The Pennsylvania State University

The Graduate School

Department of Communication Arts and Sciences

EXTENDING THE FUNCTIONAL THEORY OF COMMUNICATION AND DECISION-

MAKING IN GROUPS TO THE VIRTUAL WORLD:

A STUDY OF THE

RELATIONSHIP OF MODALITY AND CULTURAL BACKGROUND TO

SATISFACTION, CREATIVITY, AND DECISION QUALITY IN VIRTUAL TEAM

INTERACTION

A Dissertation in

Communication Arts and Sciences

by

Deanna M. Behring

Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Doctor of Philosophy

December 2015

The dissertation of Deanna M. Behring was reviewed and approved* by the following:

Dennis S. Gouran
Professor of Labor and Employment Relations and
    Communication Arts and Sciences
Dissertation Adviser
Chair of Committee

Jon F. Nussbaum
Professor of Communication Arts and Sciences & Human
    Development and Family Studies

Gerald M. Santoro
Assistant Professor of Communication Arts and Sciences

Eileen Trauth
Professor of Information Sciences and Technology

John Gastil
Head and Professor
    Communication Arts and Sciences and Political Science

*Signatures are on file in the Graduate School

ABSTRACT

In today's globally interconnected world, work is accomplished across time and space, bringing together different expertise, cultures, values, and ideas. Just how the communication process in these new, intercultural virtual teams unfolds is currently an investigation that requires consideration of group communication, virtual, and cross-cultural disciplines. This research attempted to integrate these disciplines in such a way as to provide a better understanding of how communication processes in these sorts of teams is affected by culture and technology.

This study investigated how the Functional Theory of group communication operated in the intercultural, virtual world. It assessed how various technologies (text and audio) interacted with cultural issues to affect the process and behavior during the communication process, as well as key outcomes of creativity, quality of decision, and satisfaction of the participants. Chinese and U.S. dyads participated in a decision-making exercise using text or audio and answered a questionnaire about the process to determine satisfaction. In addition, the dialogue was coded and analyzed to determine whether and, if so, how the dyads followed the steps required by Functional Theory. Finally, the communication was analyzed by a panel of experts to judge creativity and quality of decision. These results were then cross checked with satisfaction data to help reveal which technology in intercultural dyads yields the best outcomes (creativity, quality of decision and satisfaction) and how the Functional Theory applies.

The results indicated that in the intercultural context, teams following the five steps required by the Functional Theory had the highest levels of creativity and quality of decisions, although the satisfaction levels were higher in dyads in the audio condition in which the sequence addressed by Functional Theory was applied. The dyads that did not follow the sequence suggested by Functional Theory had the lowest levels of creativity and quality, whether in the text or audio condition. The Chinese reported higher levels of satisfaction overall than did their U.S.

counterparts, although the U.S. participants dominated discussion in all cases. In terms of the five functions encompassed by the theory, the audio dyads spent relatively more time on Functions 2 and 4 to develop mutual understanding and criteria for decision making than did the text dyads, which were more likely to focus on Functions 3 (developing alternatives) and 5 (making a decision). Gender analysis yielded interesting results. In the audio condition, U.S. females dominated the discussion related to Function 2, whereas U.S. males did so in the case of utterances related to Function 5. In same-sex gender pairings, greater emphasis was placed on Function 2, and in mixed gender pairings on Function 5. In the text condition, no discernible pattern was detected.

These findings have implications for how the communication process for intercultural, virtual teams might be managed. During which stage of the team building process, for example, does text technology serve the team better than audio technology in terms of desired outputs such as creativity, quality or building team satisfaction? Future research should build on the findings herein to investigate other, developing communication technologies.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

There are so many people who have supported this unusual journey. I am very grateful to the faculty and staff of the Department of Communications Arts and Sciences for taking a chance on a returning adult student to complete her PhD and attend courses part time. In particular, a debt of gratitude to Dr. Dennis Gouran who had the patience to guide me through the theory and practice of doctoral study and research. To the IT professionals there who recovered my work when my computer crashed 10 minutes before the end of my written comprehensive exam, much appreciation!

I would not be on this journey if it weren't for the encouragement of former Dean Robert Steele in the College of Agricultural Sciences who hired me and gave me the freedom for this intellectual pursuit, followed by both Dean Bruce McPheron and interim Dean Barb Christ. Thanks also to my wonderful staff in the Office of International Programs who made adjustments and helped make sure the work got done no matter what!

To my partner in research, Qian Xu, for being creative with me and developing these ideas and putting them into practice. To Rob Chesnick, Kathy Chen, Dan Tobin, Danhong Chen, Deonna Sorgel, and others who all did their part to help.

Finally, to my Mom and Dad who have been waiting for this day for a long time. To my husband who entertained the kids and did the dishes so I could focus, and who picked me up when I was down. To my darling daughters who went to the movies without me when they were little and who cheered for me every step of the way now that they understand. I dedicate this to Kaitlyn and Gillian Warner.

Chapter 1

Introduction

"Honey, I think the world is flat."

Thomas Friedman

The World is Flat: A Brief History of the 21st Century

Whether or not you—like Thomas Friedman's wife—agree with the premise of his book that ten key technological and cultural changes have created a "flattened" world, it is difficult to ignore the process of globalization. The increased mobility of capital, commodities, technology, cultural influences, and human resources across national boundaries is one of the most significant trends of modern times (Castells, 1996). Advancements in information technology, in particular, have changed the way of doing business in the 21st Century more drastically than even the advancements in transportation technology changed the ways of doing business in the last century. If the invention of the steam-engine linked continents and the railway-linked rural communities, the communication technologies available today are linking people and cultures more quickly and more comprehensively than not long ago we could ever have imagined.

Communication technology is changing the nature of collaborative and organizational processes. Organizations are becoming increasingly flexible, as is implicit in such terms as "virtual," "boundaryless," or "networked" (Nemiro, 2002). In this new, flat, and highly competitive global economy, organizations are making use of new information and telecommunication technologies to improve performance via virtual cooperation (Holahan, Aronson, Jurkat, & Schoorman, 2004). More than 60 percent of professional employees currently

work in virtual teams (Kanawattanachai & Yoo, 2002). For many organizations, survival in the new era depends on the effectiveness of virtual collaboration.

Thanks to technological advancements, organizations are no longer limited by traditional boundaries of time and space and can reach out to the far corners of the earth to create work teams and access unique knowledge. The availability of various information and telecommunication technologies makes it easier for group members to collaborate virtually across geographical boundaries (Wang & Fussell, 2009). An increasing number of multinational companies depend on teams working across cultural and national boundaries to think strategically, create new products, make decisions and respond to crises. Today's work teams are often temporary groups comprised of individuals from around the globe and from different technical backgrounds (Early & Peterson, 2004).

Although groups remain critical to the success of organizations, technology has changed the nature of group work. Face-to-face meetings are no longer the sole means by which small groups in organizations discuss problems and make decisions (Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002). As costs of travel rise and technology becomes more accessible, we can expect this trend to accelerate with computer-mediated communications (CMC) becoming an integral part of organizational communication and, in many instances, replacing face-to-face interaction. We can also expect an increase in the diversity of group members as organizations seek expertise without regard to national boundaries. Thus, understanding how groups work in this new, intercultural, virtual environment is critical for both scholars and practitioners alike.

Rationale

Little research focusing on the interaction process in intercultural virtual teams is in evidence. According to Pauleen (2003), the use of virtual teams has outpaced the development of

our understanding of them. Research relating to virtual teams to date has involved comparisons of face-to-face (FTF) and computer-mediated communication (CMC) groups, rather than examining the differences among modalities and their capabilities to facilitate or impede virtual cooperation. The results have been often contradictory (Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002). Other research has examined the technologies to support group decision making, and there is a large body of literature concerning Group Decision Support Systems and Computer Supported Cooperative Work (CSCW), but it fails to capture the interaction process adequately. A more comprehensive understanding of how the communicative aspects of the various communication technologies (text, audio, and visual) affect the group interaction process is yet to be undertaken.

Moreover, current research dealing with intercultural communication in groups focuses on face-to-face interaction. Although there is a large body related to cultural diversity of members and its influence on both processes and outcomes, particularly member satisfaction, creativity, and decision quality, the mechanisms by which these outcomes occur and what role communication plays remain objects of interest for which there is little illumination. Although intercultural collaboration can contribute to the diversity of ideas, for example, some research has shown that it can be difficult due to the different communication styles, language use, and value systems of the individuals from different cultures (Bird & Osland, 2006).

Neither is it well understood how these processes might function within a virtual context. Intercultural communication issues are complicated further by the use of media and type of media selected for collaboration (Setlock, Fussell, Ji, & Culver, 2009), such as text chat, audio/video conferencing systems, and other virtual tools. These CMC tools have different modalities and vary in their abilities for addressing ambiguity, conveying cues from the communication partner, and facilitating understanding (Daft & Lengel, 1984). These abilities, also called "affordances" (Setlock et al., 2009), might interact with different cultural characteristics in virtual collaboration to influence the outcomes. Thus, a complete understanding of the team communication process

in today's increasingly common intercultural virtual teams seemingly requires new knowledge of how culture interacts with technology to affect the process and outcomes. The conceptual model in Figure 1-1 guided this study.
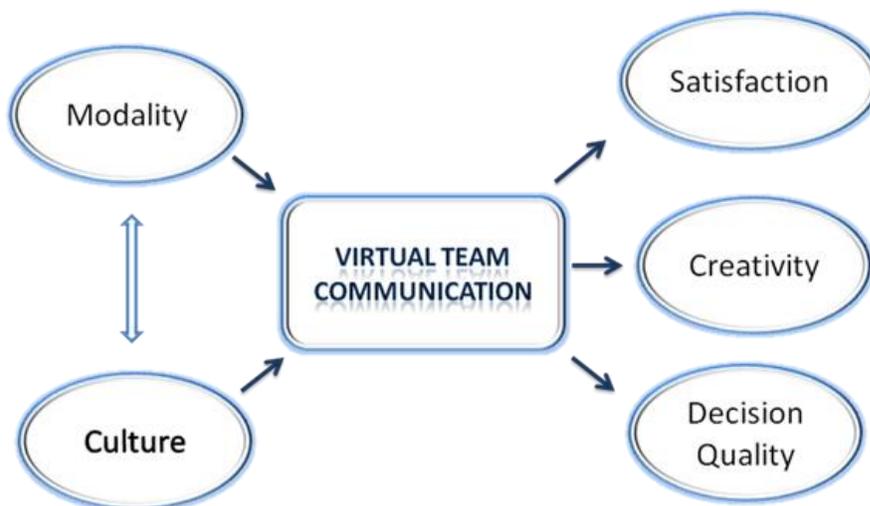
Figure 1-1. The Virtual Team Communication Conceptual Model

Theoretical Perspective

The research reported herein served to close these gaps in the group communication literature noted above. It focused on the functional aspects of communication in decision-making groups, where "functional" refers to the ways in which utterances aid in the satisfaction of task requirements and, hence, affect the outcomes achieved (Gouran, 1999). Most theory and research related to group performance effectiveness has used the lens of the functional perspective (Hollingshead, Wittenbaum, Paulus, Hirokawa, Ancona, & Peterson, 2005). In this study, the goal was to apply the dominant paradigm—the functional theory of group decision making—in the relatively new virtual and the intercultural realms and, thereby, extend the theory and its applicability for modern-day decision-making processes in organizations. It focused on the

functions of communication related to assuring satisfaction of five requirements, determined to be key to effective decision-making interaction (Gouran & Hirokawa, 2003), as the framework for the investigation:

(a) Show a correct understanding of the issue to be resolved;

(b) Determine the minimal characteristics any acceptable alternative must possess;

(c) Identify a relevant and realistic set of alternatives;

(d) Examine carefully the alternatives in relationship to each previously agreed upon characteristic of an acceptable choice; and

(e) Select the alternative that analysis reveals to be most likely to have the desired characteristics. (p. 29)

In addition, the study drew on research from a number of fields, including Communication, Management Psychology, and Information Sciences, in addressing how functional theory applies in a virtual context, how the various characteristics of the technology affect the functions group process serves, and how culture interacts with the technology to influence the process and outcomes.

The study was an investigation of Chinese and American dyads brought together for a decision-making task to determine whether or not the functions of interest would be affected by either the type of communication technology used in the interaction, as well as how cultural influences might interact with the technology to affect the process and outcomes. The study built on two previous pilot studies of the role of different media modalities in virtual collaboration in Chinese-American dyads (Behring & Xu, 2009; Behring, Chesnick, & Xu, 2007). The first one explored how two different communication modalities, text vs. audio, influenced the outcomes, such as satisfaction with task and task performance, of collaborations among intercultural dyad members. The second included an additional modality, the profile picture conveying cues of the collaboration partner, to explore: 1) the effect of multi-modality on intercultural virtual

collaboration; and 2) how intercultural dyad members adopt communication accommodation strategies under different modality conditions. In general, although the richer modality led to better collaboration outcomes in terms of satisfaction than the leaner modality, the relationship was not linear. Indeed, multimodality media are not necessarily better than single-modality media in intercultural virtual collaboration.

Research Questions

Extending the previous research and taking the functional theory of communication in group decision-making into the virtual, intercultural realm entailed three research questions:

RQ1: How does communication in team decision-making, functionally speaking, operate in a virtual context?

The objective of this research question was to determine whether and how the processes followed by teams in face-to-face interactions differ in the virtual realm. Do virtual teams exhibit the same behavior, as suggested by Functional Theory, as they perform decision-making tasks?

RQ2: How, if at all, do textual and audio characteristics of the technology affect the ways in which the functions of communication are manifested?

The objective of this research question was to determine whether, and if so how, the technology choice affects the processes by which virtual teams employ the steps outlined in the Functional Theory. Does a "leaner" medium (text) result in a different approach than a "richer" medium (voice)?

RQ3: Do cultural factors interact with the characteristics of technology in respect to the quality of the decision, the creative outcome of the team, and the satisfaction of team members with their decisions?

The objective of this research question was to determine whether or not the outcomes of a group decision-making task would differ on the basis of the type of media used? Does the "richer" technology yield better outcomes, as predicted by Media Richness Theory, or is "leaner" technology better for intercultural teams seeking better outcomes in terms of quality, creativity, and satisfaction?

Hypotheses

The following hypotheses grew from these questions, the background material reviewed, and as a result of previous research. Each one of these hypotheses corresponded to one of the five requirements mentioned above (Gouran & Hirokawa, 2003):

H1: Intercultural virtual teams will develop a more thorough understanding of the problem using audio technology vs. text (Function 1; See Gouran & Hirokawa, 2003).

H2: Intercultural virtual teams will achieve a more appropriate understanding of the requirements for an acceptable choice in the audio rather than the text condition (Function 2; See Gouran & Hirokawa, 2003).

H3: In light of the ability of rich media to transmit cultural cues that may inhibit participation, intercultural virtual teams will develop fewer realistic alternatives under conditions in which messages are received aurally as opposed to being text-based (Function 3; See Gouran & Hirokawa, 2003).

H4: Because communication accommodation is facilitated by richer media, there will be more interpersonal influence in intercultural teams in the audio vs. the text condition in respect to the determination of how well decision options satisfy criteria and which one best satisfies them as a whole   (Functions 4 and 5; See Gouran & Hirokawa, 2003).

Organization of the Report

This chapter has provided a general introduction to the dissertation project. Chapter 2 presents a review of relevant theories in group communication, interaction in virtual teams, and cross-cultural communication. The methods--both quantitative and qualitative--used in conducting this research are the subject of Chapter 3. Data were collected via two approaches: (1) surveys following intercultural, virtual teamwork; and (2) post-task, semi-structured interviews of all participants. Chapter 4 summarizes the results from the quantitative and qualitative data collection and analysis. Chapter 5 integrates the findings, notes the limitations, provides conclusions, and presents recommendations for three separate but interrelated fields of research—group communication, interaction in virtual teams, and cross-cultural communication.

Chapter 2

Review of Previous Scholarly Literature, Research Questions, and Research Hypotheses

This dissertation project lay at the intersection of three separate but interrelated fields of research—group communication, interaction in virtual teams, and cross-cultural communication. Chapter 2 begins with a review of the Functional Theory of Group Decision-Making, one of the predominant theories in the group communication literature. It first examines the basic tenets of this theory to set the stage for the research questions before turning to a review of related studies in virtual teams and cross-cultural research to help construct the hypotheses. Moreover, because of the importance of creativity to a group's potential, this chapter also examines literature concerning creativity to set the context for examining how to boost creativity in virtual, intercultural groups. The examination of previous scholarly endeavors illustrates how virtuality and culture ostensibly could influence the decision-making process as described by functional theory. The examination should make clear the framework for this study's key research questions and hypotheses.

