</td>
<td>.044</td>
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<td>.864</td>
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<tr>
<td></td>
<td>3</td>
<td>Dispersion x Modality Interaction</td>
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<td>-.019</td>
<td>.017</td>
<td>.325</td>
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<td>.726</td>
<td>.578</td>
<td>.325</td>
<td>.325</td>
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<td>Dispersion x Modality Interaction</td>
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</table>

a Individual betas for each of the dummy variables are not relevant to the hypothesis test and thus are not included in the table.
Regression analysis was used to investigate the proposed relationships in hypotheses 7-18. The same procedure was used to test all of these hypothesized relationships. Namely, the analyses examined the unique relationship between each process and dependent variable when the effects of the control variables (step 1) and other team process constructs (step 2) were partialled out.

The Relationship between Team Processes and Performance. Hypotheses 7-9 predicted that degree of team communication, information sharing, and conflict would relate to team performance. Positive relationships between team communication and performance as well as information sharing and performance were expected. Alternatively a negative relationship between team conflict and performance was proposed. Table 5.8 displays the results of the regression analyses used to investigate the hypothesized relationships.

The relationship between team communication and performance after partialling out the effects of the control variables was not found to be significant at the p < .05 or .01 levels ($\beta=-.149$, $\Delta R=.245$). Therefore support for hypothesis 7 was not extended. Using the same statistical procedure to test the proposed relationships between team information sharing and performance (hypothesis 8) as well as team conflict and performance (hypothesis 9), it was found that a significant positive relationship existed between information sharing and performance ($\beta=.541$, $\Delta R=.245$), however, there was no relationship between conflict and team performance ($\beta=-.166$, $\Delta R=.245$). Thus hypothesis 8 was accepted and hypothesis 9 was rejected.
Table 5.8: Results of regressing Communication (H7), Information Sharing (H8), and Conflict (H9) on Performance.

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<th>Adjusted R²</th>
<th>Δ R²</th>
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<td>.156</td>
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<td>.000</td>
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<td></td>
<td>Conflict (H9)</td>
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<td>-.166</td>
<td>.161</td>
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</tbody>
</table>

Individual betas for each of the dummy variables are not relevant to the hypothesis test and thus are not included in the table.
The Relationship between Team Processes and Member Satisfaction with the Process. Hypotheses 10, 11, and 12 predicted that degree of team communication, information sharing, and conflict would relate to member satisfaction with team processes. Positive relationships between team communication and process satisfaction as well as information sharing and process satisfaction were expected. Alternatively a negative relationship between team conflict and process satisfaction was proposed. Table 5.9 displays the results of the regression analyses used to investigate the hypothesized relationships. The statistical procedure used to test hypotheses 7-9 was also used to test hypotheses 10, 11, and 12.

The relationship between team communication and process satisfaction as well as the relationship between team conflict and process satisfaction after partiailling out the effects of members’ relationship with other team members and ethnicity were found to be significant (p < .05) and in the expected direction (β=.521, ΔR²=.418; β=-.393, ΔR²=.521). Therefore hypotheses 10 and 12 were supported. The proposed relationship between team information sharing and satisfaction with the team processes, however, was not found to be significant at the p < .05 or .01 levels (β=.024, ΔR²=.418). Therefore support for hypothesis 11 was not extended.
<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Step</th>
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<th>$\text{Sig } \beta$</th>
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</table>

Table 5.9: Results of regressing Communication (H10), Information Sharing (H11), and Conflict (H12) on Process Satisfaction.

a Individual betas for each of the dummy variables are not relevant to the hypothesis test and thus are not included in the table.
The Relationship between Team Processes and Outcome Satisfaction. Hypotheses 13, 14, and 15 predicted that degree of team communication, information sharing, and conflict would relate to member satisfaction with team decision outcomes. Positive relationships between team communication and decision outcome satisfaction as well as information sharing and decision outcome satisfaction were expected. Alternatively a negative relationship between team conflict and decision outcome satisfaction was proposed. Table 5.10 displays the results of the regression analyses used to investigate the hypothesized relationships. Support was found for hypotheses 13 and 15. Namely, communication was found to be positively related to members’ satisfaction with the team’s decision outcomes ($\beta=.370$, $\Delta R^2=.381$), while conflict was negatively related ($\beta=-.451$, $\Delta R^2=.381$). Information sharing, however, was not found to be significantly related to members’ satisfaction with the decision outcome as suggested by hypothesis 14 ($\beta=.160$, $\Delta R^2=.381$).
<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Step</th>
<th>Predictors</th>
<th>Total R²</th>
<th>Adjusted R²</th>
<th>Δ R²</th>
<th>β</th>
<th>Sig β</th>
<th>F</th>
<th>Sig F</th>
<th>F change</th>
<th>Sig F change</th>
<th>df</th>
</tr>
</thead>
<tbody>
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<td>a</td>
<td>.251</td>
<td>.779</td>
<td>.251</td>
<td>.779</td>
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<td>.381</td>
<td>.370</td>
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<td>.000</td>
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<td>.000</td>
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<td></td>
<td>Information sharing (H14)</td>
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<td>.160</td>
<td>.188</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Conflict (H15)</td>
<td></td>
<td></td>
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<td>-.451</td>
<td>.000</td>
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</tr>
</tbody>
</table>

Table 5.10: Results of regressing Communication (H13), Information Sharing (H14), and Conflict (H15) on Outcome Satisfaction.

a Individual betas for each of the dummy variables are not relevant to the hypothesis test and thus are not included in the table.
The Relationship between Team Processes and Perceptions of Social Presence.

Hypotheses 16-18 predicted that degree of team communication, information sharing, and conflict would relate to member perceptions of social presence. Positive relationships between team communication and social presence perceptions as well as information sharing and social presence perceptions were expected. Alternatively a negative relationship between team conflict and social presence perceptions was proposed. Table 5.11 displays the results of the regression analyses used to investigate the hypothesized relationships. Communication and conflict were both found to be significantly related to perceptions of social presence ($\beta=.610, \Delta R^2=.281; \beta=-.386, \Delta R^2=.132$). Information sharing, however, was unrelated to members social presence perceptions ($\beta=-.002, \Delta R^2=.001$).
<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Step</th>
<th>Predictors</th>
<th>Total $R^2$</th>
<th>Adjusted $R^2$</th>
<th>$\Delta R^2$</th>
<th>$\beta$</th>
<th>Sig $\beta$</th>
<th>$F$</th>
<th>Sig $F$</th>
<th>$F$ change</th>
<th>Sig $F$ change</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Presence Perceptions</td>
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<td>Controls</td>
<td>.105</td>
<td>.057</td>
<td>.105</td>
<td>a</td>
<td>a</td>
<td>2.193</td>
<td>.099</td>
<td>2.193</td>
<td>.099</td>
<td>3,56</td>
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<tr>
<td></td>
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<td>Communication (H16)</td>
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<td>.510</td>
<td>.455</td>
<td>.609</td>
<td>.000</td>
<td>11.248</td>
<td>.000</td>
<td>18.274</td>
<td>.000</td>
<td>3,53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information sharing (H17)</td>
<td></td>
<td></td>
<td></td>
<td>-.077</td>
<td>.461</td>
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</tr>
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<td></td>
<td></td>
<td>Conflict (H18)</td>
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<td></td>
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<td>.000</td>
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</tr>
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</table>

Table 5.11: Results of regressing Communication (H16), Information Sharing (H17), and Conflict (H18) on Perceptions of Social Presence.

Individual betas for each of the dummy variables are not relevant to the hypothesis test and thus are not included in the table.
Mediation Hypotheses (Hypotheses 19-22)

Baron and Kenny (1986) and later extended by Kenny et al. (1998) specify four steps for establishing mediation. As the initial step, it must be established that the independent variable significantly affects the dependent variable in the absence of the mediator. Namely, a relationship between member dispersion and the team outcomes of performance, process satisfaction, outcomes satisfaction, and perceptions of social presence must be found. As evidenced in Table 5.12, no significant relationships were found between these variables.
Dependent Variable Step Predictors Total $R^2$ Adjusted $R^2$ $\Delta R^2$ $\beta$ $F$ Sig $F$ change Sig $F$ change df

<table>
<thead>
<tr>
<th>Performance</th>
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<th>Control</th>
<th>.088</th>
<th>.056</th>
<th>.088</th>
<th>a</th>
<th>2.740</th>
<th>.073</th>
<th>2.740</th>
<th>.073</th>
<th>2,57</th>
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</thead>
<tbody>
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<td>.000</td>
<td>.005</td>
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<td>.159</td>
<td>.001</td>
<td>.972</td>
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</tr>
<tr>
<td>Process Satisfaction</td>
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<td>Control</td>
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<td>.007</td>
<td>.023</td>
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<td>.243</td>
<td>1.393</td>
<td>.243</td>
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</tr>
<tr>
<td>2</td>
<td>Team Dispersion</td>
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<td>-.010</td>
<td>.001</td>
<td>-.024</td>
<td>.700</td>
<td>.501</td>
<td>.031</td>
<td>.860</td>
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<td></td>
</tr>
<tr>
<td>Outcome Satisfaction</td>
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<td>Control</td>
<td>.002</td>
<td>-.015</td>
<td>.002</td>
<td>a</td>
<td>.131</td>
<td>.719</td>
<td>.131</td>
<td>.719</td>
<td>1,58</td>
</tr>
<tr>
<td>2</td>
<td>Team Dispersion</td>
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<td>.002</td>
<td>.040</td>
<td>.108</td>
<td>.897</td>
<td>.088</td>
<td>.768</td>
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<td>Control</td>
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<td>.054</td>
<td>.086</td>
<td>a</td>
<td>2.673</td>
<td>.078</td>
<td>2.673</td>
<td>.078</td>
<td>2,57</td>
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<tr>
<td>2</td>
<td>Team Dispersion</td>
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<td>.040</td>
<td>.003</td>
<td>.056</td>
<td>1.818</td>
<td>.154</td>
<td>.183</td>
<td>.670</td>
<td>1,56</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.12: Results of regressing Performance, Process Satisfaction, Outcomes Satisfaction, and Social Presence Perceptions on Member Dispersion.

