A SMALL GROUP INTERACTION VIA VIDEOCONFERENCING:
USERS' PERCEPTIONS AND THE EFFECTS OF
COMMUNICATION CONDITIONS ON COHESIVENESS,
SOCIAL PRESENCE, AND SENSE OF PRESENCE

A THESIS SUMBITTED TO THE GRADUATE DIVISION OF THE
UNIVERSITY OF HAWAI'I IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

IN

COMMUNICATION

MAY 2004

BY
Miwa Yamazaki

Thesis Committee:
Dineh Davis, Chairperson
Gary Fontaine
Norman Okamura
ACKNOWLEDGEMENTS

I was very fortunate to receive various forms of supports in the process of conducting interviews, focus groups, and experiments in order to complete the thesis. I would like to sincerely express my appreciation here:

Dr. Dineh Davis, who served as a chairperson of my thesis; I would like to appreciate her very much for spending large amount of precious time for discussions, and giving me guidance and support throughout the completion of this thesis;

Dr. Gary Fontaine, who were willing to be my committee member, and gave me advices and recommendations toward my thesis completion;

Dr. Norman Okamura, a Faculty Specialist with the Social Science Research Institute of the College of Social Sciences, who were willing to help me learning about videoconferencing, setting up the focus groups, and completing the work for the thesis.

I would also like to appreciate to other participants in my study:

Interviewees: Dr. Jim Dator, a professor in Future Studies in Political Science; Dr. David Lassner, the Director of Information Technology at University of Hawai‘i at Mānoa; and Dr. Blair Odo, Vice President of Academic Affairs (Japan-America Institute of Management Science, JAIMS). Other interviewees from the Judiciary in the State of Hawai‘i: Mr. Walter Ozawa, the Deputy Administrative Director of the Courts and his secretary Ms. Karen Kimm; Mr. Nathan Kim, the Director of Fiscal and Support; Ms. Karen Takahashi, Coordinator of special project for the Hawai‘i State Legislature; and Ms. Christina Ubeline, Administrator of planning and program evaluation.

Focus group participants: Mr. Jim Bannan, the Distance Education Specialist in the
Pacific Resources for Education and Learning (PREL) on Oahu island; Ms. Francis Oshiro from PREL; Mr. Danny Crisostomo from Guam; Mr. Sal Poloai (Educational Technology Administrator), Mr. Allen To (Video Teleconference Specialist), Mr. Joshua Tuitele and Mr. Tavake Pulu, Jr. (Computer Technology Specialist) from American Samoa; and Mr. Nic Sablan, Erate Program Coordinator and Ms. Cathy Salas, Applications Specialists from Saipan.

Additionally, Ms. Christina Higa, the Director and Co-Principal Investigator of PEACESAT and the Associate Director of the Telecommunications and Information Policy Group; Mr. Kekoa Hayashi (Systems Operator) who helped me arranging the schedule for focus groups and using a videoconferencing room; and others who worked as an operator during the focus groups; Ms. Eileen Sumiye who arranged the schedule for using a videoconferencing room at the College of Education; and students and friends who kindly agreed on participating in my experiment from the University of Hawai‘i at Mānoa.

Finally, I would like to thank to my friends who supported me as an assistant during the experiment via videoconferencing.

Thank you very much for all of them who encouraged me to accomplish the work for my thesis.
ABSTRACT

This study investigated the effects of communication conditions on cohesiveness, social presence, and sense of presence in small group communication via videoconferencing and in face-to-face settings. It also observed the experienced users' preferences, their perceptions of interaction through the medium, and to what extent the users' feelings of presence associate with cohesiveness. The results revealed that among inexperienced users, there were significant effects of communication conditions on social presence, but not on cohesiveness and sense of presence: the significance was higher in face-to-face than videoconferencing. In conclusion, videoconferencing conveys social presence; however, users did not necessarily perceive sense of presence due to their inability to recognize some nonverbal cues, and their perceptions about videoconferencing that presumed such interaction was not as real as face-to-face. These perceptions were influenced by members' familiarity with each other and their familiarity with the technology that allowed them to anticipate and overcome distraction.
TABLE OF CONTENTS

ACKNOWLEDGEMENTS........................................................................................................ iv

ABSTRACT............................................................................................................................ vi

LIST OF TABLES................................................................................................................... x

LIST OF FIGURE................................................................................................................... xi

CHAPTER 1: INTRODUCTION.............................................................................................. 1
  Statement of the Problem................................................................................................. 4
  Research Objectives....................................................................................................... 5

CHAPTER 2: REVIEW OF LITERATURE............................................................................... 6
  I. Media Traits.................................................................................................................. 6
     Nature of Teleconferencing ......................................................................................... 6
     Nature of Videoconferencing ...................................................................................... 8
     Asynchronous and Synchronous Communication .................................................... 11
     Media Richness............................................................................................................ 12
     Filtering: Transmitting Cues and Immediate Feedback ........................................... 14
     Equivocality................................................................................................................ 15
     Immediacy.................................................................................................................... 16
  II. Media and User’s Traits............................................................................................. 17
     Individual’s Perceptions on Communication Conditions .......................................... 17
     Definitions Related to the Concept of Presence ......................................................... 17
       Sense of Presence....................................................................................................... 17
       Social Presence........................................................................................................ 18
       Telepresence........................................................................................................... 19
       Co-presence............................................................................................................. 19
     Characteristics of Communication Conditions, Social Presence, and Sense of
     Presence ......................................................................................................................... 20
       Capability of Conveying Visual Cues and the Effects on Sense of Presence ......... 20
       Camera Control and the Effects on Social Presence .............................................. 20
       Display Size and Effects on Social Presence .......................................................... 21
       The Effects of Proximity on Social Presence and Sense of Presence .................. 21
       Sense of Presence and Shared Space ..................................................................... 22
       Sense of Presence and Communication Condition ................................................. 23
     Social Immediacy......................................................................................................... 23
  III. Users Traits in Small Group ..................................................................................... 26
     Dynamics of Small Group Communication .................................................................. 26
     The Nature of Groups: Developing A Group Culture and Shared Perceptions ........ 27
     The Nature of Groups in TIP Theory ......................................................................... 28
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Dynamics in Field Theory</td>
<td>29</td>
</tr>
<tr>
<td>Cohesiveness</td>
<td>29</td>
</tr>
<tr>
<td>Group Size and Composition</td>
<td>31</td>
</tr>
<tr>
<td>Groupthink</td>
<td>32</td>
</tr>
<tr>
<td>Member's Familiarity</td>
<td>33</td>
</tr>
<tr>
<td>Member's Participation and Group Performance</td>
<td>35</td>
</tr>
<tr>
<td>The Phases of Decision Making</td>
<td>35</td>
</tr>
<tr>
<td>IV. Media Traits in the Future</td>
<td>37</td>
</tr>
<tr>
<td>Virtual Reality Conferencing</td>
<td>37</td>
</tr>
<tr>
<td>Avatar-Future Meeting</td>
<td>38</td>
</tr>
<tr>
<td>CHAPTER 3: RESEARCH QUESTIONS AND KEY CONCEPTS</td>
<td>40</td>
</tr>
<tr>
<td>Research Questions</td>
<td>40</td>
</tr>
<tr>
<td>Key Concepts</td>
<td>41</td>
</tr>
<tr>
<td>Communication Conditions</td>
<td>41</td>
</tr>
<tr>
<td>Member's Familiarity</td>
<td>42</td>
</tr>
<tr>
<td>Cohesiveness</td>
<td>42</td>
</tr>
<tr>
<td>Social Presence</td>
<td>44</td>
</tr>
<tr>
<td>Sense of Presence</td>
<td>45</td>
</tr>
<tr>
<td>Presence</td>
<td>48</td>
</tr>
<tr>
<td>CHAPTER 4: METHODS</td>
<td>49</td>
</tr>
<tr>
<td>Interviews</td>
<td>49</td>
</tr>
<tr>
<td>Objectives</td>
<td>49</td>
</tr>
<tr>
<td>Procedures</td>
<td>49</td>
</tr>
<tr>
<td>Participants</td>
<td>49</td>
</tr>
<tr>
<td>Focus Groups</td>
<td>51</td>
</tr>
<tr>
<td>Objectives</td>
<td>51</td>
</tr>
<tr>
<td>Procedures</td>
<td>51</td>
</tr>
<tr>
<td>Participants</td>
<td>52</td>
</tr>
<tr>
<td>Technology</td>
<td>53</td>
</tr>
<tr>
<td>Experiment</td>
<td>54</td>
</tr>
<tr>
<td>Objectives</td>
<td>54</td>
</tr>
<tr>
<td>Procedures</td>
<td>55</td>
</tr>
<tr>
<td>Videoconferencing</td>
<td>55</td>
</tr>
<tr>
<td>Face-to-Face</td>
<td>56</td>
</tr>
<tr>
<td>Participants</td>
<td>56</td>
</tr>
<tr>
<td>Environment and Equipment</td>
<td>58</td>
</tr>
<tr>
<td>Videoconferencing</td>
<td>58</td>
</tr>
<tr>
<td>Face-to-Face</td>
<td>59</td>
</tr>
<tr>
<td>Tasks</td>
<td>59</td>
</tr>
<tr>
<td>Post-Experiment Questionnaires</td>
<td>61</td>
</tr>
</tbody>
</table>
CHAPTER 5: RESULTS

Research Question 1 ................................................................. 61
Research Question 2 ................................................................. 61
Focus Groups ..................................................................... 62
Research Question 3 ................................................................. 63
Interviews ........................................................................ 63
Focus Groups ..................................................................... 65
Research Question 4 ................................................................. 64
Experiment ......................................................................... 65
Research Question 5 ................................................................. 72
Experiment ......................................................................... 72

CHAPTER 6: DISCUSSION

Preferences of the Experienced Users .................................................... 75
Users’ Perceptions of the Effectiveness of Interaction .......................... 75
Effects of Communication Conditions on Cohesiveness, Social Presence, and Sense of Presence ........................................... 77

CHAPTER 7: LIMITATIONS AND SUGGESTIONS FOR FUTURE STUDIES ............. 84
Limitations ........................................................................... 84
Suggestions for Future Studies ..................................................... 85

APPENDICIES ... 88
Appendix A: Interview Questions .................................................. 88
Appendix B: Focus Group Guide .................................................... 89
Appendix C: Agreement to Participate in Experiment ......................... 91
Tasks ................................................................................. 92
Appendix D: Post-experiment Questionnaire (Videoconferencing meeting) ......................... 94
Appendix E: Post-experiment Questionnaire (Face-to-face meeting) ......................... 98
Appendix F: Demographics of the Participants in Experiment ................. 102

REFERENCES ........................................................................ 103
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Characteristics of Videoconferencing and Face-to-Face Meetings</td>
<td>13</td>
</tr>
<tr>
<td>in Media Richness</td>
<td></td>
</tr>
<tr>
<td>2. Characteristics of Videoconferencing and Face-to-Face Meeting in</td>
<td>14</td>
</tr>
<tr>
<td>Filtering</td>
<td></td>
</tr>
<tr>
<td>3. Descriptive Statistics in Videoconferencing and Face-to-Face</td>
<td>72</td>
</tr>
<tr>
<td>4. The Results of One-way ANOVA for the Effect of Communication</td>
<td>73</td>
</tr>
<tr>
<td>Conditions on Cohesiveness, Social Presence, and Sense of Presence</td>
<td></td>
</tr>
<tr>
<td>5. Correlations between Variables</td>
<td>74</td>
</tr>
<tr>
<td>Figure</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>1. Definitions of Immediacy Categories</td>
<td>24</td>
</tr>
</tbody>
</table>
CHAPTER 1  
INTRODUCTION

In the current age after the spread of internet, innovative telecommunication systems have enriched communication. Protocols have been altered from traditional face-to-face communication to media-oriented communications such as electronic mail (email), voice mail, and online chatting in the twinkling of a byte. Email has been one of the most convenient communication tools given its potential for immediate feedback that is an important element of daily communication exchanges. In terms of using telecommunication systems for a meeting, videoconferencing is one of the innovative systems that expands the possibilities of human interaction beyond one's office hours and space, especially between those who are geographically dispersed.

This study begins with an examination of whether face-to-face meetings are better than any other mediated situations; more precisely, whether or not face-to-face is better than having a meeting via videoconferencing. If so, what would be the factors that would make the medium inferior to a face-to-face situation? If not, what would be the factors that allow us to state that videoconferencing is superior or more powerful, or at least equal to face-to-face meetings?

We assume that videoconferencing is an effective alternative to face-to-face meetings because people are not always able to travel across countries to attend a business meeting during a variety of critical situations such as war, disease, and natural disaster that deter people from traveling. For instance, the September 11th attack in New York City in 2001 drastically increased the number of videoconferencing users because large numbers of people were afraid to travel by air (Cope, 2002). In addition, the SARS...
(severe acute respiratory syndrome) outbreak caused companies to postpone or cancel travel (Lemon, 2003). Furthermore, a Hawaii-based example is that of JAISMS (Japanese-American Institute of Management Science) canceling a student trip to China and also refusing to invite professors from China because of SARS. Instead, they used videoconferencing to give lectures to the students (B. Odo, Personal Communication, July 21, 2003).

In addition to the critical situations mentioned above, there are also more conventional reasons why people use videoconferencing: saving time and the cost of traveling are among the most important reasons for using videoconferencing for a business meeting; and avoiding inconvenience of undesirable travel is also another reason to use videoconferencing (Angiolillo, Blanchard, Israelski, & Mané, 1997).