Group Communication Research

Participation in groups has become an almost inescapable facet of everyday life. Since the 1940s, thousands of studies on every aspect of groups from a range of academic disciplines (sociology, psychology, management, education, information science, communication, etc.) have been published (Hollingshead, Wittenbaum, Paulus, Hirokawa, Ancona, & Peterson, 2005). It is abundantly clear from this work that some groups perform better than others, and research continues to evolve to explain group behavior, as well as to capture the changing nature and functions of groups. In Communication, since the 1980s forward, group research has been

dominated by three general perspectives: Functional Theory, Symbolic Convergence Theory, and Structuration Theory.

Most theory and research pertaining to group performance effectiveness has been through the lens of the Functional perspective (Hollingshead et al., 2005). One of the most influential theories of group communication is Gouran and Hirokawa's (1983, 1986, 1996). The Functional Theory of Group Decision Making posits that in effective decision-making groups, communication serves to facilitate sound reasoning and critical thinking, as well as to prevent members from making errors in judgment (Poole, 1999). Communication in groups can also be disruptive by diverting, retarding, or otherwise frustrating group processes (Griffin, 2008).

From the perspective of the Functional Theory of Communication in Decision-Making Groups (Gouran & Hirokawa, 2003), the members of an effective decision-making group satisfy five requirements during its decision-making interaction:

(a) Show a correct understanding of the issue to be resolved;

(b) Determine the minimal characteristics any acceptable alternative must possess;

(c) Identify a relevant and realistic set of alternatives;

(d) Examine carefully the alternatives in relationship to each previously agreed upon characteristic of an acceptable choice; and

(e) Select the alternative that analysis reveals to be most likely to have the desired characteristics. (p. 29)

Although functional theory has evolved over the years to incorporate more communicative functions (Poole, 1999), leadership issues (Gouran, 2003), and task-related features (Hollingshead et al., 2005), many matters remain unaddressed. Most of the studies reflecting the perspective examine simple input-process, input-output, or process-output relationships in isolation; more studies need to deal with the interconnections among input–process–output. In addition, although research has focused on some inputs, such as diversity, the

focus has been on gender, ability, and differences in motivation, rather than race, ethnicity, or cultural background, at least according to Hollingshead et al. We know a good deal about the content of group discussion, but much less about patterns of discussion, or the structure of talk, which may have important implications for group outcomes, such as the quality of idea generation.

To date, there appears to be only one study that has investigated group process from the functional perspective in a virtual context (Li, 2007). That study took place in Taiwan, but did not incorporate an intercultural perspective, nor did it include consideration for how various media influence how the process unfolds. To address these shortcomings, I posed the following research questions for the dissertation project:

RQ1: How does communication in team decision-making, functionally speaking, operate in a virtual context?

RQ2: How, if at all, do textual and audio characteristics of the technology affect the ways in which the functions of communication are manifested?

RQ3: Do cultural factors interact with the characteristics of technology in respect to the quality of the decision, the creative outcomes a team achieves, and the satisfaction of team members with their decisions?

The rest of this chapter examines the current literature on virtual teams and cross-cultural communication to present the testable hypotheses.

Virtual Teams

Virtual teams are a relatively new phenomenon and have changed the way groups in a wide variety of organizations work. Facilitated by the rise of the "knowledge worker," the need for innovation, and the increasing use of computer-mediated communication (CMC), virtual

teams have become instrumental for success in the performance of many types of tasks (Pauleen, 2003). Maznevski and Chudoba (2000) point out that global virtual teams are even often assigned the most important tasks in an organization, such as multi-national product launches, negotiating mergers and acquisitions, and managing strategic alliances. Research, however, has not kept pace with the rapid expansion of virtual teams, and researchers are grappling with a range of key questions from defining what makes a virtual team to understanding how such teams might function most effectively (Pauleen, 2003). This section of the chapter first identifies the challenges associated with research on virtual teams at this point in time and then lays out the key issues relevant for this dissertation project.

At present, the term "virtual team" is loosely defined. The most simple definition is a group whose members work across time and distance via information and communications technology (Townsend, DeMarie, & Hendrickson, 1998). In other words, virtual teams are groups of geographically dispersed organizational members who carry out the majority of their activities through information technologies (Nemiro, 2002). More specifically, virtual teams have members who are: geographically distributed; functionally or culturally diverse; electronically linked; and connected via lateral relationships. The term encompasses a wide range of characteristics, which manifest themselves in varying degrees of complexity. Some key characteristics relevant to this study that contribute to complexity include: degree of reliance on ICT; geographic dispersion (from having one member in a different location from the rest of the team to all members' being located in different geographic regions); the team size; the task or project duration; prior shared work experience; membership stability; and cultural diversity (national, organizational, or professional) (Dube & Pare, 2004; Staples & Zhao, 2006). (See **Error! Reference source not found.**, Virtual Team Complexity Characteristics, adapted from ube & Pare, 2004.)

Characteristics	Degree of Complexity	
	Low	High
Degree of reliance on ICT	Low reliance..High reliance	
Team size	Small...Large	
Previous experience	Extensive..None	
Task duration	Long term...Short term	
Geographic distance	Local..Global	
Time difference	None..Significant	
Cultural diversity	Homogeneous...Heterogeneous	

Figure 2-1. Virtual Team Complexity Characteristics

While the key defining factor in scholarly literature regarding virtual teams is the use of technology to interact, a second area of research underway involves understanding the costs and benefits associated with the technological aspects of virtual teams. Research has been demonstrating strengths and weaknesses of virtual teams and is also beginning to unearth what makes them effective. Benefits include: greater adaptability, faster response time, task specialization, greater reach, and more discussion. Costs include greater conflict, decreased loyalty, lack of coherent identity, and information overload (DeSanctis & Monge, 1999). Moreover, technology and virtuality combine to modify groups in several ways. Godar and Ferris (2004), for instance, have identified three key respects in which virtual teamwork is different from face-to-face interaction. New dimensions of communication among virtual team members break down barriers of space and time, modify traditional processes, and enhance capacity to access, share, manipulate, retrieve, and store information.

Because virtual teams span geographical and organizational distance and rely on information technology for communication, the richness of the communication medium is a key research topic in the study of virtual teams (Zhang, Fjermestad, & Tremaine, 2005). First

proposed by Daft and Lengel in 1984, Media Richness Theory advances the view that communication media have different capacities for resolving ambiguity, negotiating interpretations, and facilitating understanding. There are two assumptions underlying this theory: 1) people want to overcome equivocality and uncertainty in organizations; and 2) a variety of media commonly used in organizations work better for certain tasks than others.

According to Daft and Lengel (1984, 1986), evaluation of the richness of media is based on the following four criteria: 1) feedback capability–the ability of the media to facilitate instantaneous feedback, in other words, synchronicity; 2) multiple cues/communication channels used–the range of cues facilitated by the media; 3) linguistic variety–the ability to facilitate both the use of numbers and natural language; 4) personal focus–the ability to convey personal feelings and emotions of the individuals participating in the communication. Media low in richness are purportedly suitable for facilitating discussion of straightforward topics, whereas ones high in richness are suitable for more complex organizational tasks (Daft, Lengel, & Trevino, 1987). Similarly, in performing a decision-making task, collaborators usually need to reach a mutual understanding of what it entails and the knowledge needed to perform it effectively (Clark & Brennan, 1991). When the parties share a greater amount of common ground (Clark & Marshall, 1981), they are able to accomplish tasks more efficiently. Establishing common ground involves developing mutual knowledge, goals, and attitudes important for the collaborative process. Clark and Brennan (1991) propose that different communication media have different characteristics that affect the costs of establishing common ground. Leaner media, for instance, may increase the costs and time required to do so, primarily because of the lack of cues for enriching the communication exchange.

Most of the extant studies of media richness and virtual team cooperation have focused on the difference between face-to-face communication and video/audio conferencing systems or other types of online media, such as email or instant messaging systems (Paul, Samarah,

Seetharaman, & Mykytyn, 2005; Setlock, Fussell, & Neuwirth, 2004; Setlock, Quinones, & Fussell, 2007; Straus & McGrath, 1994; Venoitt, Olson, Olson, & Fu, 1999). Those conducting these studies have generally concluded that face-to-face communication is richer than computer-mediated communication. However, computer-mediated media differ in their channel speed, bandwidth, and transmission capacity, all of which directly influence how many cues are present, the degree of personal focus that can be achieved, and the ability for supporting communication (Valacich, Paranka, George, & Nunamaker, 1993). Fletcher and Major (2006) propose that since online media have different modalities, they vary in their utility for facilitating team cooperation. The ability to transmit cues and for supporting communication are particularly important in intercultural virtual teams. In light of previous research involving virtual teams and media capacity, the research reported in this dissertation addressed two hypotheses relating to understanding of the matter to be resolved:

H1: Intercultural virtual teams will develop a more thorough understanding of the problem using audio technology vs. text (Function 1; See Gouran & Hirokawa, 2003).

H2: Intercultural virtual teams will achieve a more appropriate understanding of the requirements for an acceptable choice in the audio rather than the text condition (Function 2; See Gouran & Hirokawa, 2003).

Creativity

Before beginning a discussion of creativity in intercultural groups and virtual teams, it is important for me to identify the referents for creativity in the organizational context. Although there are numerous definitions, most researchers concerned with this phenomenon agree that the two elements that best capture it are novelty and usefulness (Amabile, 1996). Creativity at times

also refers to a product or a process and at other times to a personality trait or an environmental condition (Torrance & Goff, 1992). We can say the following (Roffe, 1999):

> The key is to turn ideas into useful knowledge and the useful knowledge into added value. In practice, this means bringing together the creative thinkers so that they can discuss and elaborate on their ideas, even if they do not really want to. It also means finding the resources necessary, when resources are limited, and trying to manage what is often an unpredictable, unmanageable process. (p. 1)

Researchers interested in creativity have long recognized the potential of groups for innovation and the role that they play as the point of intersection for inquiries involving individual and organizational creativity. In 1953, Alex Osborn coined the term "brainstorming" for a group's collaborative effort to foster originality in thought. Edwin Mingoia in his 1961 article, "Can Creativity Be Harnessed?," took issue with the notion that only the individual can achieve creativity as an expression of uniqueness. Mingoia likened the group process to some "sort of contagion replete with ideas in a manner of sparks from one mind lighting up a lot of bang-up ideas in the others just like a string of firecrackers" (p. 152).

To date, research relating to creativity in groups has yielded inconsistent results in showing both positive and negative effects. On the positive side, Paulus and his colleagues (Brown, Tumeo, Larey, & Paulus, 1998; Paulus & Yang, 2000) have developed a cognitive theory of group creativity suggesting conditions under which cognitive stimulation effects can be observed in groups (Paulus & Yang, 2000). Likewise, Associative Theory (Mednick, 1962; Milgram & Rabkin, 1980) describes the increased likelihood of novel ideas generated on the basis of associations group members derive from the thoughts and ideas of others.

This positive perspective is in contrast to other research involving group brainstorming and demonstrating that groups generate substantially fewer ideas than the same number of individuals brainstorming in isolation (Paulus & Yang, 2000). This loss of productivity may be the result of drawbacks, such as social loafing, production blocking, and evaluation apprehension

(Kurtzberg, 2005). For example, participants may be unwilling to share some of their ideas for fear of electing negative reactions, or they may be reluctant to do so because they do not feel accountable or worth their time (social loafing). Production blocking may occur because individuals cannot express their ideas while someone else is talking (Paulus & Yang, 2000). In her comparison of groups using Nominal Group Technique versus the Delphi Technique, as compared to interacting or consensus groups, for example, Susan Jarboe (1999) notes inconsistent results regarding outcome, group satisfaction, effectiveness, rates of implementation, the number of ideas generated, etc. According to Kurtzberg (2005), we do not yet have a complete understanding of how the interactions of individuals with a group affect the creative process.

Despite our limited knowledge, there are several factors that appear to foster creativity in work groups: autonomy and freedom, challenge, clear direction, diversity/flexibility/tension, support for creativity, trust, and participative safety (Amabile, 1996; Baer & Frese, 2003; Nemiro & Runco, 1996). Zhou (2003) notes the presence of creative role models and low-level monitoring by supervisors may boost the creative output of groups. In addition, research by Gilson and Shalley (2004) reveals that those groups whose members perceive that their tasks require high levels of creativity and who work at jobs with high task interdependence spent time socializing with each other and had a moderate amount of organizational tenure were more creative.

Creativity in intercultural groups

Research has consistently shown that there are links between some form of diversity and creativity in groups and that those high in heterogeneity fare better than homogeneous groups when performing complex tasks (Kurtzberg, 2005). Indeed, there are a large number of characteristics of individuals in groups that may affect both the process and outcomes of their performance of a given task. Milliken and Martins (1996) have identified 14 different such

attributes: race/ethnic background, nationality, gender, age, personality, cultural values, socioeconomic background, educational background, industry experience, organizational membership, organizational tenure, and group tenure. Other researchers have proposed that these characteristics are likely proxies for other, deeper differences, such as knowledge perspectives and cognitive approaches (Cordero, DiTomaso, & Farris, 1997). Deeper differences can contribute to the creative process by bringing in more information and ideas into the team, stimulating thinking, and bringing different networks and resources to the team (Staples & Zhao, 2006).

Although there are many different types of diversity in groups, national and cultural differences seem to be particularly important to study because they include elements of both surface-level and deep-level diversity. Surface-level characteristics that can vary in relation to where one is born include race and ethnic characteristics and native language. Deep-level characteristics that vary for people from different countries influence thinking, expectations, and behavior (Evaristo 2003; Hambrick, Davison, Snell, & Snow, 1998). Hofstede's (2001) research examines culture in terms of five value dimensions: individualism/collectivism, power distance, uncertainty avoidance, masculinity/femininity, and time horizon. Each of these has implications for working successfully and creatively in groups, as well as will become apparent, for working via virtual teams.

The creative outcomes accruing in diverse groups notwithstanding, there is a corresponding price. Whereas heterogeneous groups seem to excel at experiencing more performance-based outcomes, such as originality, complexity, and decision performance, job satisfaction and team cohesion often suffer (Kurtzberg, 2005). Homogeneous teams, on the other hand, although they risk the pitfall of "groupthink," are stronger in respect to emotional outcomes, such as trust, liking, and positive attitudes. Higher conflict and lower levels of positive

affect and, therefore, perceptions of creativity in heterogeneous teams also can limit the positive impact of divergent thinking in those groups.

Creativity in virtual teams

Although there are several factors that ostensibly foster creativity in work groups, few researchers have addressed these variables in the context of virtual teams, and even fewer have investigated related aspects of communication. Perhaps the best known research to date is that conducted by Nemiro in 2002. In what appears to be the first study to focus on the creative process in virtual teams, Nemiro identified four stages in the creative process: idea generation, development, finalization/closure, and evaluation. According to Nemiro, this description is not dissimilar to the creative process in face-to-face interaction. In his studies, the idea-generation stage began with a need or someone's asking a question. One team member, or a group of individuals within the team, then became the "kicker," in suggesting an idea to the rest of the group. If the rest of the team agreed that the idea was worth pursuing, the kicker championed and developed it. In the next stage, an iterative period of development occurred as members exchanged drafts, offer feedback, etc. Once the ideas were finalized and implemented, the members of the groups usually got together to evaluate the results.

Nemiro (2002) relied on qualitative interviews of nine "real-world" virtual teams to determine the type of technology participants reportedly used in each phase of the creative process. Interestingly, team members were divided in their views of the use of technology in the idea generation stage, with some arguing that on-line idea generation was "freeing" and lifted the pressure to "be creative." Others preferred face-to-face meetings in the idea generation stage. Despite the fact that most research shows that electronic brainstorming or individual idea generation is as productive, if not more productive than, group brainstorming, many of the virtual team members missed the "synergy" apparent in face-to-face interaction and perceived that the

team was creative only when the members met in person. In the development phase, most virtual teams agreed that on-line communication was more efficient, and they used a variety of technology to develop creative ideas. For finalization/closure and evaluation, most teams preferred more interactive technology or face-to-face interaction.

Finally, Nemiro (2002) relied on grounded theory development to identify three work-design approaches virtual teams used in the creative process—the wheel, modular, and iterative approaches. The "wheel" is a classic type of communication network, in which there is one key person who communicates to all other members. Members are on two different status levels, with the high-status member usually referred to as the "hub" or center. Most information passes through the hub; little communication takes place among the lower-level members. In the modular approach, the work is parceled out or distributed among members of the team on the basis of expertise or interest. In the iterative approach, team members engage in back-and-forth development cycles in more or less random fashion. Teams may choose a combination of these approaches at different phases of the creative process. Each decision, however, has implications for the group and its members in terms of leadership roles, group cohesion/identity, job satisfaction, and creative self-efficacy.