a Individual betas for each of the control variables are not relevant to the hypothesis test and thus are not included in the table.
Although no main effects were found, recent work has shown that failure to demonstrate a direct effect is not sufficient grounds to assume that mediation has not occurred (MacKinnon, Fairchild, & Fritz, 2007; Preacher & Hayes, 2004). The remaining three steps to establishing full mediation were therefore still conducted. For step two, it must be established that the independent variable is significantly related to the proposed mediator. To determine if such a relationship existed, the relationship between member dispersion and processes of communication, information sharing, and conflict was examined in hypotheses 1, 2, and 3 respectively. As reported in Table 5.6, no statistically significant relationships were found to exist between these variables. Step 3 requires that the mediator have a significant unique effect on the dependent variables. It therefore must be shown that the proposed mediating variables of team communication, information sharing, and conflict uniquely relate to the outcomes of performance, process satisfaction, outcome satisfaction, and perceptions of social presence. Hypotheses 7-18 tested for the existence of these relationships and some significant relationships were found as presented Tables 5.8-5.11. The final step to testing for full mediation establishes that the effect of the independent variable (e.g., team dispersion) on the dependent variable (e.g., performance, process satisfaction, outcome satisfaction, social presence perceptions) becomes zero upon controlling for the effects of the proposed mediators. A summary of the findings associated with step 4 can be found in Table 5.13.
### Table 5.13: Results of regressing Performance, Process Satisfaction, Outcome Satisfaction, and Social Presence Perceptions on Member Dispersion while Controlling for Mediators.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Step</th>
<th>Predictors</th>
<th>Total $R^2$</th>
<th>Adjusted $R^2$</th>
<th>Δ $R^2$</th>
<th>$\beta$</th>
<th>Sig $\beta$</th>
<th>$F$</th>
<th>Sig</th>
<th>$F$ change</th>
<th>Sig $F$ change</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance</td>
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<td>Control</td>
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<td>.040</td>
<td>.088</td>
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<td>a</td>
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<td>.156</td>
<td>1.810</td>
<td>.156</td>
<td>3,56</td>
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<tr>
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<td>.002</td>
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<td></td>
<td>.540</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
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<td>.161</td>
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<td></td>
<td>Team Dispersion</td>
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<td>.002</td>
<td>.987</td>
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<td>.000</td>
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<td>9.662</td>
<td>.000</td>
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<td>.716</td>
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</tr>
</tbody>
</table>

*a* Individual betas for each of the control variables are not relevant to the hypothesis test and thus are not included in the table.
Table 5.13: Continued.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Step</th>
<th>Predictors</th>
<th>Total R²</th>
<th>Adjusted R²</th>
<th>Δ R²</th>
<th>β</th>
<th>Sig β</th>
<th>F</th>
<th>Sig F change</th>
<th>Sig F change</th>
<th>df</th>
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</thead>
<tbody>
<tr>
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<td>Control</td>
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<td>.619</td>
<td>.598</td>
<td>.619</td>
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<td>.371</td>
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<td>.003</td>
<td>4.998</td>
<td>.000</td>
<td>.000</td>
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<td></td>
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<td>.060</td>
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<tr>
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<td>Control</td>
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<td>.057</td>
<td>.105</td>
<td>a</td>
<td>a</td>
<td>2.193</td>
<td>.099</td>
<td>.099</td>
<td>3,56</td>
</tr>
<tr>
<td></td>
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<td>.501</td>
<td>.455</td>
<td>.609</td>
<td>.000</td>
<td>9.463</td>
<td>.000</td>
<td>.000</td>
<td>4,52</td>
</tr>
<tr>
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<td></td>
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<td>.464</td>
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</tr>
<tr>
<td></td>
<td></td>
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<td>.918</td>
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</table>

a Individual betas for each of the control variables are not relevant to the hypothesis test and thus are not included in the table.
A critical component of mediation analysis is to statistically establish indirect effects. The Baron and Kenny (1986) approach to testing for mediation can suffer from low statistical power particularly when the sample size is small (Preacher & Hayes, 2004). This in turn can contribute to higher Type II error rates. It is therefore recommended that a significance test involving the product of coefficients be used because it offers more statistical power and less stringent requirements. Namely, the Sobel test offers a more powerful strategy for testing for mediation because it requires only that 1) there exists an effect to be mediated and 2) the indirect effect is statistically significant in the predicted direction. As part of the testing for mediation, the Sobel test (1982) was conducted to generate an estimate of the indirect effects of each of the proposed mediators in the study. The results from this test are summarized in Table 5.14. Based on the test results, none of the hypothesized mediators were found to be significant.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Mediator</th>
<th>Sobel Test Statistic</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance</td>
<td>Communication</td>
<td>.287</td>
<td>.774</td>
</tr>
<tr>
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<td>Communication</td>
<td>.345</td>
<td>.730</td>
</tr>
<tr>
<td>Outcome Satisfaction</td>
<td>Communication</td>
<td>.345</td>
<td>.730</td>
</tr>
<tr>
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<td>Communication</td>
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<td>.730</td>
</tr>
<tr>
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<td>.854</td>
</tr>
<tr>
<td>Process Satisfaction</td>
<td>Information Sharing</td>
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<td>.856</td>
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<td>.855</td>
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<td>.652</td>
</tr>
<tr>
<td>Process Satisfaction</td>
<td>Conflict</td>
<td>-.505</td>
<td>.614</td>
</tr>
<tr>
<td>Outcome Satisfaction</td>
<td>Conflict</td>
<td>-.507</td>
<td>.612</td>
</tr>
<tr>
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<td>Conflict</td>
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<td>.614</td>
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Table 5.14: Summary of Sobel Test for Mediation.
Summary of Study Results

Table 5.15 presents a summary of the hypotheses and results presented in the preceding chapter sections. The discussion of these findings will be reserved for Chapter 6.
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<tr>
<th>Hypothesis</th>
<th>Supported</th>
<th>Not Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: Degree of collocation will be negatively related to communication quality</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H2: Degree of collocation will be negatively related to information sharing</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H3: Degree of collocation will be negatively related to conflict such that completely distributed teams will experience less overall conflict than partially distributed teams.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H4: Communication modality will moderate the relationship between dispersion and communication.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H5: Communication modality will moderate the relationship between dispersion and information sharing.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H6: Communication modality will moderate the relationship between dispersion and team conflict.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H7: Team communication will be positively related to team performance</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H8: Team information sharing will be positively related to team performance</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>H9: Team conflict will be negatively related to team performance</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H10: Team communication will be positively related to process satisfaction</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H11: Team information sharing will be positively related to process satisfaction</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>H12: Team conflict will be negatively related to process satisfaction</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.15: Summary of Study Findings.
<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Supported</th>
<th>Not Supported</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>H14: Team information sharing will be positively related to outcome satisfaction</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>H15: Team conflict will be negatively related to outcome satisfaction</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H16: Team communication will be positively related to perceived social presence</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>H17: Team information sharing will be positively related to social presence</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>H18: Team conflict will be negatively related to social presence</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H19: Team communications, information sharing, and conflict will fully mediate the relationship between configurational dispersion and team performance.</td>
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<td>H20: Team communication, information sharing, and conflict will fully mediate the relationship between configurational dispersion and member satisfaction with the process.</td>
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<td>H21: Team communication, information sharing, and conflict will fully mediate the relationship between configurational dispersion and member satisfaction with the decision outcome.</td>
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<td>H22: Team communication, information sharing, and conflict will fully mediate the relationship between configurational dispersion and member satisfaction with perceived social presence.</td>
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CHAPTER 6: DISCUSSION

This chapter provides a discussion of the research findings from this dissertation. It will open with an overview of the empirical contributions of the study and their theoretical implications. The limitations of the research and suggestions for future work in this area will then be presented. The chapter concludes with a discussion of the practical implications of the study results.

Overview of Findings

The use of virtual teams has become a common practice in many contemporary organizations. Management research, however, has not adequately addressed the potential theoretical and practical implications of strategically structuring teams and leveraging web 2.0 technologies to enhance team effectiveness. Consistent with the objectives stated in Chapter 1, this dissertation therefore examined the impact team member configuration and communication modality had on virtual team functioning (e.g., communication, information sharing, conflict) and effectiveness (e.g., performance, satisfaction, social presence perceptions). It also examined the link between three critical team processes and outcomes of member satisfaction, an area that is currently underrepresented in the literature (Baker, 2002). A final contribution of the research looked at mechanisms by which members’ social presence perceptions are strengthened. Namely, the relationship between members’ social presence perceptions and team processes of communication,
information sharing, and conflict were examined to determine if a significant relationship between these variables existed.

Summary of Research Findings

Empirical Findings

Member Spatial Arrangement. Member spatial arrangement in the virtual team was manipulated in this study. Team structure varied as to whether members were completely distributed from each other or partially in that some members shared an office space. This geographical configuration directly answered Polzer et al.’s (2006) call for research examining teams consisting of subgroups of different sizes and is the first known study to have systematically manipulated virtual team member dispersion in this way. Contrary to what was expected, member spatial arrangement in this context was not found to be significantly related to any of the research variables. All corresponding mediating and moderating hypotheses were therefore rejected. Limitations inherent to the design, manipulations, and sample of this study might have contributed to the non-significant findings.

First, the group size examined in this study was limited to 4 persons. Consequentially the distinction between research conditions was relatively small in that one of the team members was either assigned to his/her own office (e.g., under the completely distributed condition) or shared an office with another team member (e.g., under the partially distributed condition). While this structuring did allow for examination of the impact of subgroups of different sizes (e.g., 1 verses 2 person subgroups), the subgroup sizes were probably not sufficiently large to activate
geographically-based faultlines. Although communication, a process known to contribute to faultline dynamics, was examined, measures of propinquity and social categorization processes over time were also needed to more fully assess the extent to which faultline activation occurred.