There are other reasons to be emphasized why videoconferencing is an effective alternative to face-to-face settings. First, the medium is capable of providing visual cues and immediate feedback: those are found to be the indispensable components to replicate a face-to-face meeting. Having verbal and nonverbal cues is important for participants to feel a sense of others' presence due to the fact that a realness of a meeting affects each participant's performance and participation in discussion. In addition, the capability of the medium conveying social presence is important for users to feel a sense of others' presence during an interaction. If videoconferencing could replicate a similar experience as face-to-face settings provide, using the medium must be considered as effective as holding a meeting face-to-face.

Second, some of the strengths of the medium, for instance, speed, spontaneity, and immediacy, are generally important elements that lead users to interact productively in
accomplishing their objectives. Although videoconferencing still has technological glitches, the medium can convey realness of a meeting which is comparable to face-to-face settings. Therefore, using videoconferencing, which is capable of providing social presence, and supporting participants to communicate effectively and work productively in a limited amount of time, is an effective alternative especially when participants cannot meet face-to-face.

Since videoconferencing may provide a similar environment as face-to-face settings in terms of visuals cues and immediate feedback, interaction via videoconferencing is likely to give the same impressions as face-to-face meetings to all users in terms of sense of presence mentioned above. When the environment provides social presence and allows users to feel a sense of other’s presence, the individual’s participation and performance may be affected positively. This may lead to group cohesiveness.

Videoconferencing would have to be integrated more effectively into society to allow for spontaneity, hence, allowing individuals and companies to hold meetings more frequently without planning ahead of time. Having frequent meetings are beneficial and enable people to keep track of agendas for accomplishing tasks. In any case, choosing and deciding the most appropriate medium for the user’s needs is critical to the outcome of getting business done productively in the context of organizational communication (Rice, 1984). It is also an important factor for the survival of business operating in today’s global economy.

Although most people may recognize videoconferencing as a convenient medium not only for educational purposes but also for business uses, the penetration rate has not been as rapid as some other forms of Information and Communication Technologies
Therefore, videoconferencing use has not become a part of our life which is as convenient as using e-mail every day.

Theoretically, one might proclaim that face-to-face is the richest form of communication and scientifically this has been confirmed in different contexts. Furthermore, using videoconferencing as an alternative to face-to-face meetings has been controversial since the nature of human communication relies on face-to-face interaction (Lazer, Elton, & Johnson, 1983). Just the same, it is not too early to decide the effectiveness of using videoconferencing given the wide variation in human communication needs that are depending on the individuals’ preferences, a group’s objectives, and where to place the emphasis on human interaction.

**Statement of the Problem**

Large numbers of studies have focused on the differences among communication conditions (e.g. audio conferencing vs. videoconferencing, face-to-face meetings vs. videoconferencing). However, outcomes of previous studies (e.g. Werkhoven, Schraagen, & Punte, 2001; Yoo & Alavi, 2001) vary in explaining the effects of videoconferencing on social presence, task participation, or performance when examined under different communication conditions.

Unfortunately, few studies have explored tangible results that would address the effectiveness of videoconferencing in terms of cohesiveness, social presence, and sense of presence in small group communication. Further, it is necessary to observe to what extent users’ perceptions of social presence and sense of presence associate with their cohesiveness in group communication. Additionally, few studies have combined
member's familiarity, whether they know each other or not, and other variables such as communication conditions (face-to-face and videoconferencing), cohesiveness, social presence, and sense of presence. It is very important to integrate all variables to consider the issue in the context of using videoconferencing because they influence each other and affect the users' performance. Hence, it is necessary to study those variables together in a study to observe the effects of each variable on all other variables.

**Research Objectives**

The objectives of this study were: (1) to develop the measurement for social presence besides the traits developed by Short, Williams, and Christie (1976); (2) to observe the experienced users' preferences in using either videoconferencing or face-to-face meeting if money and time were no object; (3) to observe the experienced users' perceptions of interaction via videoconferencing versus face-to-face in terms of cohesiveness, social presence, and sense of presence; (4) to investigate the effects of communication conditions (videoconferencing and face-to-face) on cohesiveness, social presence, and sense of presence in small group communication; (5) to investigate to what extent do users' perceptions of social presence and sense of presence relate to their sense of cohesiveness in a group via videoconferencing versus face-to-face when members collaborate on decision-making tasks.

The following review of literature focuses on the important traits of the medium and users in small group interaction.
CHAPTER 2
REVIEW OF LITERATURE

This review of literature is comprised of four sections. The first section on media traits focuses on the nature of videoconferencing and discusses the medium itself, referring to asynchronous and synchronous communication, media richness, filtering, equivocality, and immediacy. The second section discusses media and user’s traits: the user’s perceptions of various communication conditions including videoconferencing and face-to-face settings; social presence as a medium’s characteristics of conveying user’s presence; and sense of presence as user’s characteristics of feeling other’s presence. The third section, about user’s traits, focuses on the nature of small group communication and its dynamics, cohesiveness, member’s familiarity, member’s perceptions, group performance, and the phases of decision-making. The last section, about media traits in the future, argues for virtual reality conferencing and suggests the possible use of an avatar for attending a meeting in the future.

I. Media Traits

Nature of Teleconferencing

Teleconferencing has expanded opportunities for having a meeting among people in multiple locations. It is a good alternative to expensive or impractical traditional meetings (Anderson, Ashraf, Douter, & Jack, 2001). Teleconferencing is adaptable to almost any organization such as major manufacturers, government agencies, health care businesses, fundraising organizations, trade and educational institutions, and religious organizations (Lazer et al., 1983).
Teleconferencing includes different types of configurations such as audio (voice-only), enhanced audio, video (full motion/slow scan), computer teleconferencing, and full-scale cyberconferencing (Housel & Skopec, 2001; Williams, 1987). The system provides "a structured, private, interactive, electronic, and scheduled meeting between two or more persons in separate locations" (Lazer et al., 1983, p. 2). Besides these facts, teleconferencing is popular due to the system's versatility (wide range of electronic communications), availability, and flexibility (Lazer et al., 1983).

Each medium works effectively in different contexts. For instance, audio conferencing works well when people have physical limitations: when people want to hold a quick meeting while they are going from one place to another by car, or when people have to attend a meeting from outside of an office, such as from a hotel where a videoconferencing system may not be available. Another situation that audio conferencing works well is when participants do not know each other since some people feel psychological pressure when meeting new people (D. Lassner, Personal Communication, July 16, 2003).

Whether or not teleconferencing equipment is appropriate to the context depends on the objectives of the meeting. In the case of holding a meeting via a medium and intending to replicate a face-to-face meeting, videoconferencing is the most effective alternative to face-to-face in terms of having visuals. Another reason for preferring videoconferencing rather than face-to-face meetings by knowing the medium is replicable to face-to-face settings is that participants can schedule meetings more frequently and also without deciding far ahead of time.

7
**Nature of Videoconferencing**

Videoconferencing is used for various purposes such as internal or external communications, focus groups, training, sales presentations, human resources and recruiting, company announcements, special events, press conferences, and crisis control (Citizens Conferencing, 2003). Numerous studies have been conducted to discover the different aspects of videoconferencing compared with face-to-face meetings in terms of a meeting structure, a task focus, problem complexity, sociability, communication richness, effectiveness and efficiency of the medium, social presence, cohesiveness, and the amount of conflicts (see for example, Bernthal & Insko, 1993; Campbell, 2000; IJsselsteijn, de Ridder, Freeman, & Avons, 2000; Yoo & Alavi, 2001). Some studies have found that videoconferenced settings are more efficient than face-to-face settings in terms of negotiation, problem solving, and having unshared information (Delafield, 1989; Fulk & Dutton, 1984; O’Connail, Whittaker, & Wilbur, 1993; Svenning & Ruchinskas, 1984; Webster, 1998; Werkhoven et al., 2001).

There are two basic versions of videoconferencing: point-to-multipoint one-way videoconferencing and interactive two-way video (Rice, 1984). Interactive two-way video provides audio and visual information for participants: those are the strengths of videoconferencing “to duplicate as closely as possible the experience of face-to-face meetings without imposing the burden of travel” (Campbell, 1998, p. 330).

Other strengths are, saving travel expenses and time (Duster & Angelides, 1997; Werkhoven, Schraagen, & Punte, 2001; Williams, 1987), and the capability of having a large numbers of participants at one time from multiple locations while face-to-face meetings limit the numbers of participants if they have to fly from one place to another.
Even though the rest of the business staff who do not participate in a face-to-face meeting still can imagine the flow of the meeting by hearing others’ reports, they would not be able to understand the nuances.

As opposed to advantages, videoconferencing seems to have disadvantages which are likely to be described as “less friendly, impersonal, business-like, depersonalized, and task-oriented” (Campbell, 2000, p. 2). Although the absence of signals that communicator exchange in shared space can be pointed out as an issue in videoconferencing, users can have greater comfort and naturalness in videoconferencing similar to face-to-face meetings since visuals are available in both situations: participants feel comfortable especially if the environment is well prepared: when eye-to-eye contact is maintained by using a half-silver mirror in front of the monitor (teleprompter-like technology), according to Buxton (1992).

In terms of informal interaction, face-to-face meetings allow people to interact informally as soon as they sit around the table. On the other hand, videoconferencing provides the situation that participants wait until the technology is ready. Informal interaction takes place not only in a meeting, but outside of a meeting: near the vending machine, in a corridor, at lunch, or by participating in other activities after a meeting. The interaction is so-called social and cultural interaction, and it is easier in face-to-face settings than in a meeting via videoconferencing.

Social exchanges, both in and outside of a meeting, are crucial, especially when participants meet with others for the first time and they are not familiar with each other. Familiarity with other members, however, leads to different attitudes and motivations so that all members can collaborate effectively. Yet, social interaction is not always
important since individuals have their own objectives and these take priority over having social interaction. In fact, the topic of the informal interaction does not always relate to the agenda of a meeting, and it could be distractive if discussion does not turn to the main agenda. Participants' attitudes change depending on whether they are participating in a meeting via videoconferencing or face-to-face.

Several differences can be observed by comparing different conferencing systems: videoconferencing with audio-conferencing or with computer-conferencing. The differences between videoconferencing and audio-conferencing are that videoconferencing conveys visual cues, while audio-conferencing deals with the situation with no visuals using conventional phone equipment which brings the difficulty of identifying who is talking (Pool, 1990). Videoconferencing allows us to have multiple participants at one meeting, while audio-conferencing limits the numbers of participants because of the difficulty of recognizing speakers and lack of turn-taking cues.

Second, computer conferencing has different advantages from videoconferencing: participants can exchange written messages over a computer network and they can participate at a time of their own choosing (Pool, 1990). In other words, participants do not always have to log onto the computer simultaneously. This advantage works especially when “participants are in different time zones” (Pool, 1990, p. 87). However, just as with audio-conferencing, the lack of visuals would be considered a disadvantage because of the importance of observing nonverbal cues, such as physical reactions of other members, including grimaces, twitches, arched eyebrows, and other body language (Pool, 1990). In addition, voice instructions which are apparent in audio-conferencing are lost in computer conferencing unless topographic conventions are established among
members. Having audio and visual information, videoconferencing setting brings complex outcomes in communication environments in terms of immediacy (Short, Williams, & Christie, 1976), nonverbal cues (Ruben, 1992), and sense of presence (Rice, 1980).

**Asynchronous and Synchronous Communication**

Communication is asynchronous when users interact at different times; but it is synchronous when “verbal and nonverbal behaviors create messages that may be instantaneously attended to by other interactants” (Ruben, 1992, p. 263). Synchronous communication is represented by videoconferencing, face-to-face meeting, and telephone. Asynchronous communication, on the other hand, is represented by electronic bulletin boards, e-mail, voice mail, and fax which allows users to interact effectively on a task during a particular time frame of each participant is choosing.

Asynchronous situations create perturbations in the temporal flow of messages between members. Effectiveness of synchronous communication is influenced by “the media richness requirements of the task and by the frequency and fluency with which group members use the communication system” (McGrath & Berdahl, 1998, p. 210). In terms of synchronicity, videoconferencing can be used in ways that “either minimize or expand the gap in time between production and consumption” (Ruben, 1992, p. 263). Managing the time difference is very important to participants from multiple locations crossing time zones.
Media Richness

Media richness theory argues that richness of a communication medium is determined primarily by the mechanical characteristics of the medium, including immediacy of feedback, the ability of the medium to transmit multiple cues (e.g., physical presence, voice inflection, posture, gesture, words, numbers, and graphic symbols), language variety, and personal focus of the medium (Daft, Lengel, & Trevino, 1987). The degree of media richness can also be evaluated by different elements such as social presence (capability of a medium conveying presence) and sense of presence (capability of users perceiving presence), and immediacy that explains psychological distance provided by the medium.

Valacich, Mennecke, Wachter, and Wheeler (1994) discuss how definition of richness has changed because of the improvement of different communication media. The 'richest' medium is that “which best provides the set of capabilities needed by the situation: the individuals, task, and (the) social context within which they interact” (Dennis & Valacich, 1999, p. 3). Therefore, face-to-face settings are not always stated as the richest communication condition.

Media richness and social presence can be evaluated not only by comparing different types of media or communication conditions, for instance, either videoconferencing or face-to-face, but also between different types of videoconferencing such as desktop or TV videoconferencing. Alavi, Wheeler, and Valacich (1995) discovered that “desktop videoconferencing systems appear to be a relatively effective medium for supporting the social and team-building interactions among distant team
members” (p. 307). It is because video capability of the technology brings the “human feel” in a meeting (Alavi et al., 1995).