Hernandez and Coronas (2004) and others have identified three key variables that influence creativity in virtual teams:

1. Goal and role clarity. Although having a shared vision and clear direction is important for creativity in traditional face-to-face work groups, these qualities appear to be even more important in virtual teams. Some research has shown that virtual groups experience more conflict than traditional groups because of the depersonalized interactions associated with mediated communication, unshared context, and nonexistence of bureaucratic rules and regulations (Hinds & Bailey, 2000). Defining roles and promoting a shared vision can maximize creative output

by minimizing conflict and assuring that different knowledge perspectives are included.

2. Trust. Most researchers interested in group creativity agree that participative safety is crucial for group creativity. Consequently, virtual teams that want to be creatively effective must learn to build trust among their members, irrespective of the level of geographic or temporal virtuality.

3. Communication patterns. Henry and Hartzler (1998) have observed that one of the greatest challenges to a virtual team is to keep the synergy and creativity flowing without frequent face-to-face interactions. Communication has been deemed vital to creating bonds between people that keep a team together. Without the usual cues— both verbal and nonverbal—virtual teams must develop other tools to promote active listening and/or attention skills and successful communication (Hernandez & Coronas, 2004).

Rosalie Ocker (2005) also investigated the influences on creativity in virtual teams and uncovered significant inhibitors, as well as enhancers, to creativity at play. She conducted an experiment involving 11 completely virtual teams consisting of graduate students using only asynchronous technology. The qualitative analysis resulted in the identification of nine influences that inhibited team creativity and five influences that enhanced it (Figures 2-2 and 2-3).

Enhancers

✓ Stimulating Colleagues

✓ Variety of Social Influences

✓ Setting the Example

✓ Collaborative Climate

✓ Surface and Reduce Equivocality
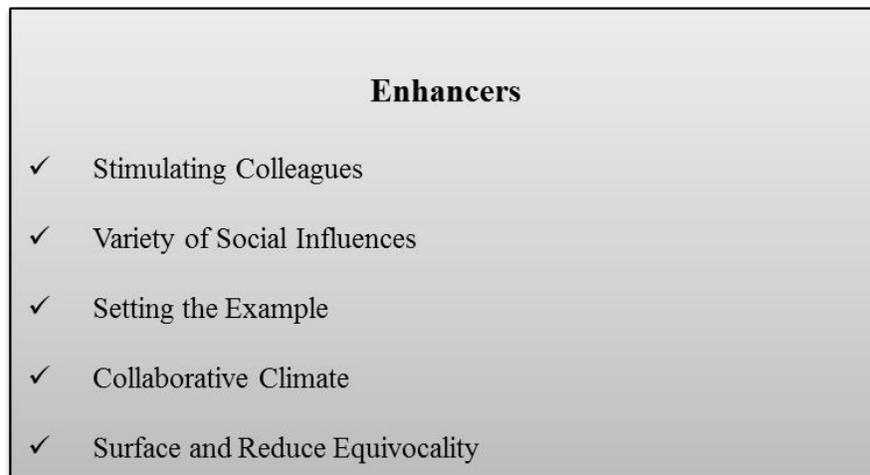
Figure 2-2. The Five Enhancers of Team Creativity

Inhibitors

✓ Dominance

✓ Domain Knowledge (technical and functional)

✓ External Reward

✓ Time Pressure

✓ Downward Norm Setting

✓ Structured Approach

✓ Technical Problems

✓ Lack of Shared Understanding

✓ Non-Stimulating Team Members
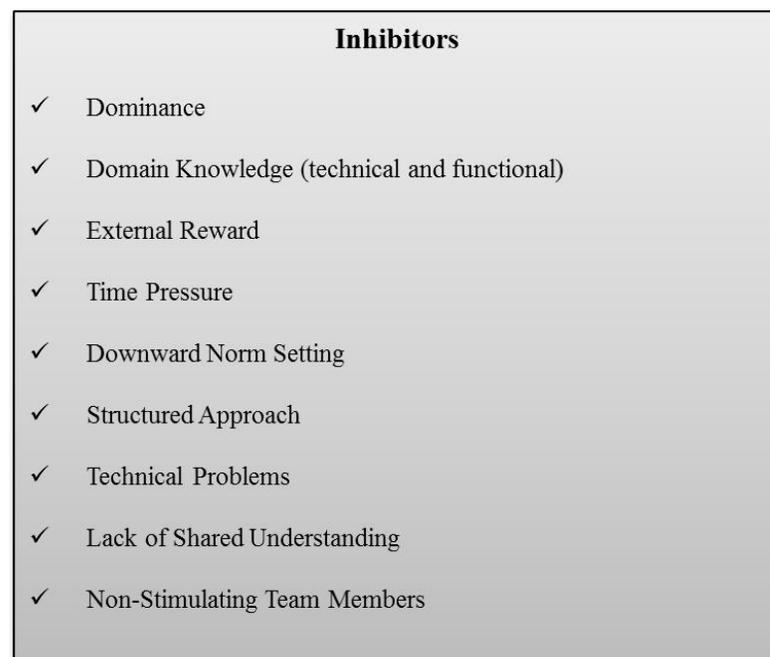
Figure 2-3. The Nine Inhibitors of Team Creativity

On the basis of this body of research, it is reasonable to suspect that creativity in virtual teams will be affected by the diversity of the members and the degree to which the technology affords knowledge of that diversity. Although relatively scant, this work has provided a foundation for the following hypothesis:

H3: In light of the ability of rich media to transmit cultural cues that may inhibit participation, intercultural virtual teams will develop fewer realistic alternatives under conditions in which messages are received aurally as opposed to being text-based (Function 3; See Gouran & Hirokawa, 2003).

Cross-Cultural Communication

Of further interest in this study was how the presence of cultural differences can affect the communication processes and outcomes associated with different technologies and modalities. Following is a review of the seminal works of Hall (1973) and Hofstede (2001) and the five dimensions of culture he identified, as well as the original work by Giles, Taylor, and Bourhis (1973) contributing to the development of Communication Accommodation Theory. Of related significance is Social Presence Theory (Short, Williams, & Christie, 1976) in considering how the richness of the media participants use might influence the communication process and outcomes in decision-making groups.

Many scholars credit Edward Hall, an anthropologist, with founding (or at least instrumental in its founding) cross-cultural communication as an area of study. In *The Silent Language*, Hall, according to Hart (1996), brought together the notions of "culture" and "human interaction" into a unified discipline. He was responsible for four key contributions to the field: 1) the shift from a uni-cultural focus to a bi-cultural comparison; 2) bringing macro-level concepts of culture to a micro-level; 3) linking culture to the communication process; and 4)

drawing attention to the role culture plays in influencing human behavior. Hall also established communication training at the Foreign Service Institute in the post-World War II environment to help American diplomats become more successful in their interactions around the world and in the delivery of American programs and policies.

In addition to Hall, one of the most influential scholars in the area of cross-cultural understanding is Geert Hofstede (2001), who identified five dimensions of culture: power distance, which focuses on the degree of equality between people in a society; individualism, which focuses on the degree a society reinforces individual or collective achievement and interpersonal relationships; masculinity, or the degree to which the society reinforces the traditional masculine work role model of achievement, control, and power; uncertainty avoidance, which entails the level of tolerance for uncertainty and ambiguity within the society; and long-term orientation, which relates to the degree to which society embraces devotion to traditional or progressive values over time.

Research concerning communication between cultures has evolved over the years, with cross-cultural communication's increasingly giving way to a more complex consideration of group dynamics in an intercultural context. Today, intercultural, communication commonly refers to a process in which a source in one culture encodes a message to be decoded by a receiver in another culture (Porter & Samovar, 2003). According to Porter and Samovar, there are eight critical intercultural communication variables: attitudes, social organization, patterns of thought, roles and role prescriptions, language, nonverbal expressive behavior, use and organization of space, and conceptualization of time. These theorists believe that attitudes, roles and role prescriptions, and nonverbal expressive behavior are the three most important variables for intercultural small group communication. In group settings, the critical concern becomes one of cultural variance in social perception or the way in which people develop and attribute meaning to social objects and events.

In Group Communication, there is a large body of research related to cultural diversity of members and its influence on both processes and outcomes. Staples and Zhao (2006) distinguish between surface-level diversity (observable traits, such as racial/ethnic characteristics and native language) and deep-level diversity (unobservable traits, such as values, expectations, and beliefs). Surface-level diversity purportedly hampers the performance of diverse groups (due to increased tension and conflict), whereas deeper-level diversity, by bringing in more information and ideas into the team and stimulating thinking, appears to contribute to the success of diverse teams. However, mechanisms by which these outcomes occur and what role communication plays remain objects of interest for which there is little illumination. Moreover, it is not well understood how these processes might affect a virtual context.

Communication Accommodation Theory

First introduced in 1973 by Giles, Taylor, and Bourhis, Communication Accommodation Theory posits that under certain circumstances, interlocutors may converge by minimizing their linguistic dissimilarities and that doing so can contribute positive evaluations and reciprocation. The theory, originally developed out of a wish to demonstrate the value and potential of social psychological concepts and processes for understanding the dynamics of diversity in speech in social settings, has its roots in Social Identity Theory, which holds that positive social identity is a product of psychological distinctiveness with regards to members of other groups (Barker, Giles, & Harwood, 2004). The initial focus of CAT was convergence (individuals' adapting to each other's speech, with the objective of gaining approval as the motivator), and divergence (individuals' accentuating differences to show distinctiveness as the motivator), but it has evolved to include attuning strategies based on cues and inferences. Such attuning strategies include intentional diversification of vocabulary, pitch, loudness, tempo, repetition, clarification checks, and event topics (Giles, Coupland, & Coupland, 1991).

Today, Communication Accommodation Theory most often applies in conjunction with inquiries into intergroup communication in the health and intergenerational contexts via the Communication Predicament of Aging Model. Designed to explain situations in which undesirable discrepancies occur between the actual communicative competence of an elderly person and the negative perception of his/her competence, CPA assumes that people begin an interaction by assessing "cues" of the communication partner (physical characteristics, mobility aids, social roles, etc.) that then lead (usually) to negative stereotypes and expectations of dependence and incompetence. This, in turn, most often affects the accommodative strategy and can result in over-accommodation or patronizing communications (Ryan, Hummert, & Boich, 1995).

CAT has also served to explain successful intercultural encounters. Because CAT can address several important antecedents (initial orientation, group vitality, etc.), the situation or context, as well as an evaluative component, it provides bases for predicting the likelihood of future interaction (Gallois, Giles, Jones, Cargile, & Ota, 1995). However, Hajek and Giles (2003), in a critique of intercultural communication research, have concluded that there is a "paucity" that involves concrete behavior. CAT has never informed research in the virtual context.

Social Presence Theory

Also of related significance is Social Presence Theory, developed in 1976 by Short, Williams, and Christie. This approach is the groundwork for much of the current research on the effects of social media and computer-mediated communication. The idea is that a medium's social effects are principally a result of the degree of social presence that it affords to its users. Social presence refers to a communicator's sense of awareness of the presence of an interaction

partner. This is important for the process by which one comes to know and think about other persons, their characteristics, qualities and inner states (Short et al., 1976). Increased presence leads to a better person perception. Thus, Social Presence Theory might be helpful in considering how the richness of the media participants use influences the communication process and outcomes in decision-making groups. Review of these theories suggest that accommodation and persuasion are more likely in the presence of social cues, which leads to the following hypothesis:

H4: Because communication accommodation is facilitated by richer media, there will be more interpersonal influence in intercultural teams in the audio vs. the text condition in respect to the determination of how well decision options satisfy criteria and which one best satisfies them as a whole (Functions 4 and 5; See Gouran & Hirokawa, 2003).

This chapter has provided an overview of the literature used as a framework for the research but also illustrates the lack of scholarly work applying established group communication theory in the virtual, intercultural context. It also highlights the lack of research analyzing how various communication technologies can affect group processes and outcomes. The next chapter introduces the process and methodology used to address these shortcomings and extend group communication theory to a new space.

Chapter 3

Methods

The research protocol for the study entailed a multi-method approach to explore the interaction between culture and virtuality in global virtual teams. Researchers examining cultural distance are increasingly relying on mixed methods as a way to bridge potential gaps between the culture of researchers and that of participants (Moghaddam, Walker, & Harre, 2003). Although difficult to categorize the methodology exactly, this research incorporated a "concurrent nested" design, as defined by Creswell, Clark, Gutmann, and Hanson (2003). As such, both qualitative and quantitative methods were involved, but the priority assigned to qualitative analysis was greater. The collection of quantitative and qualitative data was concurrent and designed to allow for cross-validation of findings. Integration occurred at both the analytical and interpretative stages.

The approach taken in the research was similar to that in two previous studies (Behring & Xu, 2009; Behring, Xu, & Chesnick, 2007), but it also incorporated the use of qualitative techniques, including observation and semi-structured interviews, to add depth and explanatory power to previous findings. Although the two pilot studies provided a substantial volume of quantitative data, both types were necessary in the present case to develop a comprehensive and more nearly complete understanding of the communication process in intercultural virtual decision-making teams. In retrospect, qualitative interviews with the research participants following the two pilot studies would possibly have added valuable insight and greater depth to the analysis and conclusions regarding process and outcomes in intercultural virtual teams gleaned from the survey data alone. Some of the responses to the survey questions may have

been too simplistic and, therefore, not captured the complexity of the issues involved. This may be particularly true in the case of non-native English speakers who participated in the survey and may have felt pressure to complete it quickly. Qualitative interviews would have been complementary and helped to "fill the gaps" potentially left by the initial answers (Currall & Towler, 2003).

Research assistance for this study was provided by Xiaozhe Chen, a graduate student studying in Penn State's School of International Affairs. Ms. Chen assisted with the recruitment of Chinese students, scheduling the experimental sessions, and administering the activities for these participants.

Participants

The research project involved mixed dyads of students from the United States and China functioning in either text or audio environments. Twenty U.S. students and 20 Chinese students from Penn State University took part. The average age of the U.S. students was 21.5 years, and 67% were female. The average age of the Chinese students was 23.6 years. Fifty-seven percent were female. Ninety-two percent of the U.S. students had traveled outside the country, but only one-third spoke one or more languages other than English.

The students were recruited via various email listservs. The opportunity to participate in the study was also announced in several classes, including Introduction to Rural Sociology (RSOC011), Global Seminar (CED410), and Global School-Based Agriculture Education (AEE 499). Students received a coupon for free ice cream in return for their participation. Although participants were recruited from classes, they received no course credit. They also took part outside class time. Hence, there was no need for an option for those not interested in being involved.

Separate recruitment material was used for the American and Chinese students. For U.S. students, it read:

> A team of graduate students is investigating how to improve communication in groups in different contexts. We are looking for native English speakers, either upper-level undergrad or graduate students, who are willing to participate. Volunteers would spend roughly 45 minutes in our comfortable lab performing a task and filling out a survey. Please contact dbehring@psu.edu. Participants will receive a coupon for ice cream.

For Chinese students, the wording was as follows:

> A team of graduate students is investigating how to improve communication in groups in different contexts. We are looking for native-born Chinese students who have been in the U.S. for less than 3 years, with Chinese as their first language. Volunteers would spend roughly 45 minutes in our comfortable lab performing a task and filling out a survey. Please contact xuc115@psu.edu. Participants will receive a coupon for ice cream.

Students from China who participated in the study were all native to China and had Chinese as their first language. Those selected for the study had resided in the United States less than three years (the average time in country for the Chinese participants was just over one year, which helped to assure that they would be able to communicate in English but while nevertheless maintaining close connections with the Chinese community and culture). The Chinese participants rated their English proficiency at 4.8 on a 7-point scale ranging from "poor" (1) to "excellent" (7). Americans and Chinese were selected not only because of the growing influence of the Chinese-based market in information technology development, but also because students representing the two cultures vary in many respects, or so one would infer from Hofstede's (2001) work. Specifically, China is a more collectivistic, high context culture, whereas the United States is more of an individualistic, low-context culture.

Chinese and American participants who volunteered for the study were individually and separately contacted to use "Sign Up Genius" to select a day and time to come to a location to perform the task of interest. Individual contact was important to prevent the participants from knowing in advance that they would be working with someone from another culture. The Chinese participants were assigned to one computer lab and the American participants to a

different one at the University Park campus of Penn State University. The experiment was

conducted over the course of a week during the evening hours, with approximately four to six

dyads participating each evening.