A second explanation for the finding might suggest that perhaps the manipulation of physical distance was an insufficient predictor of member interactions and team outcomes in this context. Additionally a measure of perceived distance between members might have provided more explanatory power and shed light on the extent to which members’ perceptions regarding teammate distance varied across the experimental conditions. People often perceive physical distances quite differently (Halford & Leonard, 2006; Harrison-Hill, 2001) and examination of proximity perceptions would help to assess the extent to which the distance between members was salient to team members. Very recent theorizing suggests that it is not only the actual distance between members but also the perceived distance that is likely to impact member interactions and subsequent outcomes (Wilson, O’Leary, Metiu, and Jett, 2008). The relationship between actual and perceived distance, however, still remains to be empirically determined (Wilson et al., 2008). Some argue that perceived distance will be greater when the geographic separation is bigger (Coshall & Potter, 1987). Given that all team members were situated in offices located on Fisher campus, it is likely that member geographic differences were less salient in this sample than if there was a greater physical distance between members. An advantage, however, of the setting was that the configuration was not highly confounded with nationality or cultural differences inherent to a geographical
location. The nationality of teams was relatively homogenous unlike prior studies where collocates shared a common nationality but differed in nationality from the other team members (Polzer et al., 2006). Differences in nationality is a diversity dimension that has been shown to activate faultlines and the categorization process. Given the objective of the research was to determine the extent to which physical distance between members (rather than cultural differences) might activate categorization and subgroup formation, it was advantageous to have a sample that was relatively homogenous in composition so as not to confound findings.

*Communication Modality.* Consistent with media richness theory, (Daft & Lengel, 1986), teams using richer communication devices demonstrated better information sharing than teams using a leaner modality. It is argued that the visual channel helped to reduce member ambiguity and uncertainty as well as increase awareness of distal team members which in turn helped to facilitate the information sharing process (Anderson et al., 1997). Although findings from this study are in line with Daft and Lengel’s media richness theory, they contrast with other’s theorizing of mediated environments. Namely, contrary to Jessup and Tansik’s (1991) argument that lean communication technologies provide greater member anonymity and thus an environment conducive for a freer exchange of ideas, in the present study teams utilizing video technology were found to exchange more information than teams with audio-only conferencing capabilities where member anonymity arguably was greater. This might in part be attributed to a loss of contextual cues (Sproull & Kiesler, 1986) that can help facilitate member feedback mechanisms. Such mechanism can help establish 1) procedures by which participants
agree to begin and end the conversation as well as 2) rules that allow participants to switch between speaking and listening roles (Walker & Whittaker, 1990). Feedback mechanisms are also necessary for showing acceptance, asking for clarifications, reducing member uncertainty, and demonstrating personal contributions to the team task. Counter to Jessup and Tansik’s experience, in this study it is likely that greater anonymity contributed to higher incidences of member disengagement as well as pressures to come to a decision outcome quickly and often times prematurely. For example, one individual in the audio-only condition noted “I think our group came to a slightly rushed decision because of one member who was in a hurry to finish. We might have been able to have a more complete and robust discussion if not for her insistence to just pick a candidate and move on.” Unfortunately it cannot be determined whether this team’s interactions would have differed if the team had been meeting face to face or using a technology that provided member visibility. There is reason to believe, however, that visibility and or copresence of others can influence members to be more engaged and participative in group discussions and more committed to the task.

Team Communication and Information Sharing. The constructs of communication and information sharing are highly related but distinct constructs. Though a significant positive correlation (.384, α=.01) between the two variables was found, the examination of both provided a more complete understanding of the communicative processes occurring in the teams. Information sharing and team communication were found to be differentially related to other study variables, further justifying the examination of both in this dissertation.
Team information sharing was the only process variable found to be related to team performance. A significant positive relationship (\( .457, \alpha = .01 \)) existed between the two variables, suggesting that as more information was shared among team members, the likelihood for optimal performance increased. Team information sharing, however, was not found to be related to the other outcome variables of interest including members’ social presence perceptions and satisfaction. This might be in part due to the fact that information sharing in this study represented the total number of uniquely held candidate attributes shared during the group conference call. All other dependent variables, with the exception of team performance, measured member’s subjective perceptions. It is very likely that had a measure of perception been used instead to assess information sharing, the relationship found between it and the team effectiveness outcomes would have differed. Namely, information sharing could have been perceived to be very good by participants even in teams where differences in their respective members’ scripts went undetected. However, the quality of information sharing represented only by participant perceptions would have been misleading and likely not a good predictor of group performance. However, participants could have been very satisfied with the team experience and the collective decisions reached, and yet have never discussed any of the unique attributes about the respective candidates. Given satisfaction is an affective outcome, members’ perceptions of the experience can act as a viable predictor.

Communication, though not found to be impacted by the richness of the technology used nor the spatial arrangement of members, was found to be related to member social presence perceptions (\( .578, \alpha = .01 \)) and member satisfaction with both the overall team experience (\( .543, \alpha = .01 \)) and the team decision outcomes (\( .429, \alpha = .01 \)). As
anticipated, teams reporting better communication experienced higher member satisfaction with the team processes and collective decisions reached. Communication, however, was not found to be related to team performance. The non-significant finding between team communication and team performance might have been because the team communications measure assessed members’ perceptions rather than reflecting an actual evaluation of the suitability of the decision making approach(es) used.

For example, it was observed that many teams’ discussions during the research task tended to center around the candidates that were selected as predissent choices. This was especially prevalent in teams that assigned overall numerical ratings to each candidate prior to joining the group discussion. This was problematic because many teams then failed to discuss all candidates and used the approach instead to only discuss those candidates that had been recommended by team members. Often times no team member had recommended the ‘correct’ candidate for hire and in turn failed to even collectively consider this candidate as a viable choice for hiring. For example, one participant noted that “I’m glad we had some discussion but we failed to even consider candidates b and c.” Another individual reported “My team seemed pretty stuck in their prior assessments of the candidates and focused largely on the number scores of their individual summary sheets.” Given the use of a hidden profile research task where each member of the team had both shared and unique information about each candidate (representative of the decision situation in most work teams), the only way to consistently make an optimal decision was through the exchange and consideration of uniquely held information and discussion of all candidates. It is believed the ‘efficiency’ decision
making approaches utilized by many teams in the present study directly contributed to poorer overall team performance.

It is hard to say whether this behavior would still occur outside of the experimental context when a ‘real’ decision is at stake and the consequences for making a ‘wrong’ decision are more severe. Given the emphasis on efficiency ingrained in many work cultures, there is reason to believe real work teams might also fall prey to adopting decision processes that increase efficiency thereby potentially compromising quality. As team sizes increase and require the coordination of more members, the adoption of tactics to facilitate decision making efficiency will likely also increase. Of course there are many contingent factors that likely influence the extent to which efficiency over quality is valued and shapes or drives a team’s processes (e.g., criticality of the decision; urgency or time pressures, appraisal system design and criteria by which the team is evaluated and rewarded). A discussion of these, however, is beyond the scope of this dissertation. What is apparent from observations gathered from this project is the prevalence of teams to, whether intentionally or unintentionally, anchor on or be biased by initial individual decisions which then influenced the team’s overall decision making process and subsequent decisions. This was found to be true irrespective of whether the team experienced complete or partial dispersion of its members and was found to occur across technological modalities.

The link between team communication and the two member satisfaction measures collectively assessed the extent to which participants felt the procedures used to evaluate and arrive at a collective decision were 1) appropriate given the team’s task objectives, 2) enabled and encouraged participants to switch between listening and speaking roles, and
3) effectively integrated all members’ contributions. The positive significant link between communication and member satisfaction is likely explained by the fact that the presence of and feedback of other team members increases awareness of their participation in the team activities which can have implications for a member’s satisfaction with the experience and strengthen perceptions of decision correctness. Member satisfaction, however, did not exhibit meaningful differences across experimental conditions, counter to predictions suggested within the diversity literature (e.g., theories of social identity, self-categorization, and faultlines). This literature suggests that the activation of diversity-based faultlines will activate the salience of subgroups within the team that can impact member identification. The strength and target of member identification in turn should differentially impact team effectiveness outcomes. No statistical differences in member satisfaction, however, were detected. Qualitative feedback from participants, however, did suggest some instances of differential member satisfaction under the partially distributed condition. Namely, one participant reported “I thought it was kind of immature how my group handled the decision making process and it kind of made me mad. I'm not a very assertive person when I just meet people I don’t really say anything. I think the guy in the room with 2 people felt more comfortable making the decision to just go with the candidate with the most votes because he was in a room with another person and therefore felt more confident. If he would have been in a room alone, I don't think he would have been so bold.” Alternatively, some members sharing a location with another team member found “being in the same room as someone else helped me to be more comfortable and interactive.” Another member felt “sharing a room was by far more fun than having the room to myself.”
Team Task Conflict. The final process variable examined in this study was a measure of team task conflict. Significant negative relationships were found between team conflict and outcomes of member satisfaction with the team process (-.403, α=.01), satisfaction with the collective decision reached (-.430, α=.01), and perceptions of social presence (-.355, α=.01). These findings suggest that teams experiencing higher conflict reported lower member satisfaction with both the team experience and the team decision outcome, as well as lower social presence perceptions. Conflict however, was not found to be related to team performance, the spatial arrangement of the team’s members, or the richness of the mediating technology used. Unfortunately, this in turn negated the explanatory power of the research model to predict what contributed to the degree of conflict experienced in the team. Although several contemporary models of diversity exist to explain the positive or negative effects of diversity when they occur, few provide guidance regarding prediction of its occurrence (van Knippenberg De Dreu, & Homan, 2004). Findings in the literature have differed with regards to the perceived importance of conflict in groups (e.g., van Knippenberg et al., 2004). It has been shown to have both positive and negative implications for team effectiveness depending on the nature of the conflict (e.g., social, process, task), type of task performed by the team (e.g., innovation), and the outcome examined (e.g., performance, member satisfaction) (e.g., Bowers et al., 2000; van Knippenberget al., 2004; Webber & Donahue, 2001). Confirming the research hypotheses, task conflict appeared to have a negative effect on most measures of team effectiveness examined in this study.