In terms of the medium’s ability to carry information, there are two components identified: data carrying capacity and symbol carrying capacity (Sitkin, Sutcliffe, & Barrios-Choplin, 1992). Data carrying capacity refers to the medium’s ability to transmit information including both verbal and nonverbal data, and both qualitative and quantitative data (Rice as cited by Sitkin et al., 1992). Symbol carrying capacity refers to the medium’s ability to carry information about the individuals communicating through a medium. Newberry (2001) establishes a concept about the richness of a medium in terms of feedback, multiple cues, message tailoring, and emotions by using three levels of rating: high, medium, and low.

Comparing the interaction via videoconferencing with a face-to-face setting, in terms of richness, videoconferencing is as rich as face-to-face when giving and receiving a feedback (ranked as high). On the other hand, videoconferencing is not as rich as face-to-face in terms of multiple cues, message tailoring, and emotions (see Table 1).

<table>
<thead>
<tr>
<th>Media Richness</th>
<th>Videoconferencing</th>
<th>Face-to-Face</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having Multiple Cues</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Message Tailoring</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Conveying Emotions</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Giving and Receiving Feedback</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 1. Characteristics of Videoconferencing and Face-to-Face Meetings in Media Richness
Although videoconferencing is low in conveying emotions, whether or not users could receive emotions through the medium is dependent on the user's familiarity with the medium and their familiarity with other members who send emotional cues.

**Filtering: Transmitting Cues and Immediate Feedback**

*Filtering* explains the capabilities of a medium in transmitting all available information, and it includes both positive and negative sides of the medium. Previous studies have evaluated the capabilities of media, and their ability to pass on maximum cues and feedback by comparing different media. Most studies focus on the difference between face-to-face meetings and other types of media, such as audio and/or videoconferencing, e-mail, online chatting, and so on (Hofner Saphiere, 1996; Sitkin et al., 1992; Valacich et al., 1994).

Theoretically speaking, face-to-face is considered as the richest spontaneity for communication (Daft et al., 1987), and videoconferencing is not considered to be as rich as face-to-face in terms of the time it takes to transmit information to give immediate feedback and the incapability of giving the same quality of sense of presence to users (see Table 2).

<table>
<thead>
<tr>
<th>Filtering</th>
<th>Videoconferencing</th>
<th>Face-to-Face</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmitting Information</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Giving Immediate Feedback</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Capability to Conveying Information Cues</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Capability to Giving the Same Quality of Sense of Presence</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>External Peripheral Noise</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 2. Characteristics of Videoconferencing and Face-to-Face Meeting in Filtering
However, videoconferencing is as rich as face-to-face settings in terms of its capability to convey information cues which are same as those in face-to-face settings. In fact, videoconferencing is richer than any other telecommunication system.

The limitations of each media are called *technological filtering* (Williams, 1987): videoconferencing has an advantage in terms of its capability to exchange visual information; compared with audio-conferencing, traditional phone and audio-conferencing are equally incapable of exchanging visuals; comparing the fax machine with the telephone, a fax machine has disadvantages in terms of not being able to convey emotional nuances of the human voice (Williams, 1987).

It is common to see both advantages and disadvantages when we compare two different media. As mentioned, videoconferencing is evaluated as inferior to face-to-face meetings; however, limitations of using videoconferencing may not only be seen as technological filtering, but also as *psychological filtering*.

Psychological filtering is “the effects of attitudinal bias and code misinterpretation in the exchange of messages” (Williams, 1987, p. 15). Channel users generally have biases and they expect only certain types of messages from a given channel: “television is frivolous, or a computer printout is accurate” (Williams, 1987, p. 16). Similar to these examples, videoconferencing users may have biases that the medium is not as effective as a face-to-face meeting because it is still the traditional way of holding a meeting.

**Equivocality**

_Equivocality_ refers to the degree of ambiguity including confusion, disagreement, and lack of understanding, in contrast to uncertainty and the absence of information (Daft
et al., 1987). Equivocality also may result from unreliable or conflicting information sources, noisy communication channels, and differing or ambiguous goals and preferences (Zack, 1999, p. 6). Richer media is preferred for equivocal tasks. Is also preferred when communication is high in equivocality and requires resolving subjective issues that involve divergent perspectives (Dennis, Kinney, & Hung, 1999). On the other hand, media which are low in richness, such as audio or telephone are appropriate for communication which is not high in equivocality. In short, media with low richness may be adequate or even preferred for the efficient communication of objective data to support routine decisions.

**Immediacy**

The term immediacy includes two aspects: technological and social immediacy (Short et al., 1976). In terms of technological immediacy, media can be ordered from most to least immediate: face-to-face situation, videoconferencing, phone, email, letters and memos (informal), bulletins and documents (formal), and computer output and numerical data. This study considers technological immediacy separately from the characteristics of social immediacy which is described in the next section.
II. Media and User's Traits

Individual's Perceptions on Communication Conditions

Individual users perceive communication conditions differently. Their preferences vary depending on the followings: his or her previous experiences and their familiarity with communication conditions; the users' objectives; and the capabilities of communication conditions to meet the goals. Users' different perceptions are the key to observe whether they could use the media effectively or not (Yoo & Alavi, 2001) because the perceptions may influence group cohesiveness and productivity which are crucial for getting the job done. Given a choice, individuals seem to have a preference for face-to-face interactions over technologically-mediated situations (Alavi et al., 1995), especially if they had an option to physically see others face-to-face.

Definitions Related to the Concept of Presence

The concept of presence is commonly assessed in virtual reality environments (VREs) to identify single determinants of this construct (Gaggioli, Bassi, & Fave, 2003). There are two different distinct characteristics: social presence that explains how capable a medium is to convey sense of other's presence; and sense of presence that explains how much users are able to be aware of their own and other users' presence and also how users perceive their sense of presence among members.

Sense of Presence

According to Gaggioli et al. (2003), citing Schloerb, sense of presence can be divided into two categories: subjective and objective presence. Subjective presence is
"the probability that a person perceives that he or she is physically present in the given environment," and objective presence is "the probability that the specific task is completed successfully" (p. 123). In addition, sense of presence, the feeling of "being there," is a multidimensional perception that varies across individuals (IJsselsteijn & Riva, 2003).

Social Presence

Social presence is the characteristics of media and it may have an opportunity to provide sense of presence. Each communication medium conveys different degrees of social presence since the capability of each medium varies as to how it conveys visual feedback or visual cues, such as facial expressions, eye-gaze, and gestures. According to social presence theory, media that convey more visual feedback or cues produce the greatest sense of social presence (Brander & Mark, 2001; Yoo & Alavi, 2001).

Social presence influences the users' perception and attitude that leads to the users' sense of presence. Therefore, the quality of sense of presence depends on the capability of the media that transmit verbal and nonverbal cues. According to Tu (2002), social presence is a significant factor in improving instructional effectiveness and it is also a strong predictor of satisfaction within an environment of computer-mediated communication (CMC): the degree of social presence has influence on students' satisfaction in distance education (Hackman & Walker, as cited by Tu, 2002).

Social presence is the context of the presence literature describes the capabilities of a medium to convey human characteristics to those participating in any communication environment. Other terms such as telepresence, co-presence, and sense of presence
convey the characteristics associated with the individuals involved in a given environment, or in the case of a single individual, refers to that person’s own perception of being fully preset in his or her given environment.

**Telepresence**

Telepresence is the psychological experience that results when the use of technology establishes a sense of shared presence or shared space among geographically separated members of a group (McGee, Neale, Amento, & Brooks, 1997; Muhlback, Bocker, & Prussong, 1995), which is enough to convince them that they are immersed in virtual worlds (Buxton, 1992; Rheingold, 1991).

Telepresence was originally promoted as “a way of controlling robots” by NASA’s Human Factors Research Division in the mid 1980s (Woolley, 1992, p. 126). A NASA research team created a wrap-around technology in order for a machine operator to “have the feeling of ‘being’ in the place of the machine being operated” (Woolley, p. 126), especially when machines were sent instead of human beings to hazardous environments such as space exploration or nuclear power plants (Woolley, 1992).

**Co-presence**

The term co-presence is “a sense of being together in a shared space,” which includes both physical presence - the sense of being physically located in mediated space (Ijsselsteijn & Riva, 2003, p. 5), and social presence - the capability of a medium and the feeling of being together. The term social presence is essentially used in
videoconferencing and other settings including shared virtual environments and videophone interactions.

The following section describes the capability of the medium conveying the visual cues and its effect on users’ sense of presence.

**Characteristics of Communication Conditions, Social Presence, and Sense of Presence**

**Capability of Conveying Visual Cues and the Effects on Sense of Presence**

Videoconferencing has a capability of conveying various visual cues and they could lead to a higher degree of social presence. Videoconferencing and face-to-face meeting have the same capabilities in terms of conveying visual cues. The difference between two communication conditions is whether participants share the same space or not.

Previous studies discussed that feeling of sense of presence is lessened in videoconferencing (McGree, et al., 1997; Rogers, 1986). In other words, the sense of user’s presence in videoconferencing is different that in a face-to-face setting.

**Camera Control and the Effects on Social Presence**

Camera direction is easily controlled by participants in most videoconferencing setting: they can control zoom (focal length or width of view), focus, exposure (usually automatic), pan (left and right movement), and tilt (up and down movement) according to Angiolillo et al. (1997). A discussion leader in videoconferencing has to control not only the picture of participants but also switch among other video sources such as documents, slides, or overhead projection cameras (Angiolillo et al., 1997). Controlling a focus of a
TV screen affects participants’ perceptions to others’ existence and it may also control the medium’s capabilities of conveying social presence.

**Display Size and Effects on Social Presence**

Participants would have a higher sense of presence if videoconferencing displayed a life-size person rather than small figures on a TV screen. In fact, users show their preferences for large displays up to the point where the image is life-size (Inoue, Yoroizawa, & Okubo, as cited by Angiolillo et al., 1997). A life-size display provides a feeling of realness that we experience in virtual reality: it is an instinctive feeling as though the remote participants are physically present in the room (Angiolillo et al., 1997). The size of the picture of participants which are shown on a screen and how close they sit to the camera; the proximity between the camera and users are important to observing different degrees of sense of presence.

**The Effects of Proximity on Social Presence and Sense of Presence**

Proximity, in other words nearness, is different in videoconferencing from face-to-face meetings. Proximity includes physical and psychological proximity. Different communication conditions provide different proximity physically and psychologically. In terms of physical proximity, face-to-face allows participants to have physical contact with one another, while each participant is physically incapable of touching others in videoconferencing: physical proximity is closer in face-to-face than in videoconferencing. Although participants in videoconferencing are incapable of sitting together with others in a remote site because of the seat arrangement, videoconferencing setting typically
forces participants to sit closer to other members than a regular face-to-face meeting due to the necessity of them to be visible to the camera lens and then shown on a screen.

Physical proximity influences participants to feel sense of others' presence: their feelings are important in considering psychological proximity. Although physical proximity seems to be in proportion to psychological proximity, this is not necessarily the case. In other words, participants sitting close to others in face-to-face meetings do not always feel psychologically close to others. Conversely, participants may feel psychologically close to others even though they are not physically close (e.g. share the same space). This may happen because of several factors, such as social presence, sense of presence, member's familiarity, familiarity with technology, and task characteristics.

**Sense of Presence and Shared Space**

Videoconferencing is attempting to replicate face-to-face meetings to overcome the main difference, which is sharing the same space, between two communication conditions (Buxton, 1992). The shared person space is considered in terms of two characteristics of spaces: person space and task space. In person space, participants have a collective sense of co-presence between/among them (Buxton, 1992) and participants’ facial expressions, a tone of voice, gaze, and body language are important elements that affect the presence. On the other hand, task space is the space that participants have to feel “co-presence in the domain of the task being undertaken” (Buxton, p. 3).

The term “person space” is differentiated from “personal space,” which carries the connotation of privacy and also implies the meaning of not sharing the space (Buxton, 1992). Space also influences sense of presence.
Sense of Presence and Communication Condition

Participants’ attitude can affect their sense of presence (Tu, 2002). The vividness of feeling sense of presence of others would affect communication efficiency in videoconferencing. The more participants try to show their positive attitudes, the more they show their favorable participation to other members. This attitude may encourage other members to be cooperative, work hard, and have close feelings of others and feel others’ sense of presence.

Social Immediacy

A communication sender and receiver keep their psychological distance between themselves and also with objects such as a medium. Whether in mediated or non-mediated environments, a communicator feels a sense of presence affecting his or her psychological distance. This is called social immediacy (Short, et al., 1976; Wiener & Mehrabian, 1968).

Immediacy is categorized into ten groups in terms of distance, time, order of occurrence, duration, activity-passivity, mutuality-unilaterality, probability, communicator participation, object participation, and communicator-object participation (Mehrabian, 1971) as shown in Figure 1, and in these categories, social immediacy is particularly influenced by the following factors: activity-passivity, probability, communicator participation, object participation, and communicator-object participation.
<table>
<thead>
<tr>
<th>Category</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>Spatial distance between communicator and object of communication</td>
</tr>
<tr>
<td>Time</td>
<td>Temporal distance between communicator and object</td>
</tr>
<tr>
<td>Order of occurrence</td>
<td>Order of interaction with the object in an interaction sequence</td>
</tr>
<tr>
<td>Duration</td>
<td>Duration of interaction or duration (e.g., length) of communication about interaction</td>
</tr>
<tr>
<td>Activity-passivity</td>
<td>Willingness versus an obligatory quality of communicator-object interaction</td>
</tr>
<tr>
<td>Mutuality-unilaterality</td>
<td>Degree of reciprocity of communicator-object interaction</td>
</tr>
<tr>
<td>Probability</td>
<td>Degree of certainty of communicator-object interaction</td>
</tr>
</tbody>
</table>
| Communicator participation| 1. The totality versus only a part, aspect or acquaintance of the communicator interacts with the object  
                               2. The communicator interacts individually with the object versus being part of a group of people who interact with the object |
| Object participation      | 1. The totality versus only a part, aspect or acquaintance of the object interacts with the communicator  
                               2. The object interacts individually with the communicator versus being part of a group of people who interact with the communicator |
| Communicator-object participation | The presence versus the absence of participation of the communicator (or object) in the interaction |


**Figure 1: Definitions of Immediacy Categories**

Besides these categories, power also has an influence on immediacy (Mehrabian, 1971). A person with high status determines the degree of immediacy permitted in their interactions with others, while a person of lower status has less right to increase their immediacy with someone of higher status. No matter which communication condition is chosen, either mediated or non mediated, high status people have a higher degree of immediacy than people with lower status when there is a hierarchy among participants.
In order to avoid the pressure of hierarchy, keeping the participants’ status equal is important.