Materials and Procedures

Upon arrival at their designated computer lab, participants were randomly assigned to

one of 20 dyads—with one Chinese and one American in each--as well as to one of two

synchronous modality conditions via computer (text vs. audio) and asked to perform a decision-

making task as a member of a team. Google Talk software was used for the different media

modalities. In the text condition, the participants used the text-typing function of Google Talk.

In the audio condition, they had headsets and a microphone necessary for using the audio call

function of Google Talk. Synchronous technologies were essential because they offer the closest

approximation to face-to-face interaction and remove variables (such as temporal disjunctions)

that can complicate or otherwise adversely affect the communication process.

The students received instruction from the researcher (U.S. participants) or her research

assistant (Chinese participants) in each laboratory concerning the task and the medium to be used

in performing the task. Each participant received a copy of a decision-making case jointly

selected by the researcher and her Chinese-born colleague, Dr. Qian Xu, from previous research

relating to this topic. The case was appropriately neutral with regard to culture and adequately

differentiated from other joint activities, such as judgment and problem-solving tasks. Decision-

making tasks are different from other team activities in the sense that the participants generally

lack objective performance criteria and are typically evaluated against normative criteria.

Decision-making tasks generally require an individual or units of two or more people to choose

from among a small set of fixed alternatives that differ from one another in kind rather than degree (Larson, 2010).

The case involved a situation at a university campus. It had been developed by the researcher for the purposes of this study and pre-tested among U.S. and Chinese students for cultural neutrality and ease of comprehension. Each team was to make a decision regarding the following scenario:

> Your campus organization wants to host a rock concert to raise awareness about environmental degradation. However, your university is located in the center of a small town. The preferred site for the concert is in the middle of a neighborhood and is surrounded by houses, many of which are owned by young parents with small children. Other issues have recently caused tension between the university students and the community, so the university administration is reluctant to agree to the concert. Your task is to find a solution to the problem that should overcome the opposition.

The pretest involved of small groups of both Chinese and American students (3-5 each) reviewing the decision case at another university under the direction of the researcher's previous collaborator, Qian Xu, and providing acknowledgement of understanding and relevancy. On that basis, the scenario appeared to be appropriate for use.

Each participant also received an agenda for the discussion to guide him or her through the decision-making steps: 1) Are we sure we understand what we are trying to accomplish? 2) What criteria should we use to evaluate our options? 3) What are the possible solutions to the problem? 4) How well does each solution satisfy our criteria? 5) Which one best satisfies our criteria as a whole? The participants then engaged in discussion with their partners either via text or the voice technology described above to reach a decision to which they and their partners could agree. All communications via text and voice technologies were recorded for later analysis.

Following the session, each participant completed an on-line survey pertaining to his or her feelings about the communication process in performing the task and to assess satisfaction with it. Seven items, each accompanied by a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree), and relating to the communication process, cooperation within the group, and

the decision, served as the measure of satisfaction. The items were adapted from ones previously developed by Mohammed and Ringseis (2001) and Schweiger, Sandberg, and Ragan (1986) and had been used in the two previously mentioned pilot studies (Behring et al., 2007; Behring & Xu, 2009). The measure used in this study can be found in the Appendix.

In addition to acquiring the quantitative data, the researcher and her assistant observed students during the course of their interactions and recorded any expressions or reactions during the conversation that conceivably could shed light on attitudes or feelings concerning the process. Finally, 10 participants (five from the United States and five Chinese) were randomly selected to undergo an in-depth semi-structured interview concerning the communication process. The answers to the questions served to augment the survey data, focused on experiences occurring during the collaborative process, and addressed the following questions: "What were your expectations for this interaction based on what you know about your partners? What did you enjoy most about this interaction? What did you enjoy least? Do you feel your ideas were considered fairly? Did you consider your partner's ideas fairly? Were you able to articulate your ideas? Did your partner listen or pay attention to you? Do you think you and your partner made the best decision? How could the process have been improved? Would you work with this team again?"

Data Analysis

To apply and extend the range of the functional perspective on communication in group decision-making in the virtual, intercultural realm, this research used a multi-method approach to answer three key research questions. The questions, relevant theoretical foundations, and forms of data for addressing them appear in the following table.

Table 3-1. Research Question Data Collection and Analysis Matrix

Research Question	Theoretical Constructs	Data Source
RQ1: How does communication in group decision-making, functionally speaking, operate in a virtual context?	Functional Theory of Group Decision Making (Gouran & Hirokawa, 2003)	Coding of communicative acts
RQ2: How do textual and audio characteristics of the technology affect the ways in which the functions of communication are manifest?	Media Richness Theory (Daft & Lengel, 1984)	Coding of communicative acts
RQ3: Do cultural factors interact with the characteristics of technology with respect to the quality of the decision, the creative outcome of the group, and the satisfaction of group members with their decisions?	Five Dimensions of Culture (Hofstede, 2001), Communication Accommodation Theory (Giles, Taylor, & Bourhis, 1973), Social Presence Theory (Short, Williams, & Christie, 1976)	Observation, survey, interviews, satisfaction and creativity measures

Quantitative Data and Analysis

To assess satisfaction for addressing RQ3, survey data were used. The data came from 20 dyads (20 Americans and 20 Chinese) with 10 communicating in audio and 10 communicating in text; they were analyzed at the individual level. Missing information for some items made the actual sample sizes slightly smaller than 40 for certain models. For the quantitative analysis, the effects of modality and nationality on various dependent variables were explored via one-way Analysis of Variance (one-way ANOVA), Analysis of Covariance (ANCOVA), and Multivariate Analysis of Variance (MANOVA). The various approaches were used to validate the results.

Measures

Table 3-2 presents a summary of and explanation for all the outcome variables. Each measure consisted of several items relating to the degree to which respondents agreed with the

associated statement on a scale of 1-7, with 1 representing strongly disagree and 7 strongly agree. Cronbach's alpha was the index of internal consistency of the items comprising each outcome variable.

Several items, based on prior work by Schwiger, Sandberg, and Ragan (1986), and Mohammed and Ringseis (2001), served as the measure of satisfaction. Each item was accompanied by a 7-point scale ranging from strongly disagree (1) to strongly agree (7) (M=5.67, SD=1.21, alpha=.92). These items further constituted two subcategories: *satisfaction with collaboration* (M=5.67, SD=1.24, alpha=.94) and consisting of four items--"I enjoyed collaborating with my partner," "I think our collaboration was effective," "Working with my partner was an enjoyable experience," and "I would enjoy working with my partner again in the future"-- and *satisfaction with decision* (M=5.67, SD=1.37, alpha=.79) captured by three items, including "I am satisfied with the decisions that were reached," "The decision my partner and I reached was high in quality," and "I wish I could change the decision that we just completed." The third item, "I wish I could change the design that we just completed," was reverse coded, so that lower values indicated higher satisfaction with decision, which was consistent with the other two items.

Although not directly related to the research questions and hypotheses, the survey also provided data for several additional measures, as well as demographic variables, namely gender and age.

Ease of communication encompassed nine items relating to how difficult participants found interacting with the partner. To be consistent with the other five, the first four components were reverse-coded in order to make them capture the meaning of the outcome correctly. Cronbach's alpha was 0.78.

Ease using Google talk, consisting of three items, related to how well the software facilitated the communication process. With the first and third item being reverse-coded, the three items had a Cronbach's alpha of 0.69.

Perceived language difference referred to how similar or dissimilar both the American and Chinese respondents saw themselves while communicating in English. Higher values indicated that the participant felt their partners' English sounded more alien, different, strange, and like "them", as opposed to local, similar, native and like "us." The four items had a Cronbach's alpha of 0.66.

Finally, *perceived consensus* concerned the extent to which the participants saw themselves in agreement, as indexed by two items. Cronbach's alpha was 0.77, with higher values reflecting greater perceived agreement.

In the analysis, these outcome variables were assessed in two ways. First, an average value was calculated from the various items for each outcome that served as the single dependent variable in the One-way Analysis of Variance (One-way ANOVA) or Analysis of Covariance (ANCOVA). Second, the items for each outcome were treated as a vector of dependent variables in a Multivariate Analysis of Variance (MANOVA).

Individual satisfaction, as revealed in the survey data, was also compared with observational and interview results as a way to assure the trustworthiness and dependability of the qualitative data and to provide multiple perspectives (LeCompte & Schensul, 1999). The examination more specifically involved comparing the coded survey data with responses to the interview questions and observations to assess whether discussion or behavior revealed a different degree of satisfaction with the process or with the outcome than what was reported in the data.

Table 3-2. Explanation of Outcome Variables

Name of Outcome Variable	Number of Items	Explanation of Each Item		Cronbach's alpha
Satisfaction with Collaboration (Scale 1-7)	4	I enjoyed collaborating with my partner. I think our collaboration was effective. Working with my partner was an enjoyable experience. I would enjoy working with my partner again in the future.		0.94
Satisfaction with Decision (1-7)	3	I am satisfied with the group decisions that were reached. The decision my partner and I reached was high in quality. I wish I could change the decision that we just completed.	Reverse coded	0.79
Overall Satisfaction (1-7)	7	Items from both satisfaction with collaboration and satisfaction with decision		0.92
Ease of Communication (1-7)	9	I found it difficult to keep track of the conversation.	Reverse coded	0.78
		There were many uncomfortable pauses.	Reverse coded	
		This was an unnatural conversation.	Reverse coded	
		There were too many inappropriate interruptions.	Reverse coded	
		I was able to take control of the conversation when I wanted to.		
		I was able to express myself comfortably.		
		I was able to understand my partner with no difficulty.		
		My partner was able to express himself/herself clearly.		
		I felt that my partner understood me with no difficulty.		
Ease Using Google Talk (1-7)	3	It was very hard to communicate effectively given the tools available.	Reverse coded	0.69
		I found it easy to communicate using the Google Talk.		
		I feel uncomfortable to interact with my partner using the Google Talk.	Reverse coded	
Perceived Language Difference (1-7)	4	Your partner's language sounded (seemed): Local 1 2 3 4 5 6 7 Alien		0.66
		Different 1 2 3 4 5 6 7 Similar	Reverse coded	
		Strange 1 2 3 4 5 6 7 Native	Reverse coded	
		Like us 1 2 3 4 5 6 7 Like them		
Perceived Consensus (1-7)	6	My partner and I developed more shared understanding about the task over time. My partner and I developed more shared understanding about the use of Google Talk over time. My partner and I developed better understanding about each other over time. I agreed with many of the points made by my partner. My partner was willing to compromise on making decisions. I adjusted my viewpoint on some of the issues to incorporate the views of my partner.		0.77

Qualitative Data and Analysis

For the qualitative analysis, and to address RQ1 and RQ2, all recordings of communications via text were saved on Google Chat, and all communications using voice technologies were transcribed by a professional service. The researcher then conducted a content analysis to determine whether the dyads behaved in line with the Functional Theory constructs in their communications. Specifically, the researcher examined whether or not the dyads interacted in a way that satisfied the five requirements Functional Theory addresses during the performance of their decision-making task and how they differed in respect to the two technology conditions of interest. The analysis included such questions as: "Did the participants follow the order or process of the functions prescribed by Functional Theory?" "Was any one of the functions more frequently in the evidence than the others?" "Did the participants fail to address any of the requirements or did they exhibit new functions to the process unique to virtual interaction?" "How did the use of the functions of communication vary for the text vs. audio condition?"

Although not explicitly called for in the research, data related to nationality and gender were also analyzed--specifically, whether the Chinese or American participants assigned greater value to any of the steps of interest in Functional Theory. An examination of the gender pairings was also conducted to determine whether gender influenced the process as prescribed by the theory. In addition, the number of pertinent communicative acts relating to each function were counted and recorded for use in testing each of the four research hypotheses and to determine whether communicative behavior was consistent with precepts of the Functional Theory more frequently in text or audio condition. To do so, the data for the 10 dyads using text communication technology were compared to those for the 10 using audio communication technology. For Hypotheses 1, 2, and 4, the expectation was that there would be a higher average number (mean) of communicative acts in the audio condition than in the text condition. That is, audio would be the technology revealing the greater attention to developing a thorough

understanding of the problem, establishing or identifying the requirements for an acceptable

choice, and determining how well a decision satisfied criteria. For Hypothesis 4, the expectation

was that there would be a lower average number (mean) of communicative acts in the audio

condition than the text condition. That is, the text condition would be the modality yielding

greater attention to developing realistic alternatives. These anticipated results are summarized in

the table below. How well the data conformed to the expectations is one of the matters covered

in Chapter 4.
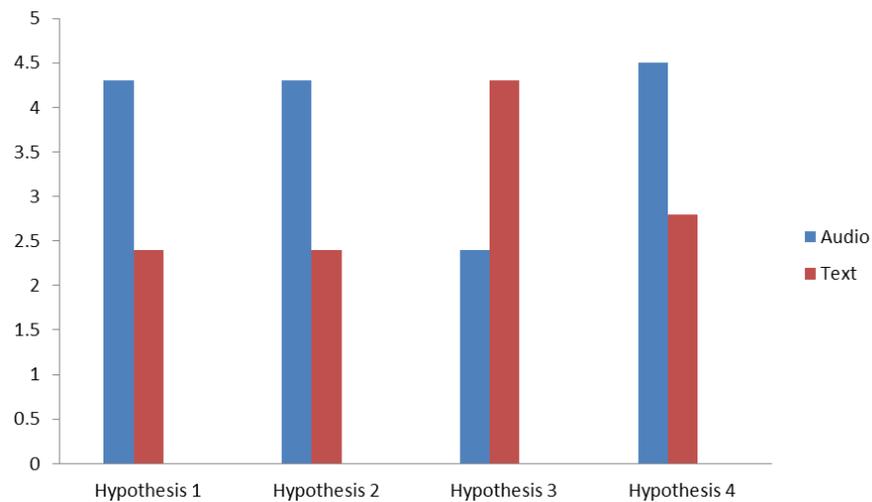
Figure 3-1. Anticipated Results

Finally, to address RQ3, a panel of experts comprised of university administrators and

faculty members was convened to judge the quality of the decision and creativity of the group.

The panel included:

(a) Dr. Theodore Alter, Professor and former Interim Dean, College of Agricultural

Sciences, The Pennsylvania State University; Co-Director, Center for Economic and

Community Development; Adjunct Research Fellow, University of New England, Australia

(b) Dr. Mark Gagnon, Harbaugh Entrepreneurship Scholar and Entrepreneurship Coordinator, College of Agricultural Sciences, The Pennsylvania State University

(c) C. Daniel Azzara , Alan R. Warehime Professor of Agribusiness, College of Agricultural Sciences, The Pennsylvania State University; Former Senior Vice President, Global Research and Development, The Hershey Company

Each of the panelists was provided with transcripts from all 20 dyads. Each was asked to review the transcripts for each dyad and answer the following questions on the evaluation sheets provided for each dyad:

1. Quality of Decision

   a. Did the team follow the five steps prescribed by the Functional Theory?

   b. Did the decision reflect an assessment of the options based on the identified criteria?

2. Creativity

   a. How many alternative ideas were generated? (Creativity was defined as a group's divergent production of ideas, according to Guilford, 1984.)

   b. Any comments about the creativity of this decision or this team?

The collection of the data occurred between October, 2013, and November, 2013. Transcription and completion of the analysis took place between January, 2014, and August, 2014. What the data revealed in respect to the research hypotheses and research questions is the focus of Chapter 4.

Chapter 4

Results

The purpose of this study was to determine whether and, if so, how the Functional Theory of Group Decision Making might apply in the virtual, intercultural team context. Of interest were three research questions and four hypotheses, involving use of both qualitative and quantitative research methods. The previous chapter discussed general methodological and procedural matters, administration of the questionnaire, and the analysis of the data acquired. This chapter presents the results for both the quantitative and the qualitative analyses.

Because the study involved a mixed-methods approach, the chapter begins with a determination of the response to Research Question 3, in light of the quantitative survey data pertaining to satisfaction, along with qualitative data deriving from the expert assessment of creativity and quality of decision outcomes. These results are also compared with those from the interviews of the participants. The chapter then reports on the use of the qualitative technique of coding of communicative acts to address research questions one and two and the related hypotheses.

Quantitative Data—Results for Satisfaction Outcomes

Survey data were used to assess the satisfaction component of the third research question: Do cultural factors interact with the characteristics of technology with respect to the quality of the decision, the creative outcome of the group, and the satisfaction of group members with their decisions? For the quantitative analysis, the effects of modality and nationality for various dependent variables were explored by means of simple Analysis of Variance (ANOVA), Analysis

of Covariance (ANCOVA), and Multivariate Analysis of Variance (MANOVA). This section of the chapter summarizes those results.