Other Comments. Given a central interest of this study was to examine the impact of team communication, information sharing, and task conflict on team performance and
affective outcomes, a hidden research profile task was determined most appropriate for examining the proposed relationships between these variables. A design strength of the present study in turn was that all groups included in the sample performed the same task (e.g., hidden profile) which systematically eliminated any variance in observed group outcomes due to the type of task being performed. While uniformity in the task across the groups allowed for more precise comparisons, it does potentially limit the generalizability of the study findings to other contexts differing in the types of tasks performed. Aside from the fact that an experimental task was used in this study (which potentially lacks the high complexity, low information clarity, and participant involvement found in natural settings and as discussed in the limitations section below could potentially limit the external validity and generalizability of the findings) rather than a ‘natural’ task, other types of experimental tasks could potentially generate findings different from those observed in this study. For example, the criticality of and even the impact of the team processes of information sharing, intra-team communication, and task conflict on team performance and member satisfaction was likely to be different in this context where an optimal outcome was difficult to attain without high member collaboration and integration of unique contributions. For tasks that are simple and or do not require as much or simultaneity of member interaction (e.g., psychomotor, planning) or when there is greater homogeneity in members’ knowledge, the amount of information sharing among members may have less impact on team performance outcomes (Dennis, 1996). Likewise, other types of tasks and task environments vary in the extent to which they demand cooperation verses competition (e.g., mixed-motive) both within and between teams which in turn can impact member identification, motivation, and satisfaction levels
(McGrath, 1984). In general, decision tasks often involve more expression and perception of emotions, coordination among members, persuasion of others, and a consensus on issues that are affected by the attitudes and values of group members than other types of tasks (Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002; Straus and McGrath, 1994). Consequentially intra-group communication, information sharing, and management of conflict are likely to have a greater impact on teams’ performance and members’ affective outcomes when performing decision tasks than other types of tasks (Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002).

The findings of this study may have also varied had additional or a different combination of variables been examined. For example, the amount of trust among members of a team is likely to impact member interactions and willingness to share information as well as have implications for members’ satisfaction with the team experience, subsequent decision outcomes, and perceptions of social presence (e.g., Polser et al., 2006). In the present study only the extent of task-related information sharing was assessed in relation to the team effectiveness outcomes. However, the extent to which other types of information were also shared (e.g., social) might have impacted how the team processes progressed (Sharifi & Pawar, 2002) which in turn can impact overall team performance, members’ satisfaction (Morris, Marshall, & Rainer, 2002), team viability, member retention, and shared group identity (Kramer & Brewer, 1986; Spears, Lea, & Lee, 1990). Group cohesiveness is also commonly examined in groups and teams research and can reflect both a members’ attraction to a group and its task (Kozlowski & Bell, 2003). The structural arrangement of members as well as the technology members were using during the team meeting could have impacted the overall
cohesiveness of the team (e.g., Chidambaram, 1996; Gonzalez et al., 2003; Warkentin et al, 1997). The extent to which members possessed a shared identity could also have impacted the team processes and outcomes examined in this study as well as have been influenced by the processes that occurred in the team (Kramer & Brewer, 1986; Spears, Lea, & Lee, 1990). Finally, the individual differences of team members could have impacted the processes and outcomes examined (e.g., Bell & Kozlowski, 2002).

Study Limitations

This section discusses several limitations of the research project and their implications for the findings and study conclusions. These limitations consist of issues regarding 1) generalizability, 2) common method variance, 3) the study design and logistics, 4) appropriateness of measurement scales, and 5) a small sample size.

Generalizability Issues

*Student Participants and Adhoc Teams.* The participants used in this study were limited to upper-level undergraduate students which potentially limits the generalizability of the results to other populations. Most of the participants had limited to no prior work experience and no existing relationship with other team members. Consequentially the decision approaches used by the novice students might differ from experienced managers that have considerably more experience to draw upon when determining what decision approach to employ. For example, some participants indicated feeling ill-experienced or under qualified to make a staffing decision in the research task domain (e.g., selecting a commercial airline pilot for hire). Consequentially they admitted to behaviors of deference to other team members and or limiting their participation in the group decision task that might not have prevailed had they felt more qualified to make the decision. The
effects of member withdrawal and or deference behaviors are especially problematic in a context where a hidden profile research task is used because each member’s contributions are equally as important and necessary for optimal team performance to be attained. However, decision making outcomes in an actual work team (rather than the use of adhoc teams and a hidden profile decision simulation) might be less impacted by a ‘weak link’ or inexperienced member because other members can better compensate for this member’s inadequacies. The impact of a member’s behaviors on team processes and effectiveness will likely be contingent on the type of work task that must be collectively performed as well as members’ expectations and perceptions surrounding an individual’s role and contributions. It is also likely in actual teams that members would be much less likely to feel unqualified to comment.

The use of student staffed adhoc teams might also limit the generalizability of results to mature work teams where members have an existing report with other members and are motivated to nurture the relationships with others in the team. It is important to note that had actual work teams been sampled, the level of experimental control necessary to test the study hypotheses would likely have been compromised. While generalizability may be an issue in this study, the controlled nature of the study allowed for a direct comparison of effects across experimental conditions that allowed for the determination of “if” the anticipated effects did in fact manifest. Outside of a laboratory setting, observed effects would likely have been confounded with other factors that could threaten the validity and explanatory prowess of the findings. Controlled experimental studies provide an appropriate environment for this type of research and help in the
detection of specific factors contributing to team effectiveness. These findings in turn can help inform practice.

*Experiment Decision Task.* The hidden profile decision task used in the experiment was also fictitious. While several steps were taken to ensure the realism of the candidate profiles provided as part of the research task (e.g., using an existing validated decision task which had undergone extensive pilot testing) and simulating a decision activity managers commonly perform as part of their job responsibilities (e.g., job candidate selection), because they were not real potentially detracts from overall study generalizability. This is in part due to the fact that behaviors of some teams’ members likely differed in this setting for a couple of reasons.

First, the decision outcome held no implications for participants personally or anyone else (e.g., job candidates, supervisor, other team members). Their reward was based solely on participation and not tied to performance or quality of the decision reached and therefore held no inherent motivational potential. For example, it was indicated by one participant that given “*the decision task did not really matter, the team did not spend the time on it that we might have if we really were choosing a pilot.*” Similarly another participant reported: “*the fact that is was simply an experiment made me more likely to give up on fighting for the person that I chose. Had I been in a real meeting and the outcome would have dire effects, I would have fought much harder for my candidate. I also would have taken the lead more to emphasize my points and drown out the other people.*” A third individual indicated that “*since it was a research project, I didn’t push my ideas as well as I would have if it had been real. I was ready to move on and therefore did not press for consideration of my candidate choice.*” From these
statements in might be inferred that real work teams, assigned real problems that have actual implications, and whose rewards are tied to performance, might approach a decision task differently from teams in which these conditions are not present.

Had a monetary incentive been offered and linked to team performance, participants as a whole may have been more invested in the research task and worked harder to ensure the collective decision reached reflected all members’ input. In offering a team-based reward tied to performance, team members might 1) feel a greater personal loss if the monetary reward must be forfeited due to an incorrect collective decision, as well as 2) experience heightened disappointment and or blame that their contribution (or failure to contribute) resulted in negative consequences for others on the team. However, even if a cash incentive had been offered, other factors inherent to the research task and experimental setting prevailed that reportedly influenced member behaviors. Namely, the research task was still fictitious, the teams were adhoc with no prior relationship and no expectation of continuance, and participant feelings of inexperience and in turn behaviors of deference to team members that are more assertive or perceived to be ‘more qualified’ to make decisions of this kind would not be alleviated.

A second concern surrounding the use of a hidden profile task was that some participants assumed differences in the candidate profiles received by each participant was a mistake rather than planned. For example, one individual reported that “Well I didn’t realize at first that we had different information regarding the candidate and didn’t speak up right away. I am glad someone else did because I thought my stuff was messed up. Once that was fixed, I think we were really able to communicate and come to a much better decision.” Consequentially the decision making process in these teams may
have been hindered at least initially because of the assumption that something was inherently wrong with the study. Although it did not happen often, when this was occurring in a team I intervened and indicated that the materials distributed to participants were correct and to please continue working towards a collective decision. Given a critical aspect of a hidden profile task is a team’s ability to discover, exchange, and integrate members’ unique information during the decision process, it seems inappropriate to inform participants upfront that members differ in the information they hold. Given research objectives that centered in part around understanding how information sharing in teams impacted team effectiveness outcomes, use of a hidden profile task was appropriate because it allowed for a more objective and direct measurement of both the extent of member information sharing and quality of team performance.

*Common Method Variance.* Common method variance (CMV) might have also been operative in this dissertation. Namely, the amount of spurious covariance shared among the mediating and outcome measures respectively was likely heightened because 1) subjective dependent variables were examined separately using regression analysis, and 2) measures of the predictor and criterion variables were obtained from the same source 3) at the same time using a single measurement device (e.g., Sackett & Larson, 1990). Consequentially raters’ implicit theories, consistency motifs, social desirability tendencies, dispositional and transient mood states, and any other tendencies on the part of the rater to acquiesce or respond in a lenient manner could have had an effect on their assigned ratings. Attitudinal measures, such as the ones examined in this study, on average tend to be more prone to these CMV biases than more directly or objectively
obtained measures such as performance outcomes (e.g., Cote & Buckley, 1987).

Common method biases have been shown to impact participants’ response behaviors as well as later recall when completing a survey (Smither, Collins, & Buda, 1989).