Immediacy is associated with liking, preference, and generally good feelings, while nonimmediacy is associated with dislike, discomfort, and other unpleasant feelings (Mehrabian, 1971). When people have positive feelings toward others or they are friendly and affinitive, they choose to be more immediate (Mehrabian, 1971). The feeling of liking influences cohesiveness which is described in the next section.
III. User’s Traits in Small Groups

Dynamics of Small Group Communication

Group dynamics are fully dependent on individuals because a group is characterized not only by individuals, but also by the mixture of diverse characteristics of individuals. Individual member contributes to create a group culture and it would affect cohesiveness, task participation, and group consensus. In order to reach a consensus, individuals must take different strategies as they have their personal foci and expectations within a group. An individual’s performance varies depending not only on their expectations but on familiarity with other members (referred as member’s familiarity in this study). If participants know each other or have a history of working together, they are likely to have high cohesiveness within a group and it will enhance their task participation in the group (Yoo & Alavi, 2001).

An individual’s performance consists of motivation (M); knowledge, skills, and attitudes (KSAs); and environment (E) in a job (Blanchard & Thacker, 1999). If individuals are not motivated, they will not perform positively, no matter how skilled and knowledgeable they are. Therefore, the combination of these factors is the key to self-efficacy in a group performance.

An individual can be a greater performer in a group setting than he or she is individually. A group is able to compose new ideas based on information from a variety of resources compared with what may be the disposal of one individual. In the case of solving problems, a group can employ a strategy from individuals’ diverse ideas and find one that works the best (Beebe & Masterson, 1986). In a process of decision-making, a group setting may bring additional pressures on members to follow the majority opinion.
in order to avoid conflict. Although group dynamics help members to reach objectives, it would also make members depend too much upon others. The dependence may allow one individual member to dominate the discussion.

A small group setting provides an interdependent environment to individuals. According to Jensen and Chilberg (1991), group interdependence takes two forms; task interdependence and relational interdependence. In terms of task interdependence, individuals recognize themselves as a part of the group, and their work performance has possible effects on others' performance in a group. In order to work effectively, members in a group need to integrate knowledge and skills sharing with other members.

Relational interdependence is mutual interdependence that refers to the emotional connections that each member can establish with others. Accordingly, relational interdependence is a necessary component for establishing group harmony, cohesion, and commitment (Jensen & Chilberg, 1991).

The Nature of Groups: Developing A Group Culture and Shared Perceptions

Group members share values, beliefs, and assumptions in the process of developing a new culture. They also create mutually understood and accepted rules, and norms that would influence their behaviors (Lumsden & Lumsden, 1993). After establishing mutual understandings, a group tries to meet the goals that they strive for. In fact, a group can work effectively "when an individual has a clear mental picture of what she or he is striving for, both the goal and the steps to be taken become more vivid and more attainable" (Lumsden & Lumsden, 1993, p. 92).
The ways in which group members feel, interact, share ideas, solve problems, and respond to one another are characterized by a group syntality. A group syntality represents “the composite set of attributes of the members of a group and has an important bearing on the ways in which they function” (Gouran, 1999, p. 6). An individual brings his or her own energy to work together with others, and this energy fuses into energy with other members. This is called synergy, which refers to the energy that moves the teams, and it is “a combination of drives, needs, motives, and vitality of the members” (Gouran, 1999, p. 93). Synergy is considered as an important factor to maintain a team’s effectiveness.

**The Nature of Groups in TIP Theory**

Each member performs in a group by allocating their efforts to a limited time of interaction as is explained by the Time, Interaction, and Performance (TIP) theory (McGrath, 1991). Group interaction in TIP theory is characterized “by shifting patterns of activities devoted to different functions at different times” (Poole, 1999, p. 45). A group has three functions that are production, member support, and group well-being (McGrath, 1991): production functions of groups contribute to the systems in which a group is embedded; member support functions contribute to each group member, meeting his or her needs, and keeping them motivated; and group well-being functions contribute to the group itself, and help members interact and continue the social structure (McGrath, 1991).

TIP theory also explains “the likely effects of the introduction of technological enhancements within the group’s communication” (McGrath, 1991, p. 171). Technology
such as computers is likely to have both desirable and undesirable effects. Therefore, TIP theory helps to assess communication in a computer-mediated situation (McGrath, 1991).

**Group Dynamics in Field Theory**

Field theory, originally introduced by Lewin (1935) emphasizes that a group is influenced by individual needs, and individuals are affected by group standards (Beebe & Masterson, 1986; Mabry, 1999; Poole, 1999). When a group has a purpose of achieving tasks, individuals try to achieve not only their own goals, but also other member’s objectives as a group. In order to achieve a group’s objectives, individuals try to be cohesive with the group members (Pavitt, 1998).

**Cohesiveness**

Cohesiveness is one of the most popular and indispensable variables among researchers to assess the members’ performance and the communication effectiveness (Bemthal & Insko, 1993; Carless & de Paola, 2000; Carron & Brawley, 2000; Gammage, Carron, & Estabrooks, 2001; Hoogstraten & Vorst, 1978; Jung & Sosik, 2002; Langfred, 1998; Mason & Griffin, 2002; Mullen & Cooper, 1994; Murdrack, 1989; Yoo & Alavi, 2001). Group cohesiveness could “energize and direct group members toward successful task performance and completion” (Mullen & Cooper, 1994, p. 215) and it also increases group productivity (Worchel, Cooper, & Goethals, 1991).

Cohesiveness is defined as “a dynamic process that is reflected in the tendency for a group to remain united in the pursuit of its instrumental objectives and/or for the satisfaction of member [sic] affective needs” (Carron, Brawley, & Widmeyer as cited by
Carron & Brawley, 2000, p. 94). Group cohesiveness is treated as a group attitude, or more precisely, group resistance to disruption (Festinger, Schachter, & Back, as cited by Carron & Brawley, 2000; Mason & Griffin, 2002) and as an individual’s consideration or motive toward the group (Carron & Brawley, 2000).

A group characteristic emerges from group interaction. Cohesiveness is the property of togetherness in group communication: cohesiveness characterizes group difference in terms of the ability of group members to get along, the feeling of loyalty; the commitment of members toward the group; pride; like-mindedness; the degree of attraction to the group members, and willingness to sacrifice for a group and remain in the same group (Beebe & Masterson, 1986; Ellis & Fisher, 1994; Lumsden & Lumsden, 1993; Shaw, 1992). Whether or not a group can be cohesive with other members depends on the number of members and their characteristics.

Cohesiveness also results from the interaction of other variables including communication, group composition, individual benefits derived from the group, and task effectiveness. Although the idea that face-to-face situations can bring more cohesive performance in a group setting than mediated situations seems to be mainstream, the groups in mediated situations are not necessarily lower in cohesiveness than face-to-face groups due to different variables explained above (Chuang, Bernard, & Ali, 2001).

Cohesion has recently been refined to include social (or interpersonal) cohesion and task cohesion (Gammage, Carron, & Estabrooks, 2001; Widmeyer, Brawley, & Carron, as cited by Mason & Griffin, 2002). Social cohesion reflects the socialization among group members outside of performances of a group; Task cohesion is an agreement among individuals on group goals and on the condition that they work well together.
(Gammage et al., 2001). Task cohesion is also considered as “task focus associated with the construct of group task satisfaction” and “the group’s commitment to achieving its task” (Mason et al., 2002, p. 289).

In addition, there is another way of distinguishing characteristics of cohesiveness: task-based cohesiveness and maintenance-based cohesiveness (Parvitt, 1998). Task-based cohesiveness appears in a group for achieving a task at hand, and maintenance-based cohesiveness explains how individuals work cohesively to maintain the personal relationships with other members.

The next section describes group size and composition that lead to different degrees of cohesiveness in a group interaction.

**Group Size and Composition**

Group size and composition are the important factors in cohesiveness. In terms of group size, members in two-party meetings can share their levels of understanding, agreement, concerns about tasks, and acknowledgements (Marshall & Novick, as cited by Rudman, Marshall, & Dykstra-Erickson, 1997). Members in a large group have higher levels of liking for the group (Indik, as cited by Mullen & Cooper, 1994). A large group has a disadvantage: teams which have three or more members use complex mechanisms for providing feedback and turn-taking (Rudman et al., 1997). In this case, cohesiveness and performance probably are reduced to low levels (Mullen, Johnson, & Drake, as cited by Mullen & Cooper, 1994).

A group’s composition is characterized by gender; cultural backgrounds; homogeneity of abilities; knowledge of others’ abilities; motivation; familiarity; fit of
personalities; cohesiveness and trust; communication structure; and homogeneity of status, roles, and power (Olson & Olson, 1997). Group size and composition influence group performance: in terms of the effects of cohesiveness-performance, it is stronger in small groups and weaker in large groups (Mullen & Cooper, 1994).

**Groupthink**

When individuals work with other members and put their heads together to do tasks, they tend to follow the way other members think. This is called *groupthink* and it is considered as one of the disadvantages of a small group. Groupthink affects cohesiveness positively or negatively. It tends to increase group cohesiveness. The higher the group cohesiveness, the higher the risk a group will have symptoms of groupthink (Janis, 1972).

The concept of groupthink shows that participants in a small group tend to minimize the critical testing of ideas within the group as they are afraid of having conflicts that lead to disharmony (Beebe & Masterson, 1986; Jensen & Chilberg, 1991). In addition, groupthink also explains the situation where group members make a decision-shift once they start their discussion to “coincide with the dominant view” (Jensen & Chilberg, 1991, p. 358).

Jensen & Chilberg (1991) identified three categories of symptoms of groupthink based on eight symptoms identified by Janis (1972): overestimations of the group, closed-mindedness, and pressures toward uniformity. Individuals tend to be optimistic and encourage taking risks in a small group. They also behave toward other members “to rationalize to discount warnings or other information that might lead the members to
reconsider their assumptions before they recommit themselves” (Janis, 1982, p. 174).

Members in a group tend to ignore the ethical or moral consequences of their decisions; however, individuals put pressure on other members who express strong arguments against any of the group’s stereotypes, illusions, or commitments. During interaction, the self-appointed mindguards appear in a group: “they (the self-appointed mindguards) refer to the members who protect the group from adverse information that might shatter their shared complacency about the effectiveness and morality of their decisions” (Janis, 1982, p. 175).

The emergence of groupthink cannot be avoided since it occurs as an invisible phenomenon. It all depends on member’s attitudes toward a group discussion and the maintenance of individual’s perceptions. This emergence also depends on how quickly members in a group can become familiar with one another in a given time frame in order to work effectively.

**Member’s Familiarity**

*Member’s familiarity* is important for exchanging shared meanings and reading nonverbal cues. Participants normally have to build relationships from scratch during a meeting if they have not met each other before (Werkhoven et al., 2000). The information about other members might have an effect on members’ performance and it may help members to understand others for developing relationships. Hence, when members know each other from the beginning, they are already familiar with each other’s characteristics and behavior patterns: the uncertainty level is low due to the capabilities of an individual to predict how others are likely to respond to him or her, based on a
previous experience (Gabarro, as cited by Olson & Olson, 1997). In addition, members who know each other convey a shared repertoire of meaning and ways of expressing messages (Gabarro, as cited by Olson & Olson, 1997), and they enhance the group's ability to be more spontaneous in exchanging information (Olson & Olson, 1997).

Members who are familiar with others can read nonverbal cues easier than those who do not know each other. Nonverbal communication “occurs through cues accompanying language or separate from language that people may interpret as having meaning” (Lumsden & Lumsden, 1993, p. 215). Nonverbal interaction also has different functions: “to carry, supplement, enrich, diminish, or substitute for verbal communication” (p. 215). The more people know each other, the more they are able to pick up one another’s nonverbal cues: even if a member cannot pick up nonverbal cues, if he or she knows others, they would be able to, at least, project what they are trying to say by analyzing a dialogue.

Nonverbal cues are attributable to an individual’s sex or psychological gender (Borisoff & Merrill, as cited by Lumsden & Lumsden, 1993) and they vary based on a person’s background including family, culture, and experiences. Environment such as meeting space, seating arrangements, and technology, also has nonverbal influences on interaction. As we can observe, various elements influence group interaction and these elements would bring a completely different outcome in efficiency of an interaction.

Individual accountability is fundamental to accomplishing group goals, and familiarity is important to reduce ambiguity in communication, to resolve conflicts constructively, and to accept and support other group members to achieve mutual goals (Johnson & Johnson, 1998). In addition, recognizing and reflecting their own behaviors
in a group is important to how well they function to improve their work process (Johnson & Johnson, 1998).

**Member’s Participation and Group Performance**

Individual’s active participation leads to interactive group performance. This participation leads to effective interaction and influences group cohesiveness. Campbell (1998) distinguishes two types of individuals in terms of participation: the individuals who actively participate in a meeting; and those who are present to observe or provide support without adopting an active or direct role. In addition, non-active but careful observation and support would help tighten cohesiveness, and also brings productive experiences to a group.