Table 4-1 shows the means and standard deviations for variables in the total sample, the U.S. subsample, the Chinese subsample, and results for the analysis of variance using nationality as the independent variable. On a scale of 1 to 7, all of the outcome variables exhibited averages over 5, except for perceived language difference, which suggests that the participants were generally satisfied with various aspects of the communication process, as well as that their perceived language difference was at a relatively low level.

One-way ANOVA with nationality as the independent variable indicated that the Chinese participants had significantly higher levels of satisfaction than U.S. participants ($p = 0.0092$ for satisfaction with collaboration, $p = 0.0114$ for satisfaction with decision, and $p = 0.0056$ for overall satisfaction). Chinese participants also perceived significantly greater ease of communication ($p = 0.0408$) and less language difference ($p = 0.0374$) without adjusting for other factors. Once modality, age, and gender were introduced as covariates to the analysis of variance, the results showed that the group differences with respect to satisfaction with decisions and ease of communication were no longer significant. The perceived language difference was also not significant across two nationalities ($p = 0.0818$), but with a larger sample, might have been. These results were largely consistent with those in the last column of Table 4-2, which shows findings for the MANOVA involving the same independent variables as ANCOVA.

An examination of the sample means for the audio and text conditions (see Table 4-2) shows that of the seven outcome measures, six had higher values in the text condition. That is, higher levels for all three measures satisfaction, ease of communication, ease using google talk, and consensus, but lower level of language difference were perceived when communication occurred via text. With modality as the explanatory variable, One-way ANOVA revealed that the group difference in ease of communication by modality was statistically significant ($p = 0.0284$),

whereas group differences for the other outcomes were not significant. ANCOVA and MANOVA yielded nearly significant results for this outcome ($p = 0.0665$ from ANCOVA and $p = 0.0501$ from MANOVA). The perceived language difference was significantly lower in the text group ($p = 0.0477$), for the ANCOVA.

In addition to the main effects for nationality and modality appearing in Tables 4-1 and 4-2, the interaction effects for these two factors in ANCOVA and MANOVA were significant only in models with perceived language difference as the dependent variable ($p = 0.0182$ from ANCOVA and $p = 0.0319$ from MANOVA).

Table 4-1. Descriptive Statistics for Total Sample, American Subsample, Chinese Subsample, and Results from Analysis of Variance Using Nationality as a Factor

Name of Variables	Total Sample			American			Chinese			One-Way ANOVA	ANCOVA	MANOVA
	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	p value	p value	p value
Satisfaction with Collaboration (Scale 1-7)	40	5.67	1.24	20	5.18	1.41	20	6.15	0.83	**0.0092**	**0.0472**	**0.0302**
Satisfaction with Decision (1-7)	40	5.67	1.37	20	5.14	1.51	20	6.19	1.00	**0.0114**	0.1347	0.1684
Overall Satisfaction (1-7)	40	5.67	1.21	20	5.16	1.37	20	6.17	0.78	**0.0056**	**0.0475**	**0.0336**
Ease of Communication (1-7)	40	5.62	0.92	20	5.33	1.04	20	5.91	0.70	**0.0408**	0.7394	0.1489
Ease Using Google Talk (1-7)	40	5.49	1.37	20	5.40	1.44	20	5.59	1.33	0.6579	0.3236	0.6515
Perceived Language Difference (1-7)	39	3.60	1.32	20	4.00	1.61	18	3.13	0.64	**0.0374**	0.0818	**0.0000**
Perceived Consensus (1-7)	40	5.17	1.10	20	5.01	1.23	20	5.34	0.96	0.3344	0.3324	0.6174
Age	40	22.39	3.18	20	21.29	3.44	20	23.55	2.48			
Number of other Languages	40	0.90	0.71	19	0.47	0.70	20	1.29	0.46			
Years in the U.S.							20	1.10	0.52			
English Proficiency (1-7)							20	4.57	1.03			
	N	Proportion (%)		N	Proportion (%)		N	Proportion (%)				
Audio	40	52.38		20	52.38		20	52.38				
Female	40	61.90		20	66.67		20	57.14				
White				19	100.00							
English as First Language				19	100.00							
Ever Travel outside U.S.				19	89.47							
Chinese as First Language							20	100.00				

Note: Nationality is the factor for one-way ANOVA.

Independent variables for ANCOVA and MANOVA include nationality, modality, age, and gender.

P values lower than 0.05 are bolded.

Table 4-2. Descriptive Statistics for Audio Subsample, Text Subsample, and Results from Analysis of Variance Using Modality as a Factor

Name of Variables	Audio			Text			One-Way ANOVA p value	ANCOVA p value	MANOVA p value
	N	Mean	S.D.	N	Mean	S.D.			
Satisfaction with Collaboration (Scale 1-7)	20	5.59	1.34	20	5.75	1.16	0.6842	0.9373	0.165
Satisfaction with Decision (1-7)	20	5.42	1.45	20	5.93	1.26	0.2341	0.4023	0.8482
Overall Satisfaction (1-7)	20	5.52	1.27	20	5.83	1.15	0.4157	0.6427	0.3626
Ease of Communication (1-7)	20	5.33	0.99	20	5.94	0.74	**0.0284**	0.0665	0.0501
Ease Using Google Talk (1-7)	20	5.32	1.37	20	5.68	1.38	0.3949	0.3964	0.1709
Perceived Language Difference (1-7)	20	3.92	1.3	17	3.18	1.26	0.081	**0.0477**	0.3217
Perceived Consensus (1-7)	20	5.14	0.92	20	5.21	1.3	0.8531	0.8313	0.2556
Age	20	22.76	3.71	20	22	2.55			
Number of other Languages	20	1	0.71	19	0.79	0.71			

	N	Proportion (%)	N	Proportion (%)
American	20	50.00	20	50.00
Audio	20	52.38	20	47.62
Female	20	54.55	20	70.00

Note: Modality is the factor for one-way ANOVA.

Independent variables for ANCOVA and MANOVA include nationality, modality, age, and gender.

P values lower than 0.05 were bolded.

As shown in Figure 4-1, the U.S. participants had higher perceived language difference scores than their Chinese counterparts, but only in the audio condition. That is, the English spoken by the Chinese participants sounded different or stranger to the U.S. participants especially when communicating by audio means, whereas the Chinese reported that their partners' language were local, similar, native, and like "us," regardless of the modality of communication. Similar levels of language difference were recognized by both the Americans and Chinese when they communicated in the text modality.
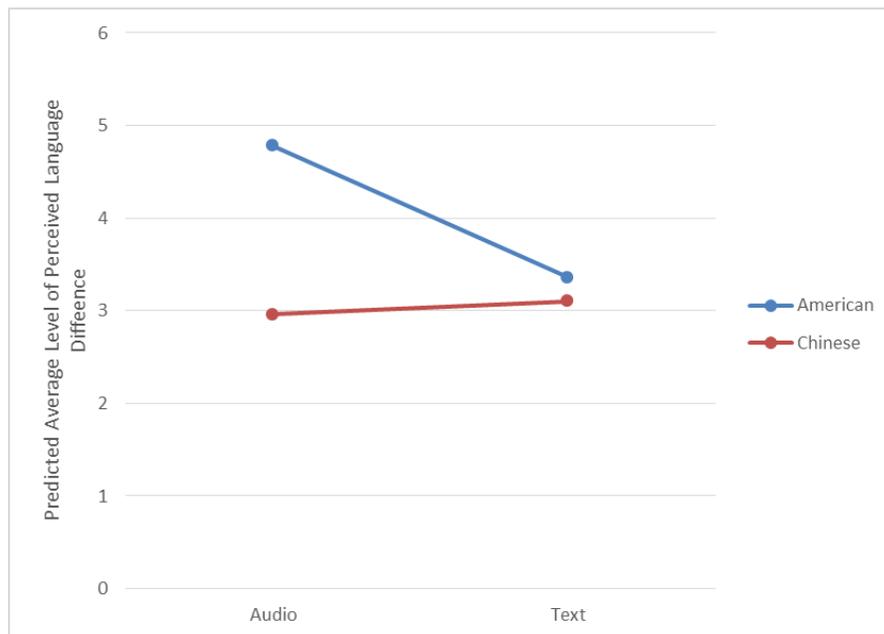

Figure 4-1. Predicted Perceived Language Difference by Nationality and Modality

Comparing the Questionnaire Data Results with Qualitative Interviews for Satisfaction Outcomes

Analysis of the answers from the in-depth, semi-structured interviews, with randomly selected participants conducted immediately after the survey, provided additional insight and

detail relating to participants' satisfaction with the process and the outcome. Of the 14 interviews (7 audio and 7 text), half of the respondents did not believe that the process yielded the best decision despite the questionnaire data suggesting high degrees of satisfaction with the process and outcome. In particular, in the audio condition, two-thirds of the interviewees reported that although the process yielded a satisfactory solution, it was not the best one. In the audio condition, one-third reported that the communication process was difficult as a result of "awkward" pauses and efforts to ensure mutual understanding, and two-thirds reported that face-to-face interaction would have been preferable. The communication difficulties reported in the text condition revolved around frustration of the speed of typing (either too fast or too slow), but fewer were dissatisfied with the decision outcome. (Note that the average time for the audio interaction was 15 minutes, whereas the average time for the text interaction was 21 minutes.) Almost all, however, reported that audio or face-to-face would have been their preferred mode of communication.

Expert Assessment of Other Outcomes

To assess the quality of the decision and the creativity of the outcome, as called for in RQ3, an expert panel was convened. The three experts were asked to review each of the interactions and answer the following questions:

Quality of Decision: Did the team follow the five requirements prescribed by the Functional Theory? Did the decision reflect an assessment of the options based on the identified criteria?

Creativity: How many alternative ideas were generated? (Creativity was defined as a teams's divergent production of ideas, according to Guilford, 1984.) Any comments about the creativity of this decision or this team?

The analysis included a review of data from two of the experts. One of the experts did not accurately understand the instructions to use the criteria of the five requirements prescribed by Functional Theory so that data for him were not included in the analysis. In addition, a second expert only correctly assessed six of the 10 dyads. In total, 16 dyads were reviewed by the experts and assessed for whether they followed the requirements of the Functional Theory, the level of creativity (as measured by number of ideas), and the quality of the decision, as determined by the expert analysis as to whether the group considered options on the basis of criteria. These data were then compared to the satisfaction data.

In the text condition, the dyads addressed the requirements in 62% of the interactions. This condition also showed the greatest creativity (7.95 ideas generated) and the highest number (9) of quality decisions as determined by the experts. This condition further yielded the second highest level of satisfaction, with an overall score of 74.5.

In the text condition, when the dyads did not follow requirements as specified by Functional Theory, the creativity levels dropped, with 4 ideas generated. In this condition, only one of the six dyads achieving a high level of decision quality. The level of satisfaction dropped to third place with a score of 67.5.

In the audio condition, the dyads also followed the requirements 62% of the time, according to the expert analysis. However, the level of creativity, as measured by number of ideas generated, was lower, with only 3.8 ideas generated on average. The quality of the decision was high (7 of the dyads generated high quality decisions), and the level of satisfaction (75) was the highest of all of the conditions.

In the audio condition when the dyads did not follow the sequence in the Functional Theory, the level of creativity dropped to the lowest level (2.4 ideas generated), with no decisions

ranked high in quality. Moreover, the average level of satisfaction, at 53, was the lowest for all

the conditions. (See Table 4-3 for summary.)

Table 4-3. Summary of Expert Review

Expert	Functions	Creativity	Quality	Satsifaction
Expert #1	$T_y = 6$	$T_y = 10.6$	$T_y = 5$ high	$T_y = 77$
	$T_n = 4$	$T_n = 6.5$	$T_n = 1$ high	$T_n = 72$
	$A_y = 5$	$A_y = 3.4$	$A_y = 2$ high	$A_y = 75$
	$A_n = 5$	$A_n = 2.3$	$A_n = 0$ high	$A_n = 47$
Expert #2	$T_y = 4$	$T_y = 5.3$	$T_y = 4$ high	$T_y = 72$
	$T_n = 2$	$T_n = 1.5$	$T_n = 0$ high	$T_n = 63$
	$A_y = 5$	$A_y = 4.2$	$A_y = 5$ high	$A_y = 75$
	$A_{n = 1}$	$A_n = 2.5$	$A_n = 0$ high	$A_n = 59$

T=text; A=Audio; Y=yes; N=no

Qualitative Data—Results for Communication Processes and Behavior

To answer Research Questions 1 and 2, content analysis of the communications between

members of the 20 dyads was conducted to determine whether the dyads followed the process and

behaved in line with the Functional Theory constructs. The coding of communicative acts

provided answers to the following specific questions: 1) How does communication in group

decision-making, functionally speaking, operate in a virtual context? 2) How do textual and

audio characteristics of the technology affect the ways in which the functions of communication

are manifest?

Order and the Communicative Process

In the audio condition, dyads followed the exact order as prescribed by Functional Theory in 30% of the interactions (Table 4-4). In 90% of the cases, dyads began the conversation with the first requirement, and finished on the last requirement 70% of the time. Half the dyads jumped into developing alternatives (Function 3) in addressing the first two requirements but skipped the second requirement only 20% of the time and the fourth requirement only 10% of time. The degree to which dyads in the audio condition deviated from the expected order was an average of 29%, as measured by the frequency with which a dyad went out of order during the interaction.

Table 4-4. Audio Summary of Order

Session	Dyad Number	Order of Functions	% Variance
Monday1	A4/C4	1; 5; 3; 2; 1	43%
Monday2	A2/C2	1; 2; 5; 3; 4	28%
Wednesday1	A2/C2	1; 3; 5; 4	16%
Wednesday1	A4/C4	1; 3; 4; 5	38%
Wednesday2	A2/C2	1; 2; 3; 4; 5	0
Wednesday2	A4/C4	1; 3; 2; 4; 5	44%
Wednesday3	A2/C2	1; 3; 2; 4; 5	21%
Thursday1	A2/C2	3; 4; 1; 2; 5	37%
Thursday2	A2/C2	1; 2; 3; 4; 5	24%
Thursday3	A2/C2	1; 2; 3; 4; 5	10%

In the text condition, dyads followed the order prescribed by Functional Theory in 20% of the interactions (Table 4-5). In 90% of the cases, dyads began the conversation with Function 1, and finished with the last requirement (Function 5) 80% of the time. In 70% of the interactions, dyads jumped into developing alternatives within first two requirements. The dyads in the text condition skipped the second requirement in 40% of the interactions and skipped the fourth requirement in 40%. The average variance from the order by dyads in the text condition was 35% of the time.

Table 4-5. Text Summary of Order

Session	Dyad Number	Order of Functions	% Variance
Monday1	A1/C1	1; 2; 3; 4; 5	33%
Monday1	A3/C3	3; 1; 5; 4	60%
Monday2	A1/C1	1; 5; 3; 2; 4	45%
Monday2	A3/C3	1; 2; 3; 4; 5	0
Monday3	A1/C1	1; 3; 5	31%
Wednesday1	A3/C3	1; 3; 4; 2; 5	42%
Wednesday1	A1/C1	1; 3; 5	31%
Wednesday3	A3/C3	1; 3; 2; 4; 5	16%
Wednesday3	A1/C1	1; 3; 2; 5	31%
Thursday1	A1/C1	1; 3; 5	25%

Importance/Focus of Effort and Communicative Behavior

In the audio condition, dyads assigned the greatest importance to or showed most focus on, as measured by number of utterances, Function 3 (37% of total utterances), followed by Function 2 (19% of total utterances), and Functions 4 and 5 tied for third place (at 16% of total utterances each). Function 1 received the least attention with 12% of total utterances (Table 4-6).

Table 4-6. Audio Summary of Importance

Session	Dyad Number	Importance
Monday1	A4/C4	3; 5; 2/3; 4
Monday2	A2/C2	3; 2; 1; 4/5
Wednesday1	A2/C2	2; 3; 4; 5; 1
Wednesday1	A4/C4	3; 5; ¼
Wednesday2	A2/C2	3; 4; 1/5; 2
Wednesday2	A4/C4	3; 2; 5; 1; 2
Wednesday3	A2/C2	3; 2/5; 4; 1
Thursday1	A2/C2	4; 3; 5; 2; 1
Thursday2	A2/C2	3; 1/2/4; 5
Thursday3	A2/C2	3; 2/4; 1/5

In the text condition, dyads assigned the greatest importance or most focused effort, as measured by number of utterances, to Function 3 (45% of total utterances), followed by Function 5 (17% of total utterances), Function 1 (16% of total utterances), Function 4 (13% of total utterances) and finally Function 2 at 8% of total utterances (see Table 4-7).