Consequentially, relationships measured between the process and criterion variables and among the criterion variables in the dissertation survey are likely comprised of the true relationships as well as some artifactual covariance based on ratees’ implicit theories regarding the relationship between these events. This is potentially problematic because the actual phenomenon under investigation becomes hard to differentiate from measurement artifacts introduced by the measurement tool (Hufnagel and Conca, 1994; Avolio & Bass, 1991). This in turn can threaten the validity of the conclusions drawn about the relationships between measures and yield potentially misleading conclusions.

Systematic measurement error is particularly problematic because it provides an alternative explanation for the observed relationships between measures of different constructs that is independent of the hypothesized relationships. While the use of regression analysis likely helped control for the occurrence of CMV among the process variable measures in this dissertation, the three subjective dependent variables were examined separately and as such any shared variance among them was not controlled.

To reduce the magnitude of CMV in this study, several procedural remedies were employed. The survey was comprised of scales varying in response formats (e.g., semantic differential, Likert scales, and open-ended questions) which have been shown to help diminish the respondent’s ability and motivation to use prior responses to answer subsequent questions. Existing highly validated scales were also used to reduce biases associated with respondent misinterpretation. Following Tourangeau, Rips, and
Rasinski’s (2000) recommendations, vague and ambiguous concepts were avoided, questions were kept simple, no double-barreled items were included, verbal labels for scale points were provided rather than bipolar numerical scale values, and different scale endpoints and formats for the predictor and criterion measures were used in the survey. This helped to better ensure proper comprehension as well as deter anchoring effects. Finally, ensuring respondent anonymity and reducing evaluation apprehension likely helped to counter biases known to distort participant responding (e.g., editing responses to be more socially desirable or reflective of how they think the researcher wants them to respond).

Although the aforementioned procedural remedies likely helped to reduce the potential effects of CMV on research findings, it is acknowledged that using separate raters and or temporally, psychologically, or methodologically separating the measurement of the predictor and criterion variables when same source responding is required is recommended (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In the present study, it might have been advantageous to use an outside rater to assess the extent of information sharing that occurred within each team. Utilizing a content analysis approach would have reduced the likelihood of common method variance; however, it also can be very labor intensive and time consuming to assess a variable using this technique and therefore its use was discouraged. The other process variables of intra-team conflict and communication would have been difficult for an alternative rater to meaningfully assess because they conceptually and operationally reflected members’ perceptions and thereby required that individual participants provided this feedback. Gaining insight into member perceptions about the team’s processes were felt to be better
predictors of affective outcomes than more direct assessments of intra-team communication and conflict. While separation of when the process and criterion variables were temporally collected could have helped to reduce problems arising from CMV (e.g., the salience of the predictor variable or its accessibility from memory are reduced), there are potential problems associated with delaying data collection. For example, separation of measurement increases the likelihood of introducing contaminating factors that could then mask a relationship that really exists. Respondent attrition is also likely to occur potentially resulting in an even smaller final sample size. Finally, separation of measurement generally takes more time and effort to implement and increases the likelihood of data entry error being introduced when participant data collected at different points in time must be linked. Given these potential costs, it was determined that collecting all data at one point in time was better.

Experiment Resources and Study Logistics

Due to the experimental nature and design of the study, a highly controlled environment was needed that provided individual work stations distributed from other team members and reliable computers with internet connectivity. Offices located throughout the Fisher campus were therefore reserved and laptop computers identical in make and model were borrowed from computing services. Given the research sites were typically located on different floors, often times in different buildings, and frequently changed on a daily basis, participants were asked to report to a central location prior to the start of the experiment. This ensured that enough participants were present to fill the team, the extra individuals were assigned to an alternative research project, consent was
collected and extra credit awarded in compliance with IRB requirements, the research
task was thoroughly explained and all questions answered before proceeding to the
experiment, and participants did not get lost trying to locate their respective research
sites. While there were several advantages to having participants meet at a central
location beforehand, the manipulation was potentially contaminated or weakened by the
fact that all participants met face to face prior to the start of the research task. While
interactions between participants were neither encouraged nor discouraged while waiting
for the study to start, contact theory (Pettigrew, 1998) would suggest that positive
contacts between members of different groups may have then helped to reduce the
negative effects of the categorization process and formation of geographically based
subgroups.

A second factor also may have impacted the quality of individual participation in
the group decision task. On a few occasions delays in member delivery were incurred
when offices were locked while the participant was in transit to it and keys had to then be
obtained from the building coordinator. Although delayed participants were encouraged
to take the time needed to review the decision case and come to an individual decision,
some participants admitted to joining the team conference call prematurely and possibly
ill-prepared so as not to delay the team deliberation further. Delayed participants
frequently were found not to have completely filled out the evaluation worksheet which
was to be used during the conference call. Their individual contributions in turn were
likely negatively impacted. It was also found that in teams where a member was delayed,
more social chat occurred between team members already on the line as they waited for
the fourth member to join. This informal social exchange in turn could have helped to build relationships between present members (which could have implications for team cooperation and cohesiveness) while simultaneously increasing the delayed member’s feelings of isolation or exclusion from the group.

It is hard to say whether a difference in findings would have been found had the teams been larger, the geographic distance between locations bigger, and the distinction between the research conditions greater. Given that the research conditions only differed in whether one of the team members was assigned to his/her own office (e.g., under the completely distributed condition) or shared an office with another team member (e.g., under the partially distributed condition) it is likely that the activation of location-based diversity faultlines did not occur. It is also likely that participant perceptions of geographic dispersion would have been stronger had the actual physical distance between team members been greater and spanned beyond the Fisher campus. Barring these factors, had diversity faultlines been activated (and the sample sufficiently large) it is likely that distinct differences in team processes and outcomes would have been found. In the original design of the study, it was planned that larger teams would be used and under the partially distributed condition multiple sites, rather than just one site, would be shared. Although appealing in conception, implementation just was not feasible due to unavoidable resource restrictions (e.g., computers, offices, participants, research team personnel) and labor intensity of conducting research of this kind. The use of four person teams, however, was not arbitrarily determined or driven solely out of convenience. There was evidence from prior research that four person teams would be sufficiently
large to activate diversity-based faultlines. However, an important distinction between these studies and the current study was the type of diversity that was manipulated. In all prior work differences in demographical attributes (e.g., gender) were the source for group diversity and not geographic diversity as was the case in this study.

Although the manipulation of geographic diversity in this study did not appear to be strong enough to generate statistically meaningful group differences, there is some qualitative evidence that suggested member structural arrangement was in fact perceived to influence the behaviors of and interactions between members in some teams. Collected as a final component of the survey, participants were invited to give open ended feedback about their experience in the team and factors that likely impacted their team’s effectiveness. Although not required to respond to the question, several participants did provide further insight into their perceptions of the experience. Based on this feedback there is considerable reason to believe that the structural arrangement of members can impact perceptions of and possibly actual effectiveness in some teams. This was evidenced by a number of participants reporting dissatisfaction with the structural arrangement of team members when offices were not uniformly assigned (e.g., partially distributed condition). Admitted behaviors of deference to the ‘majority group’ were also revealed. For example, one participant made the following comment: “We had a group of 2 people and it seemed like we had the upper hand in the discussions. What we said was kind of what the group decided on.” Another individual reported “The other team member sharing an office with me agreed with me going into the group talks so it was much easier to sway other team members to pick our candidate.” It is suggested from these
comments that member structural arrangement created divisions in these teams that were perceived to have then driven member behaviors.

Measures

Existing validated measures were adopted for use this dissertation. All scales were found to be reliable but some concerns remain regarding the appropriateness and or clarity of the decision outcome satisfaction measure used in this study. Based on qualitative feedback provided by study participants, several individuals reported dissatisfaction with the team experience and the collective outcomes reached but the measure failed to detect these participant concerns. Consequentially, caution should be exercised when considering adoption of this scale for future work.

The strength of subgroup identification also should be measured in future research of this kind. In the present study it was not assessed and therefore there is no way to determine whether subgroup identification occurred within and across the teams. There was some qualitative participant feedback indicating that subgroup identification was prevalent at least in some teams but its prevalence across all teams and strength within teams could not be determined from the existing data.

Small Sample Size

An inherent challenge to conducting team-level research is the struggle to attain a sample sizable enough to conduct statistical analyses necessary to test the research hypotheses. For the present study, an experimental design control was imposed requiring that all teams be comprised of the same number of members. To ensure enough participants would be present to fill the team, 6 to 7 participants were recruited for each trial. Using this approach, luckily only one trial could not be run because of an
insufficient number of people to fill the team. In the end a total of 417 individuals signed up to participate and 62 teams were filled. Unfortunately due to unavoidable problems with the mediating technology, two teams were removed from the sample. For one of the teams the web-based conferencing service exhibited substantial technical difficulty during the team meeting and the session had to be prematurely terminated. Because the team did not have the opportunity to sufficiently share information, did not reach a final collective decision before the technology quit working, and the experience as a whole differed from other teams in the sample (due to the difference in mediating technology quality), members of this team were not asked to complete the final survey. Out of 62 trials, only one had to be aborted due to technological difficulty of this kind. Given web-based conferencing solutions are still relatively new, problems with feedback, consistency in the visual channel, and maintaining connectivity continue to be drawbacks of using this type of conferencing solution. The second technology-related problem experienced by a team was not the result of insufficient quality in the mediating technology but rather differences in member conferencing capabilities that were activated during the team conference. Namely, one participant enabled the video capabilities resulting in a condition where other members could visibly see him even when they were not supposed to. This was problematic because it created a condition of intra-team heterogeneity in technology richness that was not comparable to other teams examined in the study. Unfortunately it was not discovered until after completion of the trial that this had occurred at which point it was too late to change the conditions to be uniform across team members. It was therefore determined this team’s data should be removed from the dataset.
The final sample for this study consisted of 60 4 member teams. Four experimental conditions were represented in the sample, with roughly the same number of teams per experimental condition. The small number of groups per experimental condition may also have reduced the likelihood of finding statistically significant results or detection of mediating or moderating relationships. With a sample this size, to detect group differences would probably require manipulations that created more distinct conditions between the groups. Consequentially, it is likely that in a small sample, as was the case here, a manipulation generating a small effect would go undetected. As discussed in chapter 4, a small effect would have gone undetected without a sample size of at least 395 teams. To test the moderation and mediation hypotheses would require sample sizes that were considerably larger than even 395 teams. To detect a moderate effect required sample sizes comprised of 77-85 teams. Had a large effect existed, the sample should have been sufficiently large to detect this.