**The Phases of Decision Making**

A group member processes different phases of decision-making. The patterns of observed communicative behaviors have four phases: orientation, conflict, emergence, and reinforcement (Fisher, as cited by Ellis & Fisher, 1994). The first phase, orientation, explains that individuals in a group take a fence-sitting attitude that allows them to be flexible to go one way or another. Individuals in this phase express attitudes that are ambiguous toward the newly introduced proposals, and they are searching for ideas and directions. Hence, “characteristics of the orientation phase are getting acquainted, clarifying, and tentatively expressing attitudes” (Ellis & Fisher, 1994).

Second, in the conflict phase, members become aware of the direction of the group regarding decision-making and make up their minds. Then, they face an emergence
phase: trying to express fewer unfavorable opinions toward decision proposals since “they (members) have already committed themselves to a stand of opposition in the conflict phase and cannot be expected to change their opinions so abruptly” (Ellis & Fisher, 1994, p. 159). In the last phase, reinforcement, all members show their agreement and develop commitment to the decisions they have made.

Individuals behave differently when they have to make decisions in a group and when they have to make decisions alone. One of the group tendencies is explained as group polarization, referring to the fact that “groups tend to be more extreme than the initial opinions of its members” (Ellis & Fisher, 1994, p. 45). In terms of decision-making, a group inherently takes different paths from one individual’s decision-making process (Ellis & Fisher, 1994).

To sum up, small group members interact differently depending on the size of the group, familiarity, the motivation to attain goals, tasks given, and the surrounding environment.
IV. Media Traits in the Future

Virtual Reality Conferencing

Using a videoconferencing system for virtual reality conferencing (VRC) has opened the door to having new types of communication styles over the pre-existing conferencing systems. It also breaks down the previous barrier of videoconferencing and face-to-face communications. Previous research has explored the possibilities of VRC (Greenhalgh, Bullock, Tromp, & Benford, 1997; Schlumberger, 2003); however, they have not yet explored possibilities of different applications of communication in virtual reality for business conferencing.

Virtual reality may have the ability to alter reality and perceptions. For example, virtual reality is applied to flight simulation, and this training leads to better flight performance; however its success depends on type of task (Weiss & Jessel, 1998). Similar to simulation, virtual reality conferencing (VRC) offers the advantage of having the ability to manipulate surroundings and reality to conduct business conferencing. In terms of feeling a realness and vividness in virtual reality, considering user’s sense of presence is the essential component. Virtual reality engenders “a feeling of actual presence in the simulated environment” (Weiss & Jessel, 1998). Gaggioli et al. (2003) also report that a user’s sense of presence has a strong link to effective virtual environments.

Virtual reality is useful, especially when the users cannot see each other face-to-face because of political conflicts. The application of VRC would be useful, for instance, in the context of marketing. Virtual reality is similar to face-to-face in terms of
producing “a simulated environment that users perceive as comparable to real world objects and events” (Weiss & Jessel, 1998).

Although VRC will enhance the users’ sense of presence to others who do not physically share the space, it is important to mention that the users may experience physical side effects, such as nausea, eyestrain, other ocular disturbances, postural instability, headaches, and drowsiness during and after the exposure to the virtual environment (Howarth & Costello, 1996). In addition, VRC must expand its potential applications for professionals in business, education, or individual use. The impact of VRC on communication has not yet been discovered.

**Avatar-Future Meeting**

When people are dispersed in multiple locations, they are normally unable to attend a joint meeting because of time differences. However, virtual reality meetings in the future will be able to solve the problems of time difference by using avatars instead of having a real person in the meeting (J. Dator, Personal Communication, July 8, 2003). It is technically possible to use avatars instead of real people to attend a meeting to create the illusion of realness. By synchronizing lips and giving facial expressions and emotional responses the avatar can simulate the human (Anthony & Lawson, 2002).

An avatar is a synthetic character and can be created by “deforming a polygonal ‘wire mesh’ structure to match the proportions and appearance of the human subject” (Anthony & Lawson, 2002, p. 3). In terms of having effective interaction, an avatar needs to have a virtual intelligence composed of two parts: a knowledge database where the avatar stores information on the issues people are likely to discuss and the
relationships of issues in different contexts; and the ability of the avatar to communicate meaningfully (Anthony & Lawson, 2002). In addition to these two parts, we need to program and simulate one person's character and characteristics.

The issue of using the avatar in a group meeting, for instance, would not only be whether it replaces real people or not, but also how much can be productively communicated with the avatar to reach the objectives of the meeting. In addition, how much realness people can feel toward the avatar and how much they are absorbed in the environment would form the keys for assessing the value of holding a meeting using the avatar in a virtual reality setting. Although it is still doubtful whether a powerful virtual reality setting replicates a real meeting, the technology in the near future allows us to have a virtual reality which enhances the sense of participants' presence more than now.
CHAPTER 3
RESEARCH QUESTIONS AND KEY CONCEPTS

Research Questions

This study was conducted in response to five research questions. All questions raised in this study were investigated by utilizing multiple methods of interviews, focus groups, and experiments.

RQ1: In addition to the traits of sociability, sensitivity, warmth, and personability, what are the other characteristics of social presence that videoconferencing provides?

RQ2: What are the experienced users’ preferences in using either videoconferencing or face-to-face meeting if money and time are no object (in terms of goal achievement)?

RQ 3: What are the experienced users’ perceptions of interaction via videoconferencing versus face-to-face in terms of cohesiveness, social presence, and sense of presence?

RQ 4: What are the effects of communication conditions (videoconferencing and face-to-face) on cohesiveness, social presence, and sense of presence when group members collaborate on decision-making tasks?

RQ 5: To what extent do users’ perceptions of social presence and sense of presence relate to their cohesiveness in a group via videoconferencing versus face-to-face when members collaborate on decision-making tasks?
Key Concepts

Communication Conditions

Conceptual definition: The concept of communication conditions is used to distinguish between mediated and non-mediated situations. Communication involving mediated situations such as audio and videoconferencing, e-mail, and online chatting; and non-mediated situations such as face-to-face settings bring different outcomes in terms of richness of conveying information, including verbal and nonverbal cues. Mediated communication among a small group is different from the group interacting face-to-face as a consequence of immediacy and cohesiveness due to the user’s familiarity with the medium or its environment and user’s familiarity with other group members; and cohesiveness brings different levels of group productivity.

In terms of mediated communication conditions for the purpose of having a conference, there are several media available upon which one can conduct research related to the effectiveness of interaction: audio-conferencing, videoconferencing, computer teleconferencing, and full-scale cyberconferencing (Housel & Skopec, 2001; Williams, 1987).

Operational definition: Mediated and non-mediated communication conditions were videoconferencing and face-to-face settings. Those conditions were assessed in terms of the relative ability to convey social presence, and to provide the environment for users to feel sense of presence, and bring cohesiveness to a group interaction.

In the context of this study, videoconferencing was defined in its technological sense to a narrow range of available equipment and facilities as follows: television screens with split image options, fixed camera (polycom) either on top of a TV screen or in a
separated place, and user-controlled cameras and microphones. For this study, the technological variations in videoconferencing were excluded: PC based collaboration, desktop conferencing, cyberconferencing, or videoconferencing with hand phones or head sets, or with a large screen television.

**Member's Familiarity**

*Conceptual definition:* The level of familiarity among small group participants is one of the crucial factors in group interaction in order to have an effective meeting. Knowing about other members helps participants to read verbal and nonverbal cues, and what others are trying to mention. Conversely, it is challenging to glean information through a conversation without having any knowledge of others (Rudman, et al., 1997). Members' familiarity has various connotations and has been used in different contexts: how long participants have known each other, and whether or not they worked together before (Yoo & Alavi, 2001).

*Operational definition:* Participants in this study were asked to bring a partner with whom they were familiar and whom they had known for at least six months with whom they could work comfortably. A pair was assigned to a group with another pair whom they did not know; therefore each person had his or her partner and two other members (he or she did not know) in a four-person group.

**Cohesiveness**

*Conceptual definition:* Cohesiveness has been defined as “a dynamic process that is reflected in the tendency for a group to stick together and remain united in the pursuit of
its instrumental objectives and/or for the satisfaction of member’s affective needs” (Carron, Brawley, & Widmeyer as cited by Carron & Brawley, 2000). In addition, a productive group culture is dependent on cohesiveness: a group is cohesive when members can share the group’s perspectives, coordinate their efforts, and enjoy working together (Jensen & Chilerg, 1991).

Cohesiveness is observed both at an individual and the group level. It operates on two different bases for attraction in a small group -- interpersonal and group attraction. Cohesiveness is accomplished when group members like each other or have a good impression, and when they like the group as a whole (Jensen & Chilberg, 1991). An individual’s and group’s attraction are influenced by the physical distance between members, which is called proximity. The environment of videoconferencing creates physical distance between members, and it may affect interpersonal and group attraction, which also affects cohesiveness.

There seems to be different ways of assessing cohesiveness. According to Cartwright (1968), there are five major approaches to measuring group cohesiveness as follows: (1) interpersonal attraction among group members; (2) evaluation of a group as a whole; (3) closeness or identification with a group; (4) expressed desire to remain a group member; and (5) composite indices of the first four types of measurements.

Operational definition: Cohesiveness in this study referred to task cohesiveness. This was measured in the decision-making situation of a task-oriented scenario in two different conditions: videoconferencing and face-to-face settings. Cohesiveness was measured by the following nine items that were adopted from prior studies which used group cohesiveness measurement (Jung & Sosik, 2002; Langfred, 1998). A six-point
scale was used, anchored by Strongly Agree to Strongly Disagree, and Not Applicable.

There were nine questions:

1. I could give suggestions and helped others.
2. I could say what I wanted.
3. Others gave suggestions and helped me.
4. I could rely on other group members to complete tasks.
5. I could count on others to help me if I had difficulties.
6. Participants could focus on completing tasks.
7. Participants could work effectively in getting tasks done.
8. Participants could work effectively to meet objectives.
9. Participants could complete tasks successfully.

**Social Presence**

*Conceptual definition:* Social presence is the characteristics and the capability of a medium, and it helps users to feel sense of presence during an interaction. Social presence is defined as “a quality of a given media [sic] that affects the degree of salience of a conversational partner in a one-to-one interaction” (Brander & Mark, 2001, p. 1). It is one of the elements that explain their existence (living or synthetic) that reacts to the people involved in the given environment (Heeter, as cited by Gaggioli et al., 2003).

Not only do researchers use different definitions to explain social presence, but they use different terminology such as social presence, telepresence, co-presence, and sense of presence in a similar context, or the same term in different contexts. The detailed distinction of vocabularies was discussed in the literature review section.

For measuring social presence, semantic differentials developed by Short et al. (1976) such as sociable/unsociable, sensitive/insensitive, personal/impersonal, and warm/cold have been used for a long time in previous studies (Yoo & Alavi, 2001). In addition, Tu (2001) added some other items such as humanizing/dehumanizing and
formal/informal. He also pointed out the limitation of using the measurement developed by Short et al. (1976) because these four items seem too general to measure the complicated user's perceptions of social presence, and the semantic differential technique may be faulty in that respondents tend to formulate different definitions and meanings to keywords.

Operational definition: Social presence in this study follows the conceptual definition. Items used in this study were originally adopted from the measurements from Short et al. (1976): they include sociable/unsociable, sensitive/insensitive, personal/impersonal, warm/cold. Other items, which were developed based on the findings of the focus group discussion, were added: formal, inclusive, attentive, comfortable, close, bonding, distant, together, and commitment. Items of personal/impersonal remained in this study although the study had participants whose members were a mixture of familiar or not familiar.

Sense of Presence

Conceptual definition: Sense of presence is the user's characteristics of feeling others' presence in interaction. It also refers to the feeling of "being there" or self's presence (Ijsselsteijn & Riva, 2003), and individuals have different perceptions that are based on "perceptual motor abilities, mental states, traits, needs, preferences, experiences, etc." (p. 3).

Insko (2003) studies different ways of measuring sense of presence, especially in the context of virtual reality (VE): he distinguishes them as subjective measures, behavioral measures, and physiological measures. The evaluation on these measurements seems to be controversial since each measurement has its advantages and disadvantages.
For instance, the International Society for Presence Research (2003) reports that "subjective measures of presence require to study participants to produce a conscious, introspective judgment regarding their experience" (p. 1), and subjective measurements of sense of presence are evaluated as valid and reliable (Prothero, Parker, Furness, & Wells, 1995).

Because subjective measures sometimes produce unstable and inconsistent responses across participants, time, and environment and situations; participants’ self-reported sense responses have to be relied on, and these are dependent on a participant’s prior experience (Insko, 2003; Prothero et al., 1995). The measurements may lack accuracy because a process of introspection may influence the participant’s responses. Furthermore, the combination of the study parameters and items may lead participants to predict the types of responses that the researcher expects (Prothero et al., 1995).

Behavioral measures posit that the more a participant feels present in a virtual environment, the more his or her responses to stimuli will match those behaviors he or she would exhibit in an identical real environment. These measures are more shielded from subject bias than subjective measures: however, they can be exposed to experimenter bias. In short, the weakness is not due to whether or not a certain behavior was caused by the experimental condition (Insko, 2003).

The last measures, defined by Insko (2003), are “physiological measures.” These assess participants’ sense of presence by using the changes of body conditions such as a change in heart rate, skin conductance, and skin temperature. Some advantages can be considered: these measures are more objective than subjective and behavioral measures,
and these are capable of measuring sense of presence in terms of time-varying qualities (Insko, 2003).