Table 4-7. Text Summary of Importance

Session	Dyad Number	Importance
Monday1	A1/C1	3; 4/5; 2; 1
Monday1	A3/C3	3; 5; 1/4; 2
Monday2	A1/C1	3/5; 4; 1; 2
Monday2	A3/C3	3; 1; 5; 2; 4
Monday3	A1/C1	3; 1/5
Wednesday1	A3/C3	3; 1/4; 5; 2
Wednesday1	A1/C1	3; 1/5
Wednesday3	A3/C3	3/4; 1/2; 5
Wednesday3	A1/C1	3; 1; 2; 5
Thursday1	A1/C1	3; 1; 5

Gender and Nationality Influences

Data related to nationality and gender and their interaction were also analyzed. Specifically, the researcher examined whether the Chinese or American participants assigned greater value to any of the steps in the Functional Theory.

In both audio and text conditions, the U.S. participants made a greater number of communicative utterances. The U.S. participants showed greater attention to Function 2 in the audio vs. the text condition (23% vs. 6% of total utterances). In particular, in the audio condition, the U.S. females had a higher number of utterances in the discussions in respect to Function 2 and to a lesser extent in the case of Function 1, with the U.S. males displaying a higher number of

utterances during the discussion in terms of Function 5. There was no substantial difference for the Chinese in the audio vs. the text condition in terms of preferences in the steps in the process.

An examination of the gender pairings was also conducted to determine whether gender influenced the process as proscribed by the theory. In the audio condition, there was a clear pattern, such that when the same sex participants were paired (whether U.S. or Chinese), the dyads made more utterances relating to Function 2. In fact, under conditions in which different sexes were partnered (FA/MC or MA/FC), there were no utterances relating to Function 2. In those different sex conditions, most of the utterances pertained to Function 5. In the text condition, no discernible pattern was evident.

Hypotheses Results for the Five Requirements of Functional Theory

The number of meaningful communicative acts relating to each function were counted and recorded to test each of the four hypotheses and to determine whether communicative behavior was consistent with the precepts of the Functional Theory more frequently in the text or audio condition. To find out, the data for the 10 dyads using text communication technology were compared to those for the 10 dyads using audio communication technology using both descriptive statistics (Tables 4-8 and 4-9) and t-tests (Table 4-10) which compared the means for numbers of utterances according to whether the dyads were using text or audio. For Hypotheses 1, 2, and 4, the expectation was that there would be a higher average number (mean) of communicative acts in the audio condition than in the text condition and a relatively greater emphasis on Functions 1, 2, 4 and 5 in audio rather than text. That is, audio would be the technology revealing the greater attention to developing a thorough understanding of the problem, establishing or identifying the requirements for an acceptable choice, and determining how well a

decision satisfied criteria. For Hypothesis 3, the expectation was that there would be a lower average number (mean) of communicative acts in the audio condition than the text condition and a relative emphasis on Function 3 in the text condition rather than in the audio condition. That is, the text condition would be the modality yielding greater attention to developing realistic alternatives. Hypotheses 2 and 4 were supported by the findings, but there was little evidence to support Hypotheses 1 and 3. This could, however, be due to the small sample size. Following are the results for each hypothesis.

H1: Intercultural virtual teams will develop a more thorough understanding of the problem using audio technology vs. text (Function 1; See Gouran & Hirokawa, 2003). As measured by the relative emphasis on Function 1 vs the other functions (utterances on Function 1 as a percentage of total utterances), the teams placed greater emphasis on Function 1 in the text condition (16.1%) than in the audio condition (11.9%) (Table 4-8). However, the results indicated a higher number (mean) of communicative acts for intercultural virtual groups to develop a thorough understanding of the problem in the audio condition (2.90) than in the text (2.60) condition (see Table 4-9). However, the difference between the audio and text groups was not statistically significant (see Table 4-10). The very small sample size posed limitations on possibilities for detecting significant differences (Trochim, 2005).

H2: Intercultural virtual teams will achieve a more appropriate understanding of the requirements for an acceptable choice in the audio rather than the text condition (Function 2; See Gouran & Hirokawa, 2003). As measured by the relative emphasis on Function 2 vs. the other functions (utterances reflecting attention to Function 2 as a percentage of total utterances), dyads placed greater emphasis on it in the audio condition (19.4%) than in the text condition (8.1%) (Table 4-8). In addition, the results indicated a higher number (mean) of communicative acts for intercultural virtual groups to develop an appropriate understanding of the requirements for an

acceptable choice in the audio (4.80) rather than in the text (1.50) condition. These descriptive

findings were further bolstered by *t*-test results, which indicated that the audio dyads were

significantly more likely to engage in behavior serving Function 2 than the text dyads ($t = 2.76$, p

$< .05$, Cohen's $d =1.24$) (Table 4-9 and 4-10). According to Becker (2000), effect sizes like

Cohen's d characterize the magnitude of a difference; those are $d \leq .2$ are small, $d \leq .5$ are

medium, and $d <=.8$ are large. Thus, the results from bivariate analysis indicated both a

statistically and practically significant difference in means in providing support for Hypothesis 2.

H3: In light of the ability of rich media to transmit cultural cues that may inhibit

participation, intercultural virtual teams will develop fewer realistic alternatives under conditions

in which messages are received aurally as opposed to being text-based (Function 3; See Gouran

& Hirokawa, 2003). As measured by the relative emphasis on Function 3 compared to the other

functions (utterances on Function 3 as a percentage of total utterances), dyads placed greater

emphasis on Function 3 in the text condition (45.3%) than in the audio condition (36.9%) (Table

4-8). However, results indicated a higher (mean) number of communicative acts for intercultural

virtual groups to develop realistic alternatives in the audio condition (8.60) as compared to the

text condition (7.10) (Table 4-9), although the difference was not statistically significant (Table

4-10). A lack of evidence, therefore, existed to support Hypothesis 3.

H4: Because communication accommodation is facilitated by richer media, there will be

more interpersonal influence in the audio vs. the text condition in respect to the determination of

how well decision options satisfy criteria and which one best satisfies them as a whole

(Functions 4 and 5; See Gouran & Hirokawa, 2003). As measured by the relative emphasis on

Functions 4 and 5 (utterances relating to steps 4 and 5 as a percentage of total utterances), dyads

placed greater emphasis on Functions 4 and 5 in the text condition (13.1% and 17.4%,

respectively) than in the audio condition (15.9% and 15.9%, respectively) (Table 4-8). In

addition, there was a higher (mean) number of communicative acts for intercultural virtual teams

in respect to determining how well decision options satisfied criteria in the audio (3.60/3.90) than

the text condition (2.0/2.8), and which one best satisfied them as a whole (Table 4-9). These

trends provided by descriptive analysis were consistent with expectations deriving from

Hypothesis 4, but they were not statistically significant (Table 4-10). However, as noted above,

small sample size limits explanatory power in bivariate analysis.

Table 4-8. Text vs. Audio Summary of Function-Related Utterances

Function	Text (161 Utterances)	Audio (252 Utterances)
1	26 = 16.1%	30 = 11.9%
2	13 = 8.1%	49 = 19.4%
3	73 = 45.3%	93 = 16.9%
4	21 = 13.1%	40 = 15.9%
5	28 = 17.4%	40 = 15.9 %

Table 4-9. Mean and Standard Deviation of Communicative Acts

	Voice (n = 10)			Text (n = 10)			Overall (n = 20)		
		Range			Range			Range	
	M, SD	Min	Max	M, SD	Min	Max	M, SD	Min	Max
Function1	2.90, 1.45	1	5	2.60, 1.35	1	5	2.75, 1.37	1	5
Function2	4.80, 3.22	0	10	1.50, 1.96	0	5	3.15, 3.10	0	10
Function3	8.60, 2.80	5	13	7.10, 2.88	4	12	7.85, 2.87	4	13
Function4	3.60, 1.43	2	6	2.00, 2.40	0	6	2.80, 2.09	0	6
Function5	3.90, 2.13	2	9	2.80, 2.35	1	8	3.35, 2.25	1	9
Total	23.40, 7.26	13	34	16.00, 7.79	6	31	19.70, 8.25	6	34

Table 4-10. Mean Differences According to Function

	Mean (SD)	t	Cohen's d
Function 1			
Voice	2.90 (1.45)	0.49	0.21
Text	2.60 (1.35)		
Function 2			
Voice	4.80 (3.22)	2.76*	1.24
Text	1.50 (1.96)		
Function 3			
Voice	8.60 (2.80)	1.18	0.53
Text	7.10 (2.88)		
(Lg) Function 3			
Voice	0.91 (0.15)	1.29	0.58
Text	0.82 (0.16)		
Function 4			
Voice	3.60 (1.43)	1.81	0.81
Text	2.00 (2.40)		
Function 5			
Voice	3.90 (2.13)	1.10	0.49
Text	2.80 (2.35)		
(Lg) Function 5			
Voice	0.54 (0.21)	0.42	0.76
Text	0.34 (0.31)		
Total			
Voice	23.40 (7.26)	2.20*	0.98
Text	16.00 (7.79)		

*$p < 0.05$

Conclusion

The analyses reported in this chapter provided some support for Hypotheses introduced in Chapter 2 and answers to the research questions. The analysis also revealed some useful insights into the applicability of the Functional Theory in virtual, intercultural teams, as well as the

creativity and satisfaction of the team outcomes. Chapter 5 discusses the results, their

implications, the conclusions they support, and suggestions for future research.

Chapter 5

Discussion, Conclusions, and Suggestions for Further Research

Today's teams, working in intercultural, virtual environments, have a range of technologies to choose from as they do their work. Which technologies they choose for various aspects of the decision-making process may affect such outcomes as satisfaction, creativity, and the quality of the decision. The research reported herein focused on how the use of two different technologies—text and audio—might affect these three outcomes in American and Chinese dyads.

This research applied the framework provided by the Functional Theory of Communication in Group Decision-Making and Problem-Solving in the virtual, intercultural context. Originally created in the 1970s (Gouran, 1999), Functional Theory is one of the pre-eminent accounts of choice-making in groups. It focuses on the functions of communication in assuring satisfaction of five requirements, determined to be key to effective group decision-making interaction (Gouran & Hirokawa, 2003). This study investigated whether or not the five functions of interest would be affected by the type of communication technology used in interactions, as well as how cultural influences might interact with the technology in respect to the process, behavior, and outcomes.

To assess the relationship of technologies of interest to various outcomes, this study brought together 20 dyads of American and Chinese participants and addressed three research questions and four hypotheses while drawing on three separate but interrelated fields of research—group communication, interaction in virtual teams, and cross-cultural, or intercultural, communication. It used a mixed-methods approach that combined previous quantitative research techniques from two previous pilot studies with qualitative methods to delve deeper into the issues, particularly those involving the intercultural differences.

This chapter provides a summary of the results and interpretation of the data organized according to the research questions. It begins with the most specific research question (RQ3) and ends with the broadest (RQ1). The summary reflects the mixed methods approach of this study in presenting the quantitative data in concert with the qualitative data to create the most complete, complex and richest picture of the interactions of culture and technology on the outcomes of interest that the data acquired permit. In the interpretation section, I then explore implications of the research for scholars and practitioners, the strengths and limitations of the study, and possibilities for future research.

Research Question 3: Intercultural Teams and Outcomes

Research Question 3 asked whether cultural factors interact with the characteristics of technology in respect to the quality of decisions, creative outcome of the team, and satisfaction of team members with their decisions. To examine this question, this research used both quantitative and qualitative means. First, immediately following the performance of an experimental task, all participants completed a short questionnaire concerning their interaction experience and related to questions about seven outcomes: satisfaction with the collaboration; satisfaction with the decision; overall satisfaction; ease of communication; ease of using Google talk; perceived language difference and perceived consensus. A subset of the participants underwent an interview to delve deeper into some of these outcome variables. Finally, an expert review panel reviewed the data from the participant interactions to assess two other key outcomes: quality of the decision and creative outcome of the team (as measured by number of ideas).

The questionnaire analysis revealed that both U.S. and Chinese participants had a greater level of satisfaction (for all three measures of satisfaction) in the text condition than the audio condition, although the difference was not statistically significant. Representatives of the two nationalities also noticed fewer language differences in the text than the audio condition, although

once again it was not a significant difference. The ease of communication in the text versus the audio condition for both Americans and Chinese participants, however, was statistically significant. Overall, the Chinese reportedly experienced greater satisfaction in all areas, less language difference and greater ease of communication than the American participants in either condition.

When coupled with the interview data, the results favor the text condition even more strongly for the outcome variables associated with satisfaction. Nearly two-thirds of the participants in the audio condition indicated that the decisions they reached were not the best ones, primarily because the process was difficult and awkward. Although the text condition yielded better results for satisfaction, the participants complained that it took too long to complete the task. All participants said they would have favored face-to-face interaction.

Finally, the expert analysis also indicates a preference for the text condition for additional outcome variables of quality of decision and creativity, particularly when the participants followed the order prescribed by Functional Theory. The expert panel rated the dyads in the text condition that followed the requirements as having the highest levels of creative output and the highest quality of decision. Note that these same dyads also had the highest levels of reported satisfaction. Of particular note, those dyads that did not follow the sequence suggested by the requirements had the lowest levels of creativity and quality of decision whether in the text or audio condition.

Table 5-1. Outcomes Matrix

	Followed	Not Followed
Audio	Creativity – 2 Quality – 2 Satisfaction – 1	Creativity – 4 Quality – 4 Satisfaction – 4
Text	Creativity – 1 Quality – 1 Satisfaction – 2	Creativity – 3 Quality – 3 Satisfaction - 3

The objective of Research Question 3 was to determine whether or not the outcomes of a group decision-making task would differ on the basis of the type of medium used. All methods of research used here point to the text condition as the better mode of communication for the key outcomes variables, particularly when the dyads satisfied the requirements of Functional Theory. These results are consistent with some, but not all, of the theoretical underpinnings for this research. According to researchers Milliken and Martins (1996), while diversity can yield positive outcomes, such as creative output for teams, most of that evolves from "deep" level diversity (Staples & Zhao). On the contrary, "surface"-level diversity (observable traits) can actually hamper performance and negatively influence job satisfaction by causing tension. Moreover, as Kurtzberg (2005) notes, creativity in teams can be negatively affected by evaluation apprehension and production blocking (e.g. someone else's talking) (Paulus & Yang, 2000). Ocker (2005) also identifies dominance as a key inhibitor to creativity in teams. In the research for this dissertation, the audio technology afforded more cues relating to cultural differences and, therefore, may have provided more opportunities for dominance, for example, so that the teams in the text condition performed better on the outcome measures. These results are inconsistent with Media Richness Theory (Daft & Lengel, 1984), which would have one predicting the "richer"

technology yielding better outcomes, particularly with regard to the quality of the decision. The richer technology (audio, in this case) should have allowed for establishing common ground as the basis for accomplishing the task at hand (Clark & Brennan, 1991; Clark & Marshall, 1981). However, this research indicated that in the case of intercultural teams, the "leaner" technology yielded better outcomes in terms of quality, creativity, and satisfaction.

Similarly, For Hypothesis 3, the expectation was that there would be a lower average number (mean) of communicative acts in the audio condition than in the text condition and a relatively greater emphasis on Function 3 in the text condition than in the audio condition. In other words, the text condition would be the "leaner" modality for shielding the surface-level diversity characteristics and allowing deeper-level diversity benefits to generate greater numbers of realistic alternatives. When measured by the relative emphasis on Function 3 compared to the other functions (utterances reflecting Function 3 as a percentage of total utterances), dyads placed greater emphasis on it in the text condition (45.3%) than in the audio condition (36.9%). However, the analysis was not statistically significant and, hence, did not support the research hypothesis.

Research Questions 1 and 2: Intercultural Teams' Processes and Behavior

To answer the first two research questions, content analysis of the communications between members of each of the 20 dyads was conducted to determine whether the dyads followed the process and behaved in line with Functional Theory constructs. Specifically, content analysis via coding of communicative acts provided insight into the following questions: 1) How does communication in team decision-making, functionally speaking, operate in a virtual context; and 2) How, if at all, do textual and audio characteristics of the technology affect the ways in which the functions of communication are manifested? Thus, the analysis focused on both the behavior

(RQ1) and the processes (RQ2), which helped to fill a large gap in current scholarly literature about patterns of discussion and the structure of talk in intercultural, virtual teams.