Future Research Directions

Several areas for future research emerged while conducting this study. A discussion of these will be provided in this section. The recommendations for future research center around three dominant streams including factors related to 1) the composition and structural configuration of teams, 2) heterogeneous technology usage in teams, and 3) an alternative measure of member proximity. In general it is also felt the research model should be tested using other types of teams and settings and work tasks expanding beyond hidden profile decision tasks administered in a controlled laboratory environment. Examination of a technological environment where mixed media and
sophisticated collaborative technologies are used (varying in richness and synchronicity) is also warranted

Team Characteristics

Team Size. From the results of this dissertation it was demonstrated that at least in smaller teams where members do not have an existing relationship, the structural arrangement adopted had less of an impact on team performance and member interactions than other factors such as the richness of the communication device used. However, future research is necessary to determine whether this still holds true even in larger teams where location-based diversity will likely be greater and the coordination of more members needed. With the combined improvements in communication technologies, greater accessibility and affordability, and the touted ability of mediating technologies to accommodate more people, the use of larger virtual work teams is on the rise. Some even argue a distinct advantage of technology mediation is the ability to effectively manage more team members than possible with tradition face to face teams. With more members in the team, location-based diversity is likely to be more salient and the activation of faultlines more prevalent when there is greater heterogeneity of member dispersion across multiple worksites. Work teams now commonly expand well beyond four people and therefore future research examining the impact of member dispersion on processes and outcomes in larger teams would be advantageous.

Member History. The use of adhoc teams where members have no existing relationship, no expectation for continuance of a relationship, and where rewards are not tied to team outcomes, potentially limits the generalizability of this research to actual work teams. In a laboratory setting, where participants are exposed to highly controlled
conditions, the influence of many rich and complex factors inherent to real group 
interactions might be eliminated and behavioral responses altered. It would therefore be 
informative to test the hypothesized relationships in a context where members have a 
mature relationship and expectation of continuance on the team. The activation of 
location-based faultlines and the strength of subgroup identities might be stronger in 
mature teams where long-term interactions and the prospect of working together again 
likely amplify members’ identification, communication and structural assurance (Alge et 
al., 2003; O’Leary & Cummings, 2002; Wilson, Straus, & McEvily, 2006). Longitudinal 
research would also shed light on whether effects of physical distance over time decrease 
as some recent theorist propose (Wilson et al., 2008).

Member Geographical Configuration. Not all subgroup formations are likely to 
elicit equivalent faultline dynamics. This study did not find partial distribution of four 
group members across three geographic locations to activate strong geographic based 
faultlines. Future research, however, is needed to determine if other structural 
configurations of even four members might generate different results. For example, the 
salience of a faultline might be strengthened if the structural arrangement of the team was 
such that two subgroups each comprised of two members were formed. Teams 
subdivided into fewer equally sized subgroups are likely to experience more harmful 
effects of faultlines (e.g., Lau & Murnighan, 1998; Polzer et al., 2006) than other 
configurations. A different dynamic might arise if three members shared a single location 
while a fourth member was geographically isolated from the others. Additionally it would 
be advantageous for future research to examine larger teams, configurations that 
geographically span multiple locations and subgroups that differed in size.

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Intrateam Communications Technology Heterogeneity

A viable extension of this dissertation would be to explore the impact of intrateam communications technology heterogeneity on team processes and effectiveness outcomes. It is not uncommon for the communications capabilities across locations to vary and the richness in turn that members experience to differ. For example, team members are often away from the office when joining a virtually hosted meeting and in turn might not have access to richer communications technologies such as computer mediated video conferencing. While the member still joins the meeting utilizing voice-only capabilities, the richness of the technology used differs from other members which could have implications for team dynamics. No known research to date has examined this phenomenon.

Measurement of Perceived Proximity

An interesting correlate of the present dissertation would be to examine the construct of perceived proximity which reflects one’s perception of how close or far another person is (Wilson et al., 2008). Conventional wisdom and a substantial amount of research suggest that individuals often feel closest to others who are most physically proximal to them (Allen, 1977; Kiesler & Cummings, 2002). Extended to work teams, the key assumption here is that interpersonal affinities and relationships will be weaker when people work in separate locations. However, recent research demonstrates that members of work teams with low levels of physical proximity do not necessarily feel distant from each other and effects of objective physical distance might actually decrease over time (Wilson et al., 2008). Therefore, treating proximity and distance in purely physical or objective terms as it was in this dissertation, perhaps provides an incomplete
representation of how ‘distance’ impacts interpersonal processes and performance. In fact, Coshall and Potter (1987) found that physical proximity explained slightly less than half of an individual’s feelings of ‘subjective distance.’ While additional research is needed to fully understand the relationships between the two constructs, future research should examine perceptions of proximity in addition to physical distance. Namely, it would be beneficial to know whether and under what conditions perceived distance between team members serves as a predictor of team effectiveness outcomes. Also, research examining factors that influence perceptions of perceived proximity (e.g., frequency of communication, content of exchanges) particularly over time could be informative. Finally, it could be valuable to understand how differences in intra-team proximity perceptions impact team processes and subsequent outcomes as well as if a minimum amount of perceived proximity is necessary for a team to function effectively.

In better understanding factors that affect perceived proximity, organizations can implement practices that can bridge the emotional divide between distributed workers. Amin and Cohendet (2004) emphasize the importance of examining perceived proximity arguing that organizations can now mitigate physical proximity through the adoption of strong work cultures, norms for interaction, structural assurance, and technology to support interactions (Kirkman, Rosen, Gibson, Tesluk, & McPherson, 2002).

**Practical Implications**

The implications of this dissertation must be considered in light of the methodological strengths and weaknesses of this study. The consideration of one group size (4 members), a small number of geographical configurations (fully distributed vs. partially distributed), one type of task (hidden profile complex decision task), and...
temporary, adhoc teams all likely influenced to some extent the relationships that were observed.

The clearest practical implication of this study is the recommendation to employ tactics to facilitate information sharing and communication among virtual team members and reduce conflict. Although not formally hypothesized in this study, it was found that teams using richer technology experienced more information sharing than teams using a leaner communication modality. The exchange of more information in turn was found to contribute to higher team performance. This was further substantiated by one member’s feedback that “it was only after that the audio session ended, that I realized we were given different inputs about each candidate. I wished we could have discussed more about each candidate since we were each provided a different perspective. With such collective information, we could have reached a conclusion with much more satisfaction. Video exchange would have definitely facilitated a much more qualitative and efficient coordination.” Thus it is suggested that for complex decision tasks requiring member collaboration and cooperation, using richer communication technology devices is better than leaner forms of technology in a virtual context.

Although teams, despite the communication modality used, were not found to significantly differ in members’ satisfaction with the team experience, several members on teams experiencing video capabilities anonymously reported that having the video channel enriched the team experience. Whereas, members of teams experiencing the audio-only condition, complained that completion of the decision task was difficult and the experience as a whole less enjoyable because they felt disconnected from other members. Knowing when to speak, who was speaking, and talking while others were
talking seemed to be common concerns among members of teams using a leaner communication device. For example, one participant felt like “it was harder to have a four-way conversation when you couldn't see each other, because there is that awkwardness of not knowing when to talk and when to listen.” Another participant reported, “The only thing that is difficult in situations like this is not seeing the person to read their body language to figure out who is going to talk, therefore we were accidentally interrupting each other when each was trying to share our opinions.” One individual even reported informally taking on the role as discussion moderator which proved to be challenging because “…it was difficult to know when someone else wanted to speak.”

A second implication of this research is the identification of two factors that impact team members’ social presence perceptions. As the use of flexible work arrangements proliferates, more employees are now working from home and interacting through technology. As a result the actual physical distance between two people is perhaps becoming less relevant but rather perceptions of social presence of each other or the organization are becoming more important (Wilson et al., 2008). Therefore knowledge of factors that can contribute to higher social presence perceptions of team members is useful to managers charged with the responsibility of staffing, structuring, and implementing tactical approaches that will lead to higher team effectiveness. The empirical findings from this research encourage the adoption of practices that facilitate member communication and ward off debilitating conflict which will better ensure stronger member perceptions of social presence. Social presence perceptions were also found to be highly correlated with members’ reported satisfaction with team processes
and decision outcomes in this study. Although causality cannot be assumed from the findings, it is interesting to note that a positive significant relationship was found between the variables.

A third implication of the study is the importance of facilitating relationship development and team building when members do not have an existing relationship. This is especially critical in virtual teams where members seldom if ever have the opportunity to meet informally or share personal information that can help with relationship building. As evidenced by a participant’s comment in this study the “feeling of distance and not knowing the other people made it very impersonal. All we discussed was the assignment at hand…there was no small talk even when waiting for team members to finish task 1.”

Virtual teams are especially prone to focusing only on the task and failing to devote attention to building a social report between members that can help to contribute to overall team effectiveness.

It can be helpful for relationship building between teammates to commence prior to undertaking a major project to ensure greater team effectiveness on assigned work tasks. When team members are meeting for the first time, it is recommended the kickoff meeting occur face-to-face (Kirkman & Mathieu, 2005). Simply being present in the same room with another team member was reported by multiple participants to increase their confidence to contribute to the team discussion and their enjoyment of the team experience. For example, one participant shared that “being in the same room as someone else made me more comfortable and interactive” in the team meeting. Another participant reported that “sharing a room was by far more fun than having the room to myself.”