Operational definition: Sense of presence in this study was based on the conceptual definition: it was defined as how participants were aware of their own presence, others’ presence, and others’ presence of one’s joint sense. In other words, it was the feeling of other’s existence, “being there,” and also the sense of togetherness and nearness.

Sense of users’ presence was assessed under two communication conditions. Items used in this study were subjective measures that rely on participants’ perceptions of and experience of feeling sense of presence through their experiences in an experiment. Items were adopted from Witmer and Singer’s (1998) Presence Questionnaire and they were modified for this study. A six-point scale was used, anchored by Strongly Agree to Strongly Disagree, and Not Applicable. The questions were as follows:

1. I was able to control events.
2. The environment was responsive to actions that I initiated (or performed).
3. The interaction was natural.
4. All my senses were being completely engaged.
5. I was involved in the visual aspects of the environment.
6. I was involved in the auditory aspects of the environment.
7. I experienced a sense of being ‘really there’ during the experiment.
8. I was aware of events occurring in the real world around me.
9. The information coming from my various senses was inconsistent or disconnected.
10. I was able to anticipate what would happen next in response to the actions that I performed.
11. I was completely able to actively survey or search the environment using vision.
12. I could quickly adjust to the environment.
13. I could concentrate on the assigned tasks rather than on the environment.
14. I was involved in the experimental task to such an extent that I lost track of time.
Presence

Conceptual definition: According to Longman Dictionary of Contemporary English (1991), presence is defined as (1) “the fact of being present,” (2) “a group of people of the stated type in a place,” (3) “personal qualities and ways of behaving that have a strong effect on others,” and (4) “a spirit or an influence that cannot be seen but is felt to be near (p. 990).”

Operational definition: Presence is defined in this study as a person’s existence and the fact of being present. The word is considered separately from social presence and sense of presence.
This study used multiple methods of interviews, focus groups, and experiment.

**Interviews**

*Objectives*

Interviews were conducted to explore their perceptions of interaction via videoconferencing and how it might compare to face-to-face meeting in terms of cohesiveness, social presence, and sense of presence (referring RQ2 and RQ3).

*Procedures*

Interviews were conducted individually with four members in the total of nine. Two sets of interviews with five members were conducted in a group setting: interviews with Dr. Norman Okamura and Ms. Christina Higa of PEACESAT, and with three members from the Judiciary, with Mr. Nathan Kim, Ms. Karen Takahashi, and Ms. Christina Ubeline. The interviews took place in the respective offices of individuals or in videoconferencing room. Interview sessions ranged was from 20 to 80 minutes. Common elements of interview questions appear in Appendix A.

*Participants*

Nine interviewees were asked to participate in this study. Interviewees were: Dr. James Dator (Professor and Director of Future Studies); Dr. David Lassner (Director of Information Technology); Dr. Norman Okamura (Principal Investigator of PEACESAT)
and Ms. Christina Higa (Co-principal Investigator of PEACESAT) from the University of Hawai‘i at Mānoa; and Dr. Blair Odo, Vice-President from the Japan American Institute of Management Services (JAIMS); and four individuals from the Judiciary in the State of Hawai‘i: Mr. Walter Ozawa, the Deputy Administrative Director of the Courts; Mr. Nathan Kim, the Director of Fiscal and Support; Ms. Karen Takahashi, Coordinator of special project for the Hawaii State Legislature; and Ms. Christina Ubeline, Administrator of planning and program evaluation.

These interviewees were considered as the experienced videoconferencing users: the first four interviewees were categorized in terms of their expertise of using and operating videoconferencing; the experience was from at least once a day to once in a few months; and other five interviewees were categorized in terms of having enough experience to assess the interaction via videoconferencing; the frequency of using a medium is from once in a few weeks to once in a few months over a period of one to twenty years.

The interviewer had a contact with each participant through her thesis committee members or by herself through e-mail prior to the interview sessions. This was a purposive selection process intended to identify and select individuals within the Oahu community with extensive background in and use of videoconferencing: interviewees were public and private administrators in government and educational settings.
Focus Groups

Objectives

The objectives of the focus groups were: (1) to investigate new elements and characteristics for measurement of social presence in addition to the items developed by Short et al. in 1976 (RQ1); and (2) to investigate experienced users' preferences in using either videoconferencing or face-to-face meeting if money and time were no object (RQ2); and (3) to investigate the experienced users' perceptions of interaction via videoconferencing versus face-to-face in terms of cohesiveness, social presence, and sense of presence (RQ3).

Procedures

Two focus groups were conducted on separate days. Before starting the discussion, participants briefly introduced themselves and got acquainted, though the first focus group members already knew each other. The primary objectives of these focus groups that were developing the measurement for social presence: the concepts of social presence (characteristics of media) and sense of presence (characteristics of users) were explained by the experimenter, and the differences between these two concepts were emphasized (direction is attached as Appendix B).

The researcher tried to take turns in order for participants to have an equal amount of time for expressing their opinions. The questions were prepared for exploring the vocabularies of explaining social presence: the questions included the followings: their perceptions of the medium's advantages and disadvantages; the experience of feeling realness of others; and the suitable description of their feelings of it. The questions were
asked in order, as the researcher planned, however, some questions needed to be skipped in order to avoid redundancy due to the fact that participants had already answered or their answers included the items needed to be answered in the following questions. Participants were allowed to interrupt other members whenever they needed to do so: when they agreed or disagreed with others and when they wanted to add other perceptions.

The researcher was leading and facilitating the discussion. She was taking notes during the focus group discussion. Besides, the entire discussion was video and audio-recorded for later transcription and analysis. Further observations explored not only the individual participants’ responses but also the group dynamics in the given environment: the interaction of individuals with the media present onsite, such as the camera and monitor, microphones, telephones, and the like.

**Participants**

Participants in these focus groups were chosen in a purposive sample from the PEACESAT database. They were in remote locations of Oahu, American Samoa, Guam, and Saipan, with the best telecommunication and videoconferencing facilities that would minimize technical difficulties from a technical perspective.

Five members participated in each focus group, with a total of nine participants, as one person participated twice. In order to observe the differences of perceptions in terms of members’ familiarity, participants for each focus group were intentionally recruited in terms of their familiarity with other members. One group consisted of familiar members
and a second group consisted of unfamiliar members for that group, with one transitional member between the two groups.

Participants were categorized as experienced and inexperienced videoconferencing users. The former group had previous experiences of using videoconferencing, or observing or operating the meeting equipment: focus group members in the first session had used videoconferencing regularly from several times a day to once a month: the participants for the second focus group, on the other hand, did not have enough experience compared with the first group; for one person, it was her third time for using videoconferencing; for another person, it was her second time; and the other three participants had no experience in participating in videoconferencing, but they had experience working as videoconferencing coordinators and technicians, and were therefore familiar with the process and technology. In this sense, they had enough knowledge to discuss videoconferencing and also observe themselves and others as participants in this focus group.

**Technology**

The videoconferencing system of Pan-Pacific Education and Communication Experiment by Satellite (PEACESAT) at the University of Hawai‘i at Mānoa (UHM) was used by connecting PEACESAT with the following sites: PREL Hawaii (Oahu), American Samoa, Guam, and Saipan. The sites were intentionally chosen among over 50 PEACESAT sites in 22 Pacific Island jurisdictions to consider the infrastructure of each site: the sites chosen represent the best telecommunication connections with the intent to reduce noise and connection problems.
About the videoconferencing settings: each site had one screen in front of the users, and it split into four tiles that showed other sites. Users could see themselves as picture in picture at the corner of a TV screen. The room where the interviewer was located had two TV screens, and she could see other sites on a TV screen which was split into four tiles, and she could see herself on the second TV monitor.

By looking at a self-view, participants had the opportunity to view their own behaviors that were observed by other participants during the meeting at the same time as potentially observing other’s behaviors. Whether or not participants could see a self-view at the corner of the screen could conceivably make a noteworthy difference on the users’ feelings of presence. Therefore, this study chose to replicate the same condition on each site to control this particular factor.

**Experiment**

**Objectives**

The purposes of the experiment were: (1) to investigate the effects of communication conditions (videoconferencing and face-to-face) on cohesiveness, social presence, and sense of presence when group members collaborate on decision-making tasks (RQ4); and (2) to observe users’ perceptions of the effectiveness of their interaction in terms of social presence and sense of presence, and to what extent those relate to cohesiveness of a group via videoconferencing versus face-to-face when members collaborate on decision-making tasks (RQ5).
Procedures

Videoconferencing

Four volunteers participated at the same time in each experimental group. The experiment was conducted with participants who knew each other and who had never used videoconferencing for any business or educational purposes. Two participants who were familiar with each other sat at two separate sites and saw each other on the TV screen. In other words, those who did not know each other sat together at the same site, and interacted with each other face-to-face while also interacting with the other two members at the remote site to complete tasks.

After the participants arrived, they were asked to read about the experiment and sign their names on a consent form. Then, they were presented the tasks and asked to reach consensus with other members. The tasks were pre-tested among the graduate students in the School of Communications and determined to take approximately ten to fifteen minutes each; for two tasks taking approximately twenty to thirty minutes total time, although room reservations allocated for up to one hour for the interaction.

Participants were briefly instructed on the use of a remote control and the need for consistency to keep their pictures at a corner of a screen throughout the experiment. They were free to use this remote control during the experiment, and change the sound volume and the size of pictures on the screen. They were asked to keep their own picture at the corner of the TV screen (picture in picture); however, participants at each site could make their own decisions on whether they wished to retain this set-up or not.

The subjects were instructed to inform the experimenter who waited outside the room during the experiment when they finished the two tasks. After completing the tasks,
a post-experiment questionnaire was distributed by the experimenter and her assistant at
the remote site, and participants answered individually. (see Appendix D).

Face-to-Face

Same as videoconferencing setting, four participants were asked to come to a room at
the same time for a face-to-face meeting. Two participants who knew each other were
asked to sit on opposite sides of the table in order to replicate the situation similar to the
videoconferencing experiment. After their arrival, they were asked to read about
direction for the experiment and sign a consent form. Then, participants were told about
the tasks and that they must achieve consensus among group members. Same as the
videoconferencing experiment, the tasks took approximately ten to fifteen minutes each
for two tasks for a total of twenty to thirty minutes.

Participants were instructed to inform the experimenter who waited outside the room
during the experiment when they finished the two tasks. After finishing the tasks, the
post-experiment questionnaires (identical to those given to the videoconferencing group)
were distributed and the participants were asked to complete them individually. (see
Appendix E).

Participants

Forty-eight participants in groups of four participated in the experiment: 20
participants in a videoconferencing setting and 28 in a face-to-face setting. Both
videoconferencing and face-to-face groups were given tasks and asked to achieve a goal
with their group members (see Appendix C for instructions given to each group).
Participants were chosen by using a non-probabilistic sample of convenience. They were undergraduate and graduate student volunteers mainly from the School of Communications (24 people) and also from other departments such as Business Administration (1 person) and Journalism (1 person), at the University of Hawai‘i at Mānoa (UHM) in the Fall semester of 2003. Students in the School of Communications were recruited through the classes of Communication 444 and 490. Others were recruited by the experimenter’s personal contacts (8 people) including friends from the School of Communications and other departments such as History, Education, Psychology, Biology, Dental Hygiene, and Political Science; and their friends (14 people) including those who were students from other departments (not identified) and who were not students. Volunteers received some credits for their classes (for those in Communication 444 and 490) or a five-dollar gift card which was available at Volcano Joe’s Coffee Shop near the UHM for their voluntary participation.

Participants were asked to bring a friend, or someone with whom they are familiar whom they had known for at least 6 months and with whom they could feel comfortable enough to work together and do tasks. Having at least one person whom each individual knew eliminated unnecessary tensions among members in a group for performing tasks. Also, having members who were not familiar simulated situations in a real, professional meeting.

Since students were not necessarily able to bring their university friend, participants who were not students at UHM were included. In addition, those who agreed to participate were assigned to one of two communication conditions, videoconferencing or
a face-to-face meeting, based on their availability on the days when the experiments were scheduled.

As students at UHM were diverse in terms of ethnicity and nationality, only native English speakers were recruited for consistency and their ability to understand tasks in English.

Environment and Equipment

Videoconferencing

Interactive two-way videoconferencing facilities in PEACESAT at the University of Hawai'i at Mānoa (UHM) were used for this experiment. Two locations, a videoconferencing room for the UH Telecommunication Information Policy Group (TIP-G) at PEACESAT and another room in the UHM College of Education, were connected for each experiment. The interaction for the videoconferencing experiment was video taped for later viewing and analysis since the researcher would not have been able to observe either site without affecting the experimental environment.

The videoconferencing room in PEACESAT has two TV monitors in front of a square-shaped table, and the participants looked at the other two members on two side-by-side screens, one displaying a remote site and the other reflecting themselves. The camera was set on top of the main screen which showed the other two members. The distance between the screens and the chairs was approximately 4 meters at PEACESAT and 3 meters in the videoconferencing room in the UHM College of Education.

The facility in the College of Education was rather small with a round table which allowed a maximum of eight people sitting at one time. There was only one TV screen
and the camera was set on a shelf above the TV screen and could be moved by 180 degrees.

**Face-to-Face**

The library research center in the School of Communications was used for the face-to-face portion of this experiment. The room is approximately the same size as the videoconferencing room in the College of Education, and the place was organized in a similar manner as the videoconferencing facilities in terms of the positioning of chairs, tables, and environment (air-conditioning).

**Tasks**

The same two tasks were used in this experiment for the videoconferencing group and face-to-face meetings. Tasks were necessary to stimulate participants to positively interact with other members and to motivate them to achieve goals. Tasks assigned in this study required them to reach consensus through a group discussion.