First, data from the coding process were analyzed to reveal whether intercultural teams followed the sequence of requirements as noted in Functional Theory in the text and audio conditions. There was greater tendency in the text condition not to follow the indicated order; only 20% of the dyads did. Dyads in the text condition were eager to jump into generating alternatives (Function 3), and some even rushed to arrive at a decision (Function 5) without satisfying the first four requirements very well, if at all. In fact, only 60% of the dyads reflected either Function 2 or 4 during the course of the conversation. In the audio condition, although most groups were also eager to generate ideas (Function 3) there was slightly less variance (dyads followed the logical order 30% of the time). Moreover, communicative behavior serving Functions 2 and 4 was more regularly in evidence at 80% and 90%, respectively.

The data were also analyzed to examine whether the intercultural teams assigned greater or less significance to any of the functions required by the theory. Using the number of utterances as a measure of importance assigned to a particular function, both audio and text dyads placed greatest emphasis on developing alternatives (Function 3) at 37% and 45% of total utterances, respectively. Reflecting the results from the analysis of order, audio dyads assigned much greater importance to Function 2 than did the text dyads (19% vs 8%).

Table 5-2. Order of Importance by Function

Audio	Text
3	3
2	5
4	1
5	4
1	2

In terms of behavior, analysis of nationality and gender provided additional insight into issues of interpersonal influence and dominance. In all cases, measured in terms of numbers of utterances, the U.S. participants dominated the discussions. In the audio condition, U.S. participants emphasized Function 2 more than in the text condition. Moreover, in the audio condition, U.S. males dominated utterances related to Function 5 (select the alternative that analysis reveals to be most likely to have the desired characteristics), and U.S. females dominated the discussion related to Function 2 (determine the minimal characteristics any acceptable alternative must possess) and to a lesser extent Function 1 (show a correct understanding of the issue to be resolved). Upon closer examination, a distinct pattern of communication emerged in the audio condition. In conditions in which same-sex pairings occurred, there was greater emphasis on Function 2. In mixed-gender pairings, there was little to no emphasis on Function 2. Indeed, most emphasis in the mixed gender pairings was on Function 5. In the text condition, there was no discernible pattern.

Table 5-3. Gender Pairings Summary Charts

Audio—Function 2

	CM	CF
USM	17	0
USF	0	30

Audio—Function 5

	CM	CF
USM	22	37
USF	25	10

The objective of these two research questions was to determine whether the communication process and behavior would differ in intercultural teams on the basis of the type of technology used. In terms of process, the teams followed the order laid out by Functional Theory more consistently in the audio condition than in the text condition, and the audio pairings spent more time communicating in ways that served Functions 2 and 4 than did the text pairings more evidently concerned with Functions 3 and 5. This outcome can be best explicated using Media Richness Theory (Daft & Lengel, 1984) and the importance of using "richer" media to establish common ground (Clark & Marshall, 1981; Clark & Brennan, 1991). The richness afforded by the audio technology provided a better opportunity to determine the minimal characteristics any acceptable alternative must possess (Function 2) and examine carefully the alternatives in relationship to each previously agreed upon characteristic of an acceptable choice (Function 4).

Both Functions 2 and 4 relate to important requirements of Functional Theory in establishing a common set of criteria for development and selection of options. With the "leaner" technology (text), it is more difficult to establish common ground and, hence, the sharper, more intense focus on Functions 3 and 5.

In terms of behavior, the interpersonal influence exerted by the U.S. participants in the audio condition can be explained by Social Presence Theory (Short, Williams, & Christie (1976), as well as Hofstede's Five Dimensions of Culture. Hofstede (2001) identified five dimensions of culture: power distance, the degree of equality between people in a society; individualism, the degree a society reinforces individual or collective achievement and interpersonal relationships; masculinity, the degree to which the society reinforces the traditional masculine work role model of achievement, control, and power; uncertainty avoidance, the degree to which society encourages tolerance for uncertainty and ambiguity; and long-term orientation, the degree to which society embraces devotion to traditional or progressive values over time. In the case of the U.S. and Chinese dyads in this study, issues of power and individualism in particular may have influenced behavior in ways that enabled the U.S. participants to dominate. Perhaps if the experiment had taken place in China rather than on a U.S. college campus, the power dimension may have been weakened. Social Presence Theory (Short, Williams, & Christie, 1976) posits that the type of medium used for communication can afford someone greater presence allowing for increased influence over process and outcomes. Given the cultural dimensions of power and individualism, richer media presumably afforded the U.S. participants opportunities for greater influence in this study, in accordance with Social Presence Theory.

Similarly, the outcomes for Hypotheses 1, 2, and 4 were mixed but not inconsistent with this analysis. Given the aforementioned theoretical underpinnings, for Hypotheses 1, 2, and 4, the expectation was that there would be a higher average number (mean) of communicative acts

in the audio condition than in the text condition and a relatively greater emphasis on Functions 1, 2, 4 and 5 in audio rather than text. That is, audio would be the "richer" technology revealing the greater attention to developing a thorough understanding of the problem, establishing or identifying the requirements for an acceptable choice, and determining how well a decision satisfied criteria. While the statistical analysis supported Hypotheses 2 and 4, there was little evidence to support Hypothesis 1.

Discussion

This research investigated whether text or audio technology would yield better outcomes (satisfaction, creativity, quality) in decision-making intercultural virtual teams. In both text and audio conditions, the outcomes were better when the teams followed the requirements as sequenced in Function Theory. Most likely, addressing the requirements of Functional Theory in sequence offered these virtual teams the clear direction needed for success (Amabile, 1996), as well as provided the means (Functions 2 and 4) necessary for establishing "common ground," which has been deemed critical to success in the virtual world (Clark & Brennan, 1991; Clark & Marshall, 1981).

Which technology (audio vs. text) intercultural virtual teams prefer to use may depend on the relative importance of the outcomes for a particular situation. For example, while texting dyads that followed the tenets of Functional Theory exhibited better outcomes in terms of quality of decision and creativity, audio-driven dyads who followed Functional Theory rated slightly higher on outcomes indicative of satisfaction. Teams eager to establish relationships based on feelings of satisfaction and less concerned about other outcomes may want to use audio, rather than text technology. On the other hand, teams concerned about creative and high quality output and less about team-member satisfaction may be better advised to use text for communication.

Despite such variations, intercultural virtual teams may be best served by text technology. The shortcomings in satisfaction appear to have stemmed from the length of time it took for

teams to communicate rather than any deeper source of frustration. These shortcomings may be readily addressed by procedural interventions to promote active listening and/or attention skills (Hernandez & Coronas, 2004). Using text, the "leaner" technology, may provide camouflage for "surface-level" diversity (observable traits) that can inhibit successful team outputs by triggering inhibitors while opening access to the "deep-level" diversity that fosters creative output by bringing more information and ideas into the team and stimulating thinking (Staples & Zhao, 2006).

Limitations of the Study

This study advanced the current status of theory in three separate but interrelated bodies of research: group communication, virtual teams, and intercultural communication. It delved into patterns of communication and talk and took a long-standing theory, Functional Theory, and extended it to the intercultural, virtual world and shed new light on the communication technologies that might best serve today's global communication needs. Moreover, this study builds on two previous studies (Behring & Xu, 2014; Behring & Xu, 2009; Behring, Xu, & Chesnick, 2007) contributing a large pool of data (both quantitative and qualitative) to the developing field of inquiry. It also addressed a large gap in the research, in that it compared two communication technologies rather than technology to face-to-face interaction.

There were several limitations to this research study that should be addressed in future efforts to replicate the results or extend the findings. First, the sample was small and the sampling method may have biased the results. The difficulty of recruiting adequate numbers of Chinese participants during this third study on this topic resulted in a decision to limit the number of total dyads to 20. Moreover, the interview data was more limited than expected due to: 1) saturation; and 2) incomplete recording of interviews of the Chinese participants. Moreover, many of the participants were recruited personally and may have had a predisposition and

inclination to work successfully in an intercultural setting. Because the sample size was small and confined to a university setting, the results may not be generalizable to the general population and may not transfer easily to a work or other organizational environment. Moreover, there were a number of other potential moderating variables not considered in the experimental procedure. While an effort was made to control for the time that the Chinese students had been living in the United States, the experiment did not control for age or language ability.

Concluding Comment and Suggestions for Future Research

Despite the limitations noted above, the study did provide evidence indicating that the Functional Theory of Group Decision Making applies to the intercultural, virtual world. Based on work by Lee and Baskerville (2003), this study offers an alternative to the traditional view of generalizability. Using Lee and Baskerville's four frameworks, the results of this study may be generalizable to Functional Theory. However, there are modifications to the functions that may need to be made in different technological settings involving different cultures. In practice, participants and managers of multicultural, virtual teams may want to consider these issues when using various technologies to maximize creativity and team satisfaction. Future research could investigate groups instead of dyads to see if results transfer to situations involving more than 2 partners and more than two cultures. This research focused solely on Functional Theory, which is designed for decision-making tasks. A larger research need exists to understand the communication patterns in the intercultural, virtual world and how technology interacts with culture to affect the structure of talk and the outcomes of groups in today's interconnected world that go beyond decision-making. An opportunity clearly exists for merging of these bodies of research to reflect the realities of today's global communication needs.

References

Amabile, T. M. (1996). *Creativity in context*. Boulder, CO: Westview Press.

Baer, M., & Frese, M. (2003). Innovation is not enough: Climates for initiative and psychological safety, process innovations, and firm performance. *Journal of Organizational Behavior, 24,* 45-68.

Baltes, B. B., Dickson, M. W., Sherman, M. P., Bauer, C. C., & LaGanke, J. S. (2002). Computer-mediated communication and group decision making: A meta-analysis. *Organizational Behavior and Human Decision Processes*, *87*, 156-179.

Barker, V., Giles, H., & Harwood, J. (2004). Inter- and intra-group perspectives on intergenerational communication. In J. F. Nussbaum & J. Coupland (Eds.), *Handbook of communication and aging research* (2nd ed., pp. 139-165). Mahwah, NJ: Erlbaum.

Becker, L.A. (2000). *Effect size (ES).* University of Colorado at Colorado Springs. Retrieved from http://www.bwgriffin.com/gsu/courses/edur9131/content/EffectSizeBecker.pdf.

Behring, D.M., & Xu, Q. (2014). The richer the better? Effects of modality on intercultural communication, *International Journal of Communication*, *8*, 2733-2754.

Behring, D. M., & Xu, Q. (2009, August). *Is multimodality better than single modality?: Exploring modality effect on inter-cultural virtual collaboration.* Paper presented at the annual Conference of the Association for Education in Journalism and Mass Communication, Boston, MA.

Behring, D. M., Xu, Q., & Chesnick, R. (2007, May). *The effect of media modality on cross-cultural virtual cooperation.* Paper presented at the annual Conference of the International Communication Association, Montreal, Quebec, Canada.

Bird, A., & Osland, J. S. (2006). Making sense of intercultural collaboration. *International Studies of Management and Organization, 35*(4), 115-132.

Brown, V., Tumeo, M., Larey, T. S., & Paulus, R. B. (1998). Modeling cognitive interactions during group brainstorming. *Small Group Research, 29,* 495-526.

Castells, M. (1996). *The rise of the network society.* Cambridge, MA: Blackwell.

Clark, H. H., & Brennan, S. E. (1991). Grounding in communication. In L. B. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 127-149). Washington, DC: American Psychological Association.

Clark, H. H., & Marshall, C. E. (1981). Definite reference and mutual knowledge. In A. K. Joshi, B. L. Webber, & I. A. Sag (Eds.), *Elements of discourse understanding* (pp. 10-63). Cambridge, England: Cambridge University Press.

Cordero, R., DiTomaso, N., & Farris, G. F. (1997). Gender and race/ethnic composition of technical work groups: Relationship to creative productivity and morale. *Journal of Engineering and Technology Management, 13*, 205-221.

Creswell, J., Clark, V., Gutmann, M., & Hanson, W. (2003). Advanced mixed methods research designs. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 209-240). Thousand Oaks, CA: Sage.

Currall, S.C., & Towler, A.J. (2003). Research methods in management and

    organizational research: Toward integration of qualitative and quantitative

    techniques. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods*

    research in social and behavioral research (pp. 513-526). Thousand Oaks, CA:

    Sage.

Daft, R. L., & Lengel, R. H. (1984). Information richness: A new approach to manager

    information processing and organization design. In B. Staw & L. L. Cummings

    (Eds.), *Research in organizational behavior* (pp. 191-233). Greenwich, CT: JAI

    Press.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media

    richness, and structural design. *Management Science*, *32*, 554-571.

Daft, R. L., Lengel, R. H., & Trevino, L. K. (1987). Message equivocality, media

    selection, and manager performance: Implications for information systems. *MIS*

    Quarterly, *11*, 355-366.

DeSanctis, G., & Monge, P. (1999). Communication processes for virtual organizations.

    Organization Science, 10, 693-703.

Dube, L., & Pare, G. (2004). The multifaceted nature of virtual teams. In D. J. Pauleen

    (Ed.), *Virtual teams: Projects, protocols and processes* (pp. 1-30). Hershey, PA:

    Idea Group Inc.

Earley, P. C., & Peterson, R. S. (2004). The elusive cultural chameleon: Cultural

    intelligence as a new approach to intercultural training for the global manager.

    Academy of Management Learning & Education, *3*, 100-115.

Evaristo, R. (2003). The management of distributed projects across cultures. *Journal of Global Information Management, 11*, 58-70.

Fletcher, T. D., & Major, D. A. (2006). The effects of communication modality on performance and self-ratings of teamwork components. *Journal of Computer-Mediated Communication, 11*, 557-576. Retrieved on March 30, 2007, from http://jcmc.indiana.edu/vol11/issue2/Fletcher.html

Friedman, T. L. (2005). *The world is flat: A brief history of the twenty-first century*. New York, NY: Farrar, Straus, and Giroux.

Gallois, C., Giles, H., Jones, E., Caregile, A. C., & Ota, H. (1995). Accommodating intercultural encounters: Elaborations and extensions. In R. Wiseman (Ed.,), *Theories of intercultural communication* (pp. 115-147). Thousand Oaks, CA: Sage.

Giles, H., Coupland, N., & Coupland, J. (1991). Accommodation theory: Communication, context, and consequence. In H. Giles, N. Coupland, & J. Coupland (Eds.), *Context of accommodation: Developments in applied sociolinguistics* (pp. 1-68). Cambridge, England: Cambridge University Press.

Giles, H., Taylor, D. M., & Bourhis, R. (1973). Towards a theory of interpersonal accommodation through language: Some Canadian data. *Language in Society*, *2*, 177-192.

Gilson, L. L., & Shalley, C. E. (2004). A little creativity goes a long way: An examination of teams' engagement in creative processes. *Journal of Management, 30,* 453-470.

Godar, S. H., & Ferris, S. P. (2004). Preface. In S. H. Godar & S. P. Ferris (Eds.), *Virtual and collaborative teams: Process, technologies, and practice* (pp. vi-xiii). London, England: Idea Group.

Gouran, D. S. (1999). Communication in groups: Emergence and evolution of a field of study. In L. R. Frey, D. S. Gouran, & M.S. Poole (Eds.), *The handbook of group communication theory and research* (pp. 3-36). Thousand Oaks, CA: Sage.

Gouran, D. S. (2003). Leadership as the art of counteractive influence in decision-making and problem-solving groups. In R. Y. Hiokawa, R. S. Cathcart, L. A. Samovar, & L. D. Henman (Eds.), *Small group communication theory & practice: An anthology* (8th ed., pp. 172-183). New York, NY: Oxford University Press.

Gouran, D. S., & Hirokawa, R. Y. (1983). The role of communication in decision-making groups: A functional perspective. In M. S. Mander (Ed.), *Communications in transition: Issues and debates in current research* (pp. 168-185). New York, NY: Praeger.

Gouran, D. S., & Hirokawa, R. Y. (1986). Counteractive functions of communication in effective group decision-making. In R. Y. Hirokawa & M. S. Poole (Eds.), *Communication and group decision-making* (pp. 81-92). Newbury Park, CA: Sage.

Gouran D. S., & Hirokawa, R. Y. (1996). Functional theory and communication in decision-making and problem-solving groups: An expanded view. In R. Y. Hirokawa & M. S. Poole (Eds.), *Communication and group decision-making* (2nd ed., pp. 55-80). Thousand Oaks, CA: Sage.

Gouran, D. S., & Hirokawa, R. Y. (2003). Effective decision making and problem solving in groups: A functional perspective. In R. Y. Hirokawa, R. S. Cathcart, L. A. Samovar, & L. D. Henman (Eds.), *Small group communication theory and practice: An anthology* (8th ed., pp. 27-38). New York, NY: Oxford University Press.

Guilford, J. P. (1984). Varieties of divergent production. *Journal of Creative Behavior*, *18,* 1-10.

Griffin, E. (2008). *A first look at communication theory* (7th ed.). New York, NY: McGraw-Hill.

Hall, E. T. (1973). *The silent language.* Oxford, England: Anchor.

Hambrick, D. C., Davison, S. C., Snell, S. A, & Snow, C. C. (1998). When groups consist of multiple nationalities: Towards a new understanding of the implications. *Organization Studies, 19,* 181-205.

Hajek, C., & Giles, H. (2003). New directions in intercultural communication competence: The process model. In J. O. Greene & B. R. Burleson (Eds.), *Handbook of communication and social interaction skills* (pp. 935-957). Mahwah, NJ: Erlbaum.

Hart, W. (1996, November). *A brief history of intercultural communication: A paradigmatic approach.* Paper presented at the annual Conference of the Speech Communication Association, San Diego, CA.

Henry, J. E., & Hartzler, M. (1998). *Tools for virtual teams.* Milwaukee, WI: ASQC Quality Press.

Hernandez, M. G., & Coronas, T. T. (2004). Virtual teams and their search for creativity. In S. H. Godar & S. P. Ferris (Eds.), *Virtual and collaborative teams: Process, technologies and practice* (pp. 213-231). London, England: Idea Group.

Hinds, P., & Bailey, D. (2000). Virtual teams: Anticipating the impact of virtuality on team process and performance. *Academy of Management Proceedings,* 2000, OCIS.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations* (2nd ed.). Thousand Oaks, CA: Sage.

Holahan P. J., Aronson Z. H., Jurkat M. P., Schoorman F. D. (2004). Implementing computer technology: A multiorganizational test of Klein and Sorra's model. *Journal of Engineering and Technology Management, 21*(1-2), 31-50.

Hollingshead, A. B., Wittenbaum, G. M., Paulus, P. B., Hirokawa, R. Y., Ancona, D. G., Peterson, R. S., et al. (2005). A look at groups from the functional perspective. In M. S. Poole & A. B. Hollingshead (Eds.), *Theories of small groups: Interdisciplinary perspectives* (pp. 21-62). Thousand Oaks, CA: Sage.

Jarboe, S. (1999). Groups communication and creativity processes. In L. R. Frey, D. S. Gouran, & M. S. Poole (Eds.), *The handbook of group communication theory and research* (pp. 335-368). Thousand Oaks, CA: Sage.

Kanawattanachai, P., & Yoo, Y. (2002). Dynamic nature of trust in virtual teams. *Journal of Strategic Information Systems, 11,* 187-213.

Kurtzberg, T. R. (2005). Feeling creative, being creative: An empirical study of diversity and creativity in teams. *Creativity Research Journal*, *17*, 51-65.

Larson, J. R. (2010). *In search of synergy in small group performance.* New York, NY: Psychology Press.

LeCompte, M., & Schensul, J. (1999). *Designing and conducting ethnographic research.* Walnut Creek, CA: AltaMira.

Lee, A. S., and Baskerville, R. L. (2003). Generalizing Generalizability in Information Systems Research," *Information Systems Research, 14*, 221-243.

Li, S. S. (2007). Computer-mediated communication and group decision making: A functional perspective. *Small Group Research*, *38*, 593-614.

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

Mednick, S. (1962). The associative bias of the creative process. *Psychological Review, 69,* 220-232.

Milgram, R. M., & Rabkin, L. (1980). Developmental test of Mednick's associative hierarchies of original thinking. *Developmental Psychology, 16,* 157-158.

Milliken, F. J., & Martins, L. L. (1996). Searching for common threads: Understanding the multiple effects of diversity in organizational groups. *Academy of Management Review, 21*, 402-433.

Mingoia, E. (1961). Can creativity be harnessed? *Journal of Educational Sociology, 35,* 152-158.

Moghaddam, F., Walker, B., Harre, R. (2003). Cultural distance, levels of abstraction, and the advantages of mixed methods. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 111-134). Thousand Oaks, CA: Sage.

Mohammed, S., & Ringseis, E. (2001). Cognitive diversity and consensus in group

decision making: The role of inputs, processes, and outcomes. *Organizational*

Behavior and Human Decision Processes, 85, 315-335.

Nemiro, J. E. (2002). The creative process in virtual teams. *Creativity Research Journal*,

14, 69-83.

Nemiro, J., & Runco, M. A. (1996). *Creativity and innovation in small groups.*

Unpublished manuscript, The Claremont Graduate School, Claremont, CA.

Ocker, R. J. (2005). Influences on creativity in asynchronous virtual teams: A qualitative

analysis of experimental teams. *IEEE Transactions on Professional*

Communication, *48*, 22-39.

Paul, S., Samarah, I. M., Seetharaman, P., & Myktyn, P.P. (2005). An empirical

investigation of collaborative conflict management style in group support system-

based global virtual teams. *Journal of Management Information Systems*, *21*,

185-222.

Pauleen, D. (2003). Leadership in a global virtual team: An action learning approach.

Leadership and Organization Development Journal, 24, 153-162.

Paulus, P. B., & Yang, H. (2000). Idea generation in groups: A basis for creativity in

organizations. *Organizational Behavior and Human Decision Processes*, *82*, 76-

87.

Poole, M. S. (1999). Group communication theory. In L. R. Frey, D. S. Gouran, & M. S.

Poole (Eds.), *The handbook of group communication theory & research* (pp. 37-

70). Thousand Oaks, CA: Sage.

Porter, R. E., & Samovar, L. A. (2003). Communication in the multicultural group. In L. A. Samover, R. Y. Hirokawa, & R. S. Cathcart (Eds.), *Small group communication theory & practice: An anthology* (8th ed., pp. 155-169). New York: Oxford University Press.

Roffe, I. (1999). Innovation and creativity in organizations: A review of the implications for training and development. *Journal of European Industrial Training, 23,* 224-241.

Ryan, E. B., Hummert, M. L., & Boich, L. H. (1995). Communication predicaments of aging: Patronizing behavior toward older adults. *Journal of Language and Social Psychology, 14,* 144-166.

Schweiger, D. M., Sandberg, W. R., & Ragan, J. W. (1986). Group approaches for improving strategic decision making: A comparative analysis of dialectic inquiry, devil's advocacy, and consensus. *The Academy of Management Journal, 29*, 51-71.

Setlock, L. D., Fussell, S. R., & Neuwirth, C. (2004). Taking it out of context: Collaborating within and across cultures in face-to-face settings and via instant messaging. *Proceedings of CSCW 2004* (pp. 604-613). New York, NY: ACM Press.

Setlock, L. D., Quinones, P., & Fussell, S. R. (2007). *Does culture interact with media richness? The effects of audio vs. video conferencing on Chinese and American dyads.* Paper presented at the 40th Annual Hawaii International Conference on System Sciences. Honolulu, HI.

Setlock, L. D., Fussell, S.R., Ji, E., & Culver, M. (2009). Sorry to interrupt: Asian media preference in cross-cultural collaborations. *Proceedings of the International Workshop on Intercultural Collaboration,* 309-312. New York, NY.

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

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

Straus, S., & McGrath, J. (1994). Does the medium matter? The interaction of task type and technology on group performance and member reactions. *Journal of Applied Psychology, 79,* 87-97.

Torrance, E. P., & Goff, K. (1992). A quiet revolution. In S. J. Parnes (Ed.), *Sourcebook for creative problem solving* (pp. 78-84). Buffalo, NY: The Creative Education Foundation Press.

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

Trochim, W.M. (2005). *Research methods: The concise knowledge base.* Cincinnati, OH: Atomic Dog.

Valacich, J. S., Paranka, D., George, J. F., & Nunamaker, J. F. (1993). Communication concurrency and the new media: A new dimension for media richness. *Communication Research, 20,* 249-276.

Veinott, E., Olson, J., Olson, G., & Fu, X. (1999). Video helps remote work: Speakers who need to negotiate common ground benefit from seeing each other. *Proceedings of the CHI 99* (pp. 302-309). New York, NY: ACM.

Wang, H.-C., & Fussell, S.R. (2009). Cultural adaptation of conversational style in

    intercultural computer-mediated group brainstorming. *Proceedings of the*

    International Workshop on Intercultural Collaboration (pp. 317-320). Palo Alto,

    CA.

Zhang, S., Fjermestad, J., & Tremaine, M. (2005). Leadership styles in virtual team

    context: Limitations, solutions and propositions. *Proceedings of the 38th Annual*

    Hawaii International Conference on System Sciences (p. 48). Honolulu, HI.

Zhou, J. (2003). When the presence of creative co-workers is related to creativity: Role

    of supervisor close monitoring, developmental feedback, and creative personality.

    Journal of Applied Psychology, 88, 413-422.

Appendix

Collaboration Questionnaire

Your Task Number_____

Part A : Your Satisfaction with the Task

Please describe your satisfaction with the task. REMEMBER, all the ratings of items are based on the task you have just finished.

1) I enjoyed collaborating with my partner.

   Strongly disagree 1   2   3   4   5   6   7 Strongly agree

2) I think our collaboration was effective.

   Strongly disagree 1   2   3   4   5   6   7 Strongly agree

3) Working with my partner was an enjoyable experience

   Strongly disagree 1   2   3   4   5   6   7 Strongly agree

4) I would enjoy working with my partner again in the future.

   Strongly disagree 1   2   3   4   5   6   7 Strongly agree

5) I am satisfied with the group decisions that were reached.

   Strongly disagree 1   2   3   4   5   6   7 Strongly agree

6) The discussion my partner and I reached was high in quality.

   Strongly disagree 1   2   3   4   5   6   7 Strongly agree

7) I wish I could change the design that we just completed.

   Strongly disagree 1   2   3   4   5   6   7 Strongly agree

Part B : Your Attitude toward the Communication Process

Please choose the number that best describes your feeling towards the communication process of the task. REMEMBER, all ratings of items are based on the task you have just finished.

1) I found it difficult to keep track of the conversation.

  Strongly disagree 1   2   3   4   5   6   7 Strongly agree

2) There were many uncomfortable pauses.

  Strongly disagree 1   2   3   4   5   6   7 Strongly agree

3) This was an unnatural conversation.

  Strongly disagree 1   2   3   4   5   6   7 Strongly agree

4) There were too many inappropriate interruptions.

  Strongly disagree 1   2   3   4   5   6   7 Strongly agree

5) I was able to take control of the conversation when I wanted to.

  Strongly disagree 1   2   3   4   5   6   7 Strongly agree

6) I was able to express myself comfortably.

  Strongly disagree 1   2   3   4   5   6   7 Strongly agree

7) I was able to understand my partner with no difficulty.

  Strongly disagree 1   2   3   4   5   6   7 Strongly agree

8) My partner was able to express himself/herself clearly.

  Strongly disagree 1   2   3   4   5   6   7 Strongly agree

9) I felt that my partner understood me with no difficulty.

  Strongly disagree 1   2   3   4   5   6   7 Strongly agree

 10) It was very hard to communicate effectively given the tools available.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

11) I found it easy to communicate using the Google Talk.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

12) I feel uncomfortable to interact with my partner using the Google Talk.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

Part C: Your Impression towards Your Partner

Please describe your impression towards your partner. REMEMBER, all the descriptions are for the partner you have just cooperated with.

Your partner's language sounded (seemed):

Local   1   2   3   4   5   6   7   Alien

Different   1   2   3   4   5   6   7   Similar

Strange   1   2   3   4   5   6   7   Native

Like us   1   2   3   4   5   6   7   Like them

Part D: The Interaction between You and Your Partner on the Task

1) My partner and I developed more shared understanding about the task over time.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

2) My partner and I developed more shared understanding about the use of Google Talk over time.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

3) My partner and I developed better understanding about each other over time.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

4) I agreed with many of the points made by my partner.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

5) My partner was willing to compromise on making decisions.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

6) I adjusted my viewpoint on some of the issues to incorporate the views of my partner.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

7) The viewpoints expressed by my partner had no impact on my thinking about the ranking of items.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

8) I had a completely opposite view on the item rankings after discussion with my partner.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

9) My partner made statements that influenced the way I thought about the ranking of items.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

10) My partner made me rethink my own views I had before the discussion.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

Part E: Your Attitude toward the Google Talk

1) Compared with the text chat function, the audio talk function of Google Talk took your partner and you **less** time to reach a decision.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

2) Compared with the text chat function, the audio talk function of Google Talk took your and your partner **less** time to prioritize ideas.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

3) Compared with the text chat function, the audio talk function of Google Talk produced **higher** quality ideas.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

4) Compared with the text chat function, the audio talk function of Google Talk generated **more** ideas.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

5) My personal level of contribution to the task was **higher** in the text chat-based collaboration than in the audio-talk based collaboration.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

6) The results of the text chat-based collaboration reflect my inputs **less** than did the audio talk-based collaboration.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

7) There was **more** conflict in the text-based collaboration than in the audio-based collaboration.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

8) The text chat function of Google Talk was **easier** to use than the audio talk function.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

9) I'd prefer to use the text chat function of Google Talk rather than the audio talk function for similar tasks in the future.

Strongly disagree   1   2   3   4   5   6   7   Strongly agree

Part F: Demographic information about yourself.

1) How often do you use Instant Message Systems (such as MSN, Yahoo Messenger, Googletalk, Skype, etc)?

Never   0   Rarely 1   2   3   4   5   6   7   Very Often

2) Please describe your level of familiarity with the Instant Message Systems in general.

Not at all familiar   1   2   3   4   5   6   7   Very familiar

3) Please describe your level of familiarity with the text chat function of the Instant Message Systems.

Not at all familiar   1   2   3   4   5   6   7   Very familiar

4) Please describe your level of familiarity with the audio talk function of the Instant Message Systems.

Not at all familiar   1   2   3   4   5   6   7   Very familiar

5) Your gender?   1   male   2 female

6) Your age: _____

7) Your nationality: _____

8) Your Ethnicity: 1 Hispanic

          2 Black

          3 Asian

          4 American Indian/Alaska Native

          5 White, not Hispanic

9) What is your first language?   1 Chinese   2 English   3 other

10) How many other languages (aside from your first language) do you speak?

_____

11) Have you traveled outside of the U.S.?   1 yes   2 no

VITA
Deanna M. Behring

EDUCATION AND LANGUAGE
Ph.D. Communications Coursework, The Pennsylvania State University (expected 12/15)
Research: Cross-Cultural Communication in Virtual Communities
Ph.D. Economics Coursework, University of Colorado, Boulder, Colorado (1991-1992)
M.A. International Economic Development, University of Ohio, Athens, Ohio (1986)
Research: Economic Growth and Policies of the Taiwanese Tiger
B.A. Economics, French, and Public Policy, Albion College, Albion, Michigan (1985)
Certificate in Chinese Language, Feng Chia University, Taichung, Taiwan (1986)
Certificate in French Language, Alliance Francaise, Paris, France (1984)

SELECT PROFESSIONAL EXPERIENCE
The Pennsylvania State University (2000-present)
Director of International Programs, College of Agricultural Sciences

U.S. Department of Commerce, Technology Administration (1999-2000)
International Consultant to the Under Secretary for Technology

White House Office of Science and Technology Policy and National Security Council
Assistant Director for International Affairs and Director for Science and Technology (1995-1999)
Senior Policy Analyst, National Security and International Affairs (September 1994-April 1995)

Central Intelligence Agency 1988-1994
Senior Economic Analyst, International Trade and Finance (1993-1994)
Economic and Political Analyst (1988-1991)

TEACHING EXPERIENCE
The Pennsylvania State University, International Agriculture Minor (2011-present)
University of Colorado, Department of Economics, Teaching Assistant (1991-1992)
Feng Chia University, Taiwan, English Instructor (1985-1986)

RELEVANT PAPERS, PUBLICATIONS, PRESENTATIONS
"The Richer the Better? Effects of Modality on Intercultural Communication," in the
        International Journal of Communication, University of Southern California press (2014).
"Extending the Functional Theory of Communication Decision-Making in Groups to the Virtual
        World: A Study of the Relationship of Modality and Cultural Background to
        Satisfaction, Creativity, and Decision Quality in Virtual Team Interaction," 2012, The
        Third Annual WRTC Graduate Symposium on Communication, Harrisonburg, VA
"Is Multimodality Better than Single Modality? Exploring modality effect on inter-cultural
        virtual collaboration," 2009, AEJMC Annual Convention, Boston, MA
"The Effect of Media Modality on Cross-Cultural Virtual Cooperation," 2008 International
        Communication Association, Montreal, Canada
"The Effect of Media Modality in Chinese-American Virtual Teams," 2008 IST Graduate
        Symposium, February 1, 2008, State College, PA