Alternatively some members not given the opportunity to physically interact with other
team members were much less satisfied with their personal contributions. In fact, some members reported altering their behaviors because of unfamiliarity with their other team members. One participant noted that “because I didn't know the other people very well, I was a little more reserved about giving my opinions than I normally would be.” Another individual stated that “since I did not have a connection with the other team members, I was reluctant to really give a strong opinion on any candidate.” A third participant admitted that “not knowing the other individuals I was participating with, I decided to wait to see who would take the lead. Usually when I am in a more comfortable situation I do not mind taking the lead, but not knowing my surroundings and feeling distant from the people I was talking with made me feel a little uncomfortable.” A fourth participant mentioned “I felt disconnected to people which made me less enthusiastic.” Finally, another participant attributed “the fact we did not know each other well made the decision less involved.”

A fourth observation in the study demonstrated how an evaluation tool intended to help participants with the decision making process can actually hinder and or bias subsequent member discussion contributing to diluted team effectiveness. For example, in the present study an evaluation tool was provided requiring participants to rate the importance of each specific candidate attribute. A copy of the tool given to participants is provided in Appendix C. As part of the pre-dissent research task, participants were directed to fill in each of the traits they had pertaining to a specific candidate and then rate the beneficiality of that trait for a commercial airline pilot. Once ratings had been assigned to each of the candidates, participants were asked to indicate the candidate they would recommend for hiring based on their evaluations. Although not required or even
recommended, many participants in turn made their final decisions by tallying the total number of points they had assigned to a particular candidate and picking the candidate which had received the ‘highest’ total point value. Using this type of comparative approach is not necessarily faulty when an individual is making the decision. What was found to be problematic was how assignment of a rating then heavily influenced how and even what information was then subsequently shared within many teams. Teams where quantitative ratings were assigned tended to anchor on these initial ratings each team member assigned rather than discuss actual attributes about candidates. It was only when ratings were extremely different did team members sometimes dissect their evaluations item by item and uncover differences in member information sets.

A final observation from this study is the need to train people how to share knowledge in an environment that hinders optimal sharing, receival, and processing of information. This is especially critical when situational constraints reduce the amount of information that can be attained through observation. When verbal exchange is the only mechanism through which information can be received, teams should consider the implementation of practices that encourage turn taking and appoint a member of the team to act as a moderator of the discussion. Training members how to effectively exchange information in a context where communication is hindered because of the physical distance between members is important. Many teams in the current study never uncovered that fact that members held different information about the job candidates. This was not necessarily because they failed to exchange information or did not care about reaching an optimal solution but rather the use of shortcuts such as identifying an attribute only by its order on the list rather than specifically communicating which
attribute was being discussed. This led to misunderstandings on the part of receivers that in turn negatively impacted subsequent decisions.

Conclusion

The growth in virtual team use over the past ten years has brought with it a host of new team management challenges that has implications for both research and practice. This dissertation began to lay the groundwork for understanding what team processes impact members’ perceptions of social presence and affective outcomes of satisfaction in the virtual context. As expected, team processes of conflict, communication, and information sharing were found to differentially impact the team effectiveness outcomes proposed in the research model. The criticality of information sharing to team performance and the impact both communication and intra-team conflict can have on members’ satisfaction and social presence perceptions were evidenced by this research. While the mediating and moderating relationships proposed in the research model were not supported, it is premature to dismiss the conceptual relationships delineated. Other experimental manipulation and sampling limitations need be addressed before definitive relationships between these variables can be determined. This dissertation also depicted many challenges inherent to conducting research on virtual teams and uncovered additional issues in need of empirical investigation. Hopefully future work will benefit from and build off of the initial steps taken in this study and carry along the tradition of building theory, providing answers, and disseminating knowledge to practitioners and scholars alike.


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


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Jehn, K.A. (1995). A multimethod examination of the benefits and detriments of


Postmes, T., Spears, R., & Lea, M. (2002). Intergroup differentiation in computer-mediated communication: Effects of depersonalization. Special Issue: Groups and Internet, 6, 3-16.


Appendix A: Recruitment Statement
Protocol title: An examination of use of synchronous computer-mediated communication in work teams
Protocol number: #2008B0340
Principal Investigator: Howard J. Klein and Aden E. Heuser

Purpose of Project:
This research project looks at computer-mediated communication in work teams. The purpose of the study is to gain a better understanding of how team design impacts internal team processes and performance. Your participation will help inform organizations on how to structure teams to facilitate higher performance and member satisfaction outcomes. To be eligible to participate, you must be at least 18 years of age.

What is asked of you:
If you are willing to participate, you will be asked to attend a session where you will be assigned to a team and responsible for collectively completing an assigned research task. The research task will take no longer than 1 hour to complete. Immediately following completion of the team task you will be asked to complete an online survey. The survey takes about 10 minutes to complete. This survey asks participants about their experiences on the team and satisfaction with the outcomes your team achieved.

Your participation in this project is voluntary. You may choose not to participate without penalty and if you agree to participate, you may withdraw at any time without penalty. In completing the survey you are free to skip any questions you do not wish to answer. The survey and your answers are housed on a secure server and the information we gather will only be accessible to the research team.

To sign up for the extra credit project:
Go to the following web address:

To sign up for the research project:
- Open a web browser with the address: [http://osufisher-mhr.sona-systems.com](http://osufisher-mhr.sona-systems.com)
- In the lower left hand corner under ‘New Participant,’ select ‘Request an account here’
- To create your participant account: enter your 1) first name, 2) last name, 3) lastname.# that has been assigned to you by OSU
- An email confirmation containing your user password will be sent to your OSU email account
- Return to [http://osufisher-mhr.sona-systems.com](http://osufisher-mhr.sona-systems.com) and sign in and enter your UserID (e.g., lastname.#) and password (that was sent in the confirmation email)
• Select ‘Study Sign-Up’
• Select ‘Teams Research’
• Select ‘View Time Slots for This Study’
• Finally select ‘Sign-Up’ for the time-slot that you want to attend

In return for your participation:

We appreciate your participation in this study. In return for your time, you will be awarded **4 extra credit points**. These points will be awarded after you have participated in the study. Should you have questions at any time, please feel free to contact Aden Heuser at heuser_24@fisher.osu.edu. If you do not wish to participate you may complete an alternative, non-research related assignment worth up to 4 extra credit points. For information about the non-research related opportunity contact Aden.
Appendix B: Research Task Materials
Appendix B: Experiment Task Materials (Schulz-Hardt et al. (2006))

Study Directions

Dear Participant,

Please read the directions below in their entirety before beginning the first task. This project requires the completion of three different tasks.

Background Information:

For this project, you are a member of a committee responsible for selecting a pilot to fly internationally for an airline company you work for. Over the next year, your company intends to start offering international flights and requires pilots with extensive professional flight experience to fill the schedule. Your company has recently posted a recruitment announcement about the new international pilot position on the company intranet. You are currently only considering existing pilots of the company for promotion into this position. To maximize the number of potential applicants, employees from four regional subsidiaries of your company are being recruited for the position. As a rule, important decisions like this one, hiring for a high responsibility position, are made by expert groups. For you, we have adopted and simplified a real decision case.

As part of Task 1, you will be asked to review the candidate information for four pilots who have responded to the job advertisement. All four pilots currently work for your airline and have the same amount of flying hours and several years of domestic flight experience. Imagine that the information on the four pilots comes mainly from application documents and from personal conversations you had with the pilots as well as with their supervisors and colleagues.

TASK 1: Initial Task Assignment: (To be completed before the team conference session)

As part of Task 2 of this research session you will take part in a group discussion with the other participants assigned to your team. As a team you must agree on who of the four pilots is the most suitable candidate for the international pilot position. To prepare optimally for the group discussion, read the document titled “Candidate Profiles” about the four pilots that has been provided in the manila folder titled “Candidate Information.” After reading the profiles, select the candidate that you feel is best suited for the position. Be prepared to defend why you have recommended the candidate that you have for hire. You will have 10 minutes to review this information and prepare for the discussion. To help facilitate the decision making process, please complete the “candidate summary sheet exercise” that can also be found in the “Candidate Information” folder. After completing the candidate summary exercise, please indicate which candidate you
would recommend hiring for this position. Once you have made your candidate selection, please situate yourself in front of the computer in preparation for Task 2 involving a group discussion.

**TASK 2: Instructions for Group Discussion:**

After completing Task 1 to familiarize you with the candidates, you will participate in a web-conference with the other members of your group. **For Task 2, as a team you must determine the best applicant to hire for the international pilot position based on the information team members report.** Note that on the basis of the total information available to you as a group, one of the four applicants is unambiguously the best according to expert opinion. It is therefore your job as a group to determine who that applicant is based on the information that is shared during your group conference. This may or may not be the same person that you selected in Task 1. You are encouraged to take notes during your group’s conference.

For your convenience, the web conferencing technology for your team session has already been activated prior to your arrival. When you are ready to start the group discussion, please relocate such that you sit in front of the computer that has been prepared for the conference. Three other group members will be joining the conference with you. The sound on your computer is currently muted; when you are ready to begin the session press the “mute” button located at the top of your computer and put on the provided headphones.

When you begin the session, tell the other group members your name, make sure your other three committee members are present, and then proceed with the committee’s assignment. Remember, depending on when you join the conference (e.g., if you are the first caller), you might have to wait for other group members to join the session before you can officially begin. During the team decision case activity, you may take as much time as needed to arrive at an agreement on who of the four pilots you would select for the position. **In making your final group decision, please select only one candidate.**

**TASK 3: Survey: (to be completed after the team conference)**

Once the group discussion has been completed the team portion of this session will be finished, but you will still have a final task to complete. Specifically, **for Task 3 you will need to fill out a short online questionnaire related to your experiences on this team.** This survey will take less than 10 minutes to complete. To access this questionnaire, please close out of the conference call and then click on the icon labeled “survey.” This icon can then be found on the computer desktop. Once you have completed the survey you are free to leave. Please leave all materials related to the study at your research site.