The tasks required discussion and resolution: the first task was originally developed by Hammond as cited by Bernthal and Insko (1993). This task which was studied by the National Review of Higher Education was about the desirability rating of a dormitory. The procedure of doing each task was changed for this experiment. In the original task, three bar graphs presented the ratings of three facilities at a dormitory: educational, residential, and recreational. Instead of guessing the ranking, participants in this experiment were asked to consider the overall desirability rating of a dormitory as a total living and learning environment (educational/residential/recreational), and rank them.
(from one to three) according to their importance for the residents. Then, participants were asked to discuss their answers with other members in the group and reach consensus. (see Appendix C)

The second task was developed by the experimenter. The task required participants to discuss the best suitable person to work abroad for a new project. A description of the three candidates for this project was provided, and the participants needed to decide which one candidate would be chosen for the job (both tasks are attached as Appendix C).

**Post-Experiment Questionnaires**

The post-experiment questionnaires consisted of three parts to assess group cohesiveness, user's perception of the capability of medium conveying social presence, and their perceptions of feeling sense of presence. The measurement for cohesiveness was adopted from Langfred (1998), and Jung and Sosik (2002), and tailored for this study. There were nine questions, which were measured by a five-point Agree-Disagree scale (from Strongly Agree to Strongly Disagree) plus a measurement of Not Applicable (see Appendix E).

Social presence was measured by using the items adopted from Short et al. (1976) such as sociable, sensitive, warm, and personal, and the items developed for this study based on the findings from the focus groups. The ideas of a measurement for sense of presence were adopted from the study done by Witmer and Singer (1998), and developed for this study. For the experimenter's reference, the participants' demographics were collected for the experimenter's reference at the end of the questionnaires.
CHAPTER 5
RESULTS

Research Question 1

Focus groups were conducted to answer research question one: “In addition to the traits of sociability, sensitivity, warmth, and personability, what are the other characteristics of social presence that videoconferencing provides?”

The researcher tried to start the discussion by asking several questions in terms of participants’ experience of using videoconferencing and their feelings of other’s presence in order to increase their awareness to these issues. The researcher then extracted appropriate words from the participants’ responses as they applied to the medium’s characteristics of social presence.

The following words were given to participants to consider social presence: nearness, closeness, togetherness, bonding, and formality. In this process, the experimenter tried to observe user’s perceptions of those vocabularies and how they could develop other items during the discussion. By the end of the discussion, nine items were noted: formal, inclusive, attentive, comfortable, close, bonding, distance, together, and commitment.

The first focus group discovered traits such as inclusive and attentive to explain social presence. Participants from the first focus group had known each other through videoconferencing, or having actually met each other face-to-face before. Seven out of nine participants agreed on using nearness, closeness, togetherness, and bonding to describe social presence that videoconferencing conveys. In fact, eight out of nine participants from the first focus group felt that videoconferencing provides the feelings of
closeness to others. The feeling was almost like others were here sitting in front of them the same as a face-to-face meeting, but the difference was that they could not touch others. In addition, member’s familiarity brought a high level of comfort which made participants feel close to others. In addition, a camera could deliver the presence of human beings.

The word *formal* seemed not appropriate for the focus group participants to explain their interaction via videoconferencing since formality was dependent on the purpose of using videoconferencing in either business or private use. Since participants had used videoconferencing for their business meeting, they felt the interaction was rather informal due to member’s familiarity. In addition, levels of formality also vary depending on the extent of familiarity with the equipment. Since the quality of interaction via videoconferencing depends on participant’s status and member’s familiarity, formality seemed not the appropriate variable to explain attributes of videoconferencing.

(Note: those items mentioned above were adopted from the previous studies, and investigated again for the post-experiment questionnaires and survey questionnaires.)

**Research Question 2**

The discussion in the focus groups answered research question two: “What are the experienced users’ preferences in using either videoconferencing or face-to-face meeting if money and time are no object (in terms of goal achievement)?”
Focus Groups

Six out of nine participants agreed that they preferred to participate in a face-to-face meeting although videoconferencing is available and they have been using it on a regular basis. The reasons were: First, if they have multiple tasks that they have to accomplish in a limited time, videoconferencing is not the best choice for this situation. In addition, if the subject of discussion is a sensitive matter, participants need to see the other person’s body language to know whether they are accepting ideas or not, or whether messages are getting across to others. Even though users can see body cues via videoconferencing, the medium is still different from seeing others face-to-face in the same room. Participants may be able to pick up some parts of other’s conversation if they are together in the same room; however, they may miss that in interaction via videoconferencing.

Second reason why participants preferred face-to-face over videoconferencing was due to the fact as follows: a purpose of face-to-face meeting is not only just participating in a meeting but also exchanging cultures with others especially for those who come from small countries. Participants in a face-to-face meeting are able to join other activities after a meeting to exchange various perceptions among different cultures; however this is not possible in videoconferencing.

Research Question 3

Interviews and focus group discussions answered research question three: “What are the experienced users’ perceptions of interaction via videoconferencing versus face-to-face in terms of cohesiveness, social presence, and sense of presence?”
Interviews

The researcher asked general questions about interviewee’s experience of using videoconferencing and how it is different from face-to-face setting in terms of realness, social presence, and sense of presence. The interviews investigated whether feeling sense of presence is different depending on the purpose of videoconferencing: for business uses or educational purposes. D. Lassner (Personal Communication, July 16, 2003) reported a major difference between business and educational settings. While feeling physically and psychologically close to others is an important factor in a business meeting to work productively, feeling that others are being there may not be as important as it is in distance learning. This is because a class is conducted in lecture-style and students are not necessarily interacting with other classmates on their sites, and this situation will happen on other sites as well. Instead of interacting with other classmates, students are listening to an instructor lecturing and concentrating on the content of a lecture. In short, feeling other student’s presence (feeling sense of presence) is not important in this context because it matters especially in the contexts requiring two-way interaction.

The experienced users seem to perceive that interaction via videoconferencing is effective same as face-to-face especially when participants know each other: they understand what others imply by the tone of their voices (D. Lassner, Personal Communication, July 16, 2003). It is difficult for participants to feel sense of presence when we have a meeting via videoconferencing by connecting thirty sites at the same time, because participants never know who were there.

When holding a meeting with a few members via videoconferencing, users seemed to be able to feel intimacy as they do in a face-to-face setting. This happens even when
members meet for first time. In fact, some participants reacted “as if I was an old friend of theirs or even a lover because people see me close-up and they really know me from the television” (J. Dator, Personal Communication, July 8, 2003).

Experienced users have an expectation that videoconferencing conveys the same quality of social presence as a face-to-face meeting does. People, in general, “are accustomed to the medium being very personal of making us feel that we know people intimately” (J. Dator, Personal Communication, July 8, 2003). To sum, when users expect the medium to convey social presence, users are, in fact, able to feel sense of others’ presence. Depending on the users’ different levels of experience, their recognition of the capability of the medium conveying social presence and users feeling their sense of presence varies.

**Focus Groups**

Participants of focus groups revealed that they can comfortably interact via videoconferencing as they do in face-to-face settings, especially when they know other members. In addition, they could be cohesive, and recognize the medium is able to convey social presence and they naturally feel others’ sense of presence. Many of the advantages may have a negative impact on some participants while some of the disadvantages may prove helpful to others.

It is common to video-record a meeting via videoconferencing, whereas typically no one takes a face-to-face meeting. Therefore, the videoconferencing is beneficial not only for participants to refresh their memories, but also for others to follow a meeting agenda or settle misunderstandings as to what actually took place in the meeting. One
interviewee reasoned the advantages of a tape recorded session due to the information coming straight from one person is the second hand information for others who did not participate in a meeting, and this information does not convey all messages in a meeting (D. Chrisostomo, Personal Communication, September 4, 2003). In short, watching a video helps all to avoid misunderstandings and increase the feeling of security of sharing the same information. However, videotaping would be a disadvantage for those who did not prefer to have the record. It also inhabits the unpopular or minority views.

Videoconferencing allows us to hold a meeting more conveniently without planning too far ahead of time as compared to traveling. In case of a person intending to hold a meeting with large numbers of people from multiple locations, videoconferencing will allow each site to send multiple participants at one time. However, because of cost factors and totally abandoning other work obligations, we can only send a limited number of participants if they need to travel to another place for a face-to-face meeting.

Participants in videoconferencing are capable of looking at all people on a screen and pay attention to other’s reactions, though they may not behave similarly to face-to-face settings. One of the interviewees commented that the camera can grab more than our eyes do. However participants may be concern about who else is there as the camera captures only a limited numbers of people.

Videoconferencing allows participants to adjust their space on a screen by manipulating a camera, and changing camera shots and the size of others with a remote control. It also allows participants to choose and set the most comfortable environment, which is not possible in a face-to-face meeting. However, participants do not always have a remote control when the numbers are large and when they have an operator
controlling a camera. Participants in a face-to-face meeting have options to choose seats where they feel the most comfortable, but they cannot change the distance from others as the seats are already arranged.

Participants in videoconferencing seem to be able to control multiple tasks. For instance, they can answer a phone call during the meeting. It sounds distractive and rude; however, knowing that users can mute their voices allows them to talk outside of the main discussion without feeling any obligations. Muting the voices never reveal to whom they are talking: whether he or she talks with a person in a control room to ask for help, or they talk to a person who called from outside.

Videoconferencing may help users to overcome their shyness: the physical separation mitigated shyness. Interacting with others face-to-face is not always a comfortable situation for some people especially when they see others for the first time. Besides the mediated environment provides comfortable atmosphere due to the physical distance, the level of comfort depends on the familiarity with the technology.

Users can hide what they do not want others to see in videoconferencing. For instance, users may be able to put articles on a table and read them until a meeting starts, or during a time when one sites tries to hook up other sites. In addition, users may be able to relax more in videoconferencing than face-to-face by putting their feet on the chair.

A time delay in videoconferencing especially in satellite connections often happens: having a time lag can be distracting for participants to have the natural flow of conversation. The researcher in this study experienced the time delay including audio and visual during a focus group discussion even though the sites which had the best
connections were chosen for this discussion; however, the distraction was minimal. If the connection was not good at all, the time delay might happen more often than usual and it could bring negative effects on the discussion session.

On the other hand, the technological disadvantage can be considered as an advantage if we see the glitches of time delay are necessary for the ambiance of interaction in terms of providing a moment for participants to get their thoughts into shape for the next discussion although the delay must be only for a short moment. The mechanism of the time delay provides a natural and enforced break in each segment of interaction to allow for each individual to extend the time break to their own advantage. In other words, it slows down the pace of conversation enough to be of assistance to some users especially in the context of international meetings when a second language may be the primary form of communication.

One of participants commented on his experience: in videoconferencing, the physical block of a TV screen requires him to put additional efforts to convey opinions to others who are in other sites (N. Sablan, Personal Communication, September 4, 2003). In terms of physical reactions, the media traits such as a time delay (immediacy) and equivocality cause the users' physical reactions. In addition, participants in videoconferencing cannot have small talk in order to clarify doubts about questions with others who would have been sitting next to them in a face-to-face meeting. They also cannot interrupt others by raising their hand because interaction via videoconferencing is not immediate.

Users know that interrupting others or starting to talk in their own pace can possibly ruin the rest of someone's speech especially in a situation where an interaction is not
immediate, and participants do not capture the flow and the rhythm of conversation. Therefore, interrupting others may be more rude and destructive in videoconferencing than face-to-face. In fact, in videoconferencing, it is difficult for users to maintain a smooth conversation, to interrupt others, and listen to others talk, or to hold someone from talking for a moment.

Videoconferencing creates unnecessary tension among users: they may feel that a person who is sitting at another site is against them just because he or she is sitting separately and looking straight at them through a TV screen (S. Poloai, Personal Communication, September 4, 2003). Although it takes a very short time to feel comfortable with the people sitting physically next to each other, even if they do not know one another; getting to know others on remote videoconferencing sites takes longer due to a lack of informal interaction and given the task-oriented manners associated with this physical set-up.

Another form of tension observed was physical reactions such as stiff necks and backs from feeling obligated to face the camera (N. Sablan, Personal Communication, September 4, 2003). While one participant pressed that he did not feel so relaxed during videoconferencing, others mentioned that participants in videoconferencing can relax by putting their feet on a chair. To sum, videoconferencing users might not feel relaxed when they know others were observing, however, they could relax when they recognized that parts of their body would be off camera.

Users may have another tension and concern in videoconferencing: who else are there in other sites or behind the scene? It is possible that other sites may have someone who does not appear on a TV screen but is listening to their conversation (J. Bannan,
Personal Communication, September 4, 2003). This user's tension is high especially when hierarchy and status matter. In short, the medium may provide the situation for participants to feel pressure because of absence of certainty of having another person listening to a meeting and evaluating participants. Also there is always concern about who will watch the video of their session.

There is no way of observing every single movement of all participants in videoconferencing even though a camera tries to pan all participants sitting around the table, while participants can observe others' visual cues in a face-to-face meeting by changing the position of their body and head. The difference of this fact is especially important when the numbers of participants are large, which also means that observing every single visual cues is easier when they are in a small group. Even though a camera is fixed, shows all participants, and captures every single visual cue, the picture shown on a TV screen is still a snap-shot of each participant. Therefore, the attitudes of participants outside of what is visible on each screen cannot be observed as an interviewee mentioned (B. Odo, Personal Communication, July 21, 2003).

Individual participants may not have a remote control especially when he or she participates in a conference with a large number of people and when there is a technician who is in charge of controlling the video camera. Keeping up with a discussion without having a visual of the speaker is very difficult for other sites unless the technician pays attention to the flow of the discussion and shows the proper picture of a speaker. Otherwise, the situation is very distractive to the entire meeting and decreases participant's motivations. The control over "where to look and when" is shifted from each individual in a face-to-face meeting to a second or third party in videoconferencing.
The position of a camera and the location of a TV screen may bring distraction in a meeting. Camera is normally set on top of a TV screen, but a camera may also be set separately from the screen. If so, the picture shown on a TV screen may convey the picture of a person looking at a different direction because users tend to look at a TV screen when they talk rather than looking at the camera pointing at them. This situation was observed in a focus group discussion: most participants looked at a TV screen while talking to others, because it is more natural for them to talk to others by looking at their faces on the screen.

If participants continue to look at the TV screen while they listen to others talking, a TV screen shows them looking at a different direction because a camera is potentially separated from the TV screen. These situations mentioned above are completely uncomfortable to both speakers and listeners since they may feel that others are not paying attention to them. Knowing others' lack of attention may affect their feelings of other's presence and their closeness to others. In other words, lack of direct eye contact makes a speaker feel offended as though they are being insulted, and therefore he or she perceives the other as a rude person.
**Research Question 4**

“What are the effects of communication conditions (videoconferencing and face-to-face) on cohesiveness, social presence, and sense of presence when group members collaborate on decision-making tasks?”

**Experiment**

A one-way analysis of variance (ANOVA) was used as a statistic technique to test if any differences exist among the means: for measuring the effects of communication conditions on cohesiveness, social presence, and sense of presence. The mean of each variable in two communication conditions appears in Table 3.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohesiveness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Videoconferencing</td>
<td>20</td>
<td>3.83</td>
<td>5.00</td>
<td>4.5389</td>
<td>.36635</td>
</tr>
<tr>
<td>Face-to-face</td>
<td>28</td>
<td>3.39</td>
<td>5.00</td>
<td>4.6409</td>
<td>.43495</td>
</tr>
<tr>
<td>Social Presence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Videoconferencing</td>
<td>20</td>
<td>2.42</td>
<td>4.69</td>
<td>3.7577</td>
<td>.53514</td>
</tr>
<tr>
<td>Face-to-face</td>
<td>28</td>
<td>3.23</td>
<td>4.62</td>
<td>4.0398</td>
<td>.35102</td>
</tr>
<tr>
<td>Sense of Presence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Videoconferencing</td>
<td>20</td>
<td>2.93</td>
<td>4.79</td>
<td>3.8000</td>
<td>.50486</td>
</tr>
<tr>
<td>Face-to-face</td>
<td>28</td>
<td>3.36</td>
<td>4.64</td>
<td>3.9311</td>
<td>.35341</td>
</tr>
</tbody>
</table>

**Table 3. Descriptive Statistics in Videoconferencing and Face-to-face**

The results from the experiment revealed the significant effects of communication conditions on social presence ($p$ < .05): the significance level was higher in face-to-face settings than videoconferencing. In terms of the effects of communication conditions on cohesiveness and sense of presence, the results were found to be non-significant [Cohesiveness ($F$ = .729, n.s.); Sense of presence ($F$ = 1.123, n.s.)] (see Table 4).
Table 4: The Results of One-way ANOVA for the Effects of Communication Conditions on Cohesiveness, Social Presence, and Sense of Presence

Research Question 5

“To what extent do users’ perceptions of social presence and sense of presence relate to their cohesiveness in a group via videoconferencing versus face-to-face when members collaborate on decision-making tasks?”

Experiment

A Pearson test of correlations was conducted between each set of two variables: cohesiveness and social presence; social presence and sense of presence; and cohesiveness and sense of presence. The results of the experiment demonstrated significant correlations between two variables: [Cohesiveness and social presence ($r = .427, p < .01$); cohesiveness and sense of presence ($r = .375, p < .01$); and social presence and sense of presence ($r = .632, p < .01$)] as Table 5 shows.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cohesiveness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>1</td>
<td>.427(**)</td>
<td>.375(**)</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.002</td>
<td>.009</td>
</tr>
<tr>
<td>N</td>
<td>48</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td><strong>Social Presence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.427(**)</td>
<td>1</td>
<td>.632(**)</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.002</td>
<td>.002</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>48</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td><strong>Sense of Presence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.375(**)</td>
<td>.632(**)</td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.009</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>48</td>
<td>48</td>
<td>48</td>
</tr>
</tbody>
</table>

** p < .01

Table 5: Correlations between Variables
CHAPTER 6
DISCUSSION

The advantages of using videoconferencing are saving money and saving time instead of physically going to other places. However, videoconferencing has not matured yet to fully penetrate in the business world. This is because face-to-face is essentially considered as the ideal way to hold meetings; discuss agendas, complete tasks, and achieve goals. In addition, business people do not always value using the medium for holding a meeting because of its high cost.

As well, videoconferencing has yet to be used effectively among all users who are under the necessity of using the medium. This study intended to address the necessary attitudes required of users to accept the capability and incapability of a medium in order to help them accomplish meeting objectives efficiently.

Preferences of the Experienced Users

Although this study expected that experienced users would prefer videoconferencing over a face-to-face meeting when both communication conditions are equally available, and money and time are no object, the results revealed that most people preferred to attend a face-to-face meeting over videoconferencing or, they did not have preferences. Several reasons were offered:

(1) Users prefer to be in a ‘real’ meeting which allows participants to see others’ unmediated faces rather than seeing them on a screen; (2) The realness and vividness of feeling others’ presence are different in videoconferencing from a face-to-face meeting. Videoconferencing somehow gives an impression to others that interaction is artificial:
seeing others on a TV screen gives them a feeling that things are not real; in other words, others on screen are not perceived as being there in the same time period and space. On the other hand, people observe face-to-face communication as the richest since it allows people to share the same space, have a physical interaction, and see reactions including verbal and nonverbal cues in an unmediated environment.

Some experienced users preferred videoconferencing over a face-to-face setting when they had multiple participants from different sites. In terms of having informal interaction within a meeting, there seems to have been no difference in preference if there are multiple participants from different sites.

The medium essentially provides a more formal atmosphere and it makes participants tend to behave in a task-oriented manner. Therefore, if they would like to focus on accomplishing tasks, videoconferencing may work better than face-to-face settings because the videoconferencing environment makes participants tend not to interact informally. However, the experiment revealed no time or outcome differences between the two groups to substantiate this hypothetical argument. Although the medium creates a formal atmosphere, a main factor may not be the medium itself, rather the user’s attitude toward the medium.

For those who are not familiar with videoconferencing, face-to-face settings are richer than the medium in terms of having informal interaction. If participants are familiar with the medium, there is no difference between videoconferencing and face-to-face settings in terms of participants’ behaviors: they can behave similarly in both communication conditions. This situation also occurs when participants are familiar with other members. To sum up, a user’s attitude varies depending on the user’s familiarity.
with the technology and familiarity with other members. The user’s attitude toward the medium may vary depending on the cultures where participants are coming from.

“Chatting” itself is a cultural exchange in or outside of a meeting, or in conjunction with other activities and this seems to be especially important for those who come from small countries as one of the participants in the focus group indicated.

**Users’ Perceptions of the Effectiveness of Interaction**

In terms of experienced users’ perceptions of others’ sense of presence through a medium, a focus group discussion revealed two contrasting opinions between those who have enough experience of using the medium and who are familiar with other members, and those who have less experience of using the medium and who are unfamiliar with other members.

Experienced users among the familiar members perceived higher sense of others’ presence than inexperienced users with unfamiliar members: this is because the experienced users were good at capturing others’ reactions such as facial expressions, voice, and body languages. On the other hand, inexperienced users did not feel closeness or sense of other’s presence due to the fact a person was not physically present and also due to their lack of capabilities of feeling others’ presence through a medium.

Although a lack of experience of picking up nonverbal cues and recognizing others’ thoughts seemed to be the reasons why participants did not feel close to others, the second focus group discussion revealed that a person’s presence has nothing to do with the picture which users are looking at. Overall, whether a person feels closeness to others or not during an interaction is based not only on us sharing the same space, having other
members present, or seeing visual cues, but also on us being able to image other’s feelings and reactions.

Videoconferencing users could feel a high sense of presence if they could perceive others’ characteristics such as friendliness and the formality of their behaviors. Sense of presence controls users’ feelings of closeness, bonding, warmth, and aura, and also helps users to project what others are expecting of them.

The users’ perceptions of feeling others’ sense of presence may vary depending on whether or not they can see themselves at a corner of a screen as picture in picture. For instance, in a situation of focus groups, each site had a TV screen which was split into four sites. All members could see themselves as picture in picture. Looking at themselves at the same time as looking at other sites seemed to help participants to be more aware of their own behaviors and others’ existence. Their pictures that were shown on a TV screen were the same picture that others were looking at; therefore, an individual could avoid the distractive situation where he or she might look in another direction while others talk, or he or she looked in another direction without knowing a camera was capturing them while they were not talking.

Having eye contact with others is always crucial in communication. Users perceive a difficulty more in videoconferencing than face-to-face even though both situations convey visual cues. In fact, a videoconferencing setting creates the illusion that users are having eye contact if eyes are always directed toward the camera. Everyone believes they are having an eye contact with others only when they are looking at a TV screen, whereas they must look into the camera to establish their eye contact. In fact, in any case,
users cannot tell who is looking at whom especially when there are many participants from multiple sites as was the case in a focus group setting.

Although we cannot always expect the effects of having visual cues and an eye contact on users’ sense of presence, the illusion, which a videoconferencing setting may provide, unintentionally leads users to feel sense of other’s presence. In addition, having an eye contact, which must help users to feel other’s presence in any situation, has meanings only in the following situations: if users recognize that they have a mutual understanding about an agenda and others’ ideas; and when other users confirm that messages are conveyed as they expect.

Member’s familiarity and the level of experience of using the medium affect users’ perceptions of feeling sense of others’ presence. To be more precise, the experience of using the medium seems more important than member’s familiarity with each other in an interaction. The concept of social presence and sense of presence observe the medium’s characteristics and user’s characteristics. It is possible to consider the presence of the medium itself in an environment besides the presence of participants (D. Davis, Personal Communication, January 26, 2004): the camera can become a center of the individual’s attention, and the camera and a TV screen will remain in most communicators’ minds while they interact with other members.

**Effects of Communication Conditions on Cohesiveness, Social Presence, and Sense of Presence**

The experiment revealed the effects of communication conditions as significant on social presence, but not on sense of presence and cohesiveness. In other words,
communication conditions provide the environment to convey social presence; but they were not the factors to bring different levels of cohesiveness among participants who have never experienced using videoconferencing. If participants had the previous experience of using videoconferencing, the study might observe different results. In other words, familiarity with the technology and the mediated environment might influence their group performance which leads to cohesiveness.

Although the experimenter expected that participants who had never used videoconferencing would be more affected by the communication conditions, they were actually not. The reason why those participants could perform similarly in videoconferencing and face-to-face settings with no experiences and lack of prior judgment about the medium's characteristics turned out to have positive effects on their performance which may have led them to reach their goal without having any distraction from the environment.

As described in the results section, the correlations between three variables (cohesiveness, social presence, and sense of presence) were significant at the 0.01 level in the experiment. Several reasons were considered. First, the results of the correlations between variables did not necessarily show that the causation existed. Therefore, other reasons must exist to affect cohesiveness other than social presence and sense of presence in a group interaction: one of the main reasons in this study was member's familiarity, and other reasons would be motivation for achieving goals; commitment to a group, task familiarity, group size and composition which includes gender, occupation, and cultural backgrounds. In addition, other attributes such as liking and preference (social immediacy) might have affected cohesiveness in this study. This is because the
experimenter observed that participants enjoyed talking about personal information
(asking each other about where others live; the local places they like; etc.) with other
members before the experiment started even though they were meeting for first time.

Although this study revealed that the capability of a medium in terms of conveying
social presence or providing the environment for users to feel sense of presence is not the
most important when the objectives of holding a meeting are just getting the tasks done,
the effects of communication conditions should be seriously considered due to their
possible effects on cohesiveness and group performance: the medium should originally
be used to maximize the group productivity rather than minimizing it.

Effectively, a medium needs to provide an ambiance which is not intrusive on group
interaction. In other words, a medium should not be an obstacle to interaction. Although
the medium has been drastically improved and evolved to maintain smooth interaction, it
is still challenging to overcome its deficiency. Users require the medium to be an
equalizer, to facilitate communication among participants, not as an obstacle to distract
from conversation on the task.

In addition, if the videoconferencing users could treat the medium as invisible and
transparent, the medium can be less obtrusive and rather facilitate group interactions. It
may be possible technologically to make the medium transparent, and to replicate a face-
to-face meeting in a videoconferencing setting. This would be similar to the virtual
reality settings.

It is important to know that, in any case, inappropriate use of videoconferencing
often impairs the individual’s performance and the group’s performance as a whole
(Cornelius & Boos, 2003). This is because individuals have different perceptions toward
the medium and they perform differently: if they have a positive attitude toward the medium, they may work well without having any effects which the medium provides; on the other hand, if they have a negative attitude, they may not interact with others as effectively as the medium is supposed to function to help users to communicate. Although technological improvement and evolution of the medium are as important as the improvement of user’s skills to control the medium effectively: in reality, whichever comes first; both are necessary factors for the refinement of the medium. Hence, each person needs to have skills to overcome negative effects of videoconferencing.

To answer the question addressed in the beginning of this study: whether or not face-to-face is better than having a meeting via videoconferencing; the answer was ‘no’ depending on where we choose to place our emphasis on human interaction. Even if we value how productively participants in a meeting can achieve goals, the answer to that question is still ‘no’ since productivity in