**Thanks again for your participation and help!!**
Candidate Profiles

Directions: In preparation for your team conference, please review the following attributes about each candidate and then complete the candidate summary sheet exercise.

Candidate A:
1. has a very good feeling for dangerous situations
2. is at times not good at taking criticism
3. can assess complex situations well
4. has excellent depth perception
5. is sometimes unorganized
6. has very good leadership qualities

Candidate B:
1. maintains composure even in crisis situations
2. is regarded as grumpy
3. is highly reliable
4. is able to assess weather conditions very well
5. is regarded as not very cooperative
6. has very good computer skills

Candidate C:
1. is resistant to stress
2. is not verbally skillful
3. is able to make the right decisions very quickly
4. is regarded as egocentric
5. fosters a good atmosphere within the crew
6. has a poor diet

Candidate D:
1. is able to react to unforeseen events adequately
2. is considered arrogant
3. is able to concentrate very well over long periods of time
4. commands a high problem solving ability
5. is not very suitable for leading a team
6. has a very good sense of responsibility
Candidate Profiles

Directions: In preparation for your team conference, please review the following attributes about each candidate and then complete the candidate summary sheet exercise.

Candidate A:
1. has a very good feeling for dangerous situations
2. is regarded as a show-off
3. can assess complex situations well
4. has excellent depth perception
5. is regarded as not being open to innovations
6. has very good leadership qualities

Candidate B:
1. maintains composure even in crisis situations
2. has below average memorization skills
3. is highly reliable
4. is able to assess weather conditions very well
5. makes nasty remarks about his colleagues
6. has very good computer skills

Candidate C:
1. is able to make the right decisions very quickly
2. is very conscientious
3. is not verbally skillful
4. has a poor diet
5. is very skilful in dealing with complicated technology
6. puts the security of persons he is responsible for above everything

Candidate D:
1. is able to react to unforeseen events adequately
2. is regarded as a ‘know-it-all’
3. is able to concentrate very well over long periods of time
4. commands a high problem solving ability
5. is hot-headed
6. has a very good sense of responsibility
Candidate Profiles

Directions: In preparation for your team conference, please review the following attributes about each candidate and then complete the candidate summary sheet exercise.

Candidate A:
1. has a very good feeling for dangerous situations
2. is unfriendly
3. can assess complex situations well
4. has excellent depth perception
5. has very good leadership qualities
6. takes part in further education only reluctantly

Candidate B:
1. maintains composure even in crisis situations
2. is regarded as arrogant
3. is highly reliable
4. is able to assess weather conditions very well
5. adopts the wrong tone sometimes
6. has very good computer skills

Candidate C:
1. puts the security of persons he is responsible for above everything
2. is able to make the right decisions very quickly
3. is regarded as egocentric
4. shows very good performance with regard to attention
5. has a poor diet
6. fosters a good atmosphere within the crew

Candidate D:
1. is able to react to unforeseen events adequately
2. is considered moody
3. is able to concentrate very well over long periods of time
4. commands a high problem solving ability
5. is regarded as a loner
6. has a very good sense of responsibility
Candidate Profiles

Directions: In preparation for your team conference, please review the following attributes about each candidate and then complete the candidate summary sheet exercise.

Candidate A:
1. has a very good feeling for dangerous situations
2. is unfriendly
3. can assess complex situations well
4. has excellent depth perception
5. has very good leadership qualities
6. takes part in further education only reluctantly

Candidate B:
1. maintains composure even in crisis situations
2. is regarded as arrogant
3. is highly reliable
4. is able to assess weather conditions very well
5. adopts the wrong tone sometimes
6. has very good computer skills

Candidate C:
1. puts the security of persons he is responsible for above everything
2. is able to make the right decisions very quickly
3. is regarded as egocentric
4. shows very good performance with regard to attention
5. has a poor diet
6. fosters a good atmosphere within the crew

Candidate D:
1. is able to react to unforeseen events adequately
2. is considered moody
3. is able to concentrate very well over long periods of time
4. commands a high problem solving ability
5. is regarded as a loner
6. has a very good sense of responsibility
**Research Task: Complete Information Regarding Applicants**

**Applicant A**

has a very good feeling for dangerous situations  
can assess complex situations well  
has excellent depth perception  
has very good leadership qualities  
is at times not good at taking criticism  
is sometimes unorganized  
is regarded as a show-off  
is regarded as not being open to innovation  
is unfriendly  
takes part in further education only reluctantly

**Applicant B**

maintains composure even in crisis situations  
is highly reliable  
is able to assess weather conditions very well  
has very good computer skills  
is regarded as grumpy  
is regarded as not very cooperative  
has below average memorization skills  
makes nasty remarks about his colleagues  
is regarded as arrogant  
adopts the wrong tone sometimes

**Applicant C**

is not verbally skillful  
is regarded as egocentric  
is able to make the right decisions very quickly  
is resistant to stress  
fosters a good atmosphere within the crew  
is very conscientious  
is very skilful in dealing with complicated technology  
puts the security of persons he is responsible for above everything  
has a high attention to detail  
has a poor diet
Applicant D

is able to react to unforeseen events adequately
is able to concentrate very well over long periods of time
commands a high problem solving ability
has a very good sense of responsibility
is considered arrogant
is not very suitable for leading a team
is regarded as a ‘know-it-all’
is hot-headed
is considered moody
is regarded as a loner
Appendix C: Pre-Dissent Materials
**Candidate Evaluation Tool**

**Directions:** In the space provided, please copy the candidate attributes identified in the candidate profile sheet and then rate each attribute with regard to how positive or negative it is for the suitability of this candidate for the position. 1 = not at all beneficial and 5 = extremely beneficial. Please indicate your answer choice by circling the number that best reflects what you think.

<table>
<thead>
<tr>
<th>Candidate A Attributes</th>
<th>Not at all Beneficial</th>
<th>Slightly Beneficial</th>
<th>Moderately Beneficial</th>
<th>Very Beneficial</th>
<th>Extremely Beneficial</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<td>4.</td>
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## Pre-dissent Candidate Selection

**Directions:** Please indicate which candidate you would hire for this position by placing an X next to the name listed below. Please only select one candidate.

Candidate A  
Candidate B  
Candidate C  
Candidate D  

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Appendix D: Post-Dissent Questionnaire
Information Sharing: Participant Recall of Candidate Attributes

Directions: Thinking back to your team’s meeting, which of the following attributes about a candidate were mentioned by at least one team member during the group session? Please place an A next to all attributes that were mentioned for candidate A. Please place a B next to all attributes that were mentioned for candidate B. Please place a C next to all attributes that were mentioned for candidate C. Please place a D next to all attributes that were mentioned for candidate D.

___ has a very good feeling for dangerous situations
___ can assess complex situations well
___ has excellent depth perception
___ has very good leadership qualities
___ is at times not good at taking criticism
___ is sometimes unorganized
___ is regarded as a show-off
___ is regarded as not being open to innovation
___ is unfriendly
___ has a poor diet
___ maintains composure even in crisis situations
___ is highly reliable
___ is able to assess weather conditions very well
___ has very good computer skills
___ is regarded as grumpy
___ is regarded as not very cooperative
___ has below average memorization skills
___ makes nasty remarks about his colleagues
___ is regarded as arrogant
___ adopts the wrong tone sometimes
___ is not verbally skilful
___ is regarded as egocentric
___ takes part in further education only reluctantly
___ is able to make the right decisions very quickly
___ is resistant to stress
___ fosters a good atmosphere within the crew
___ is very conscientious
___ is very skilful in dealing with complicated technology
___ puts the security of person he is responsible for above everything
___ shows very good performance with regard to attention
___ is able to react to unforeseen events adequately
___ is able to concentrate very well over long periods of time
___ commands a high problem solving ability
___ has a very good sense of responsibility
___ is considered arrogant
Communication Measure

**Directions:** Please indicate your agreement with each of these items. When answering, please think about your team’s communication process and using the provided response scale indicate your experience with each item. (Note: items will be rated on a 7-point Likert scale)

1. There was open communication in this group.
2. Everyone had a chance to express their opinion.
3. During the exercise, group members maintained a high level of idea exchange.

Process Satisfaction Measure

**Directions:** This scale is designed to assess feelings and attitudes toward various meeting processes. Please consider the following characteristics of the approach your team used during the meeting and circle the point along the scale that you consider to be the most appropriate. Work rapidly. Do not return to previously completed responses.

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Decision Outcome Satisfaction

**Directions:** This scale is designed to assess your satisfaction with your team’s final decision outcome. When answering, please think about your team’s performance and using the provided response scale indicate your satisfaction with each item. (Note: items will be rated on a 7-point Likert scale with anchors “completely dissatisfied” to “completely satisfied.”)
1. How satisfied are you with the quality of your group’s decision?
2. To what extent does the final decision reflect your inputs?
3. To what extent do you feel committed to the group decision?
4. To what extent are you confident that the group decision is correct?
5. To what extent do you feel personally responsible for the correctness of the group decision?

Perceived Social Presence Scales:

Directions: Please consider the following characteristics of the entire meeting environment and indicated the best answer choice given your experience working in this team. Work rapidly and do not return to previously completed responses. Note, the following statements will be assessed using a 7-point Likert scale with anchors ‘very strongly disagree’ to ‘very strongly agree.

1. There was a sense of human contact during our team meeting.
2. There was not a sense of personableness during our team meeting.**
3. There was a sense of sociability during our team meeting.
4. There was a sense of human warmth during our team meeting.
5. There was a sense of human sensitivity during our team meeting.
6. There was a sense of distance during our team meeting.**
7. There was a sense of expressiveness during our team meeting.

**Indicates reverse coded items.

Team Decision Outcome:

Directions: Please indicate which candidate your team has selected to hire for this position by placing an X next to the name listed below. Please only select one candidate.

Candidate A  ___
Candidate B  ___
Candidate C  ___
Candidate D  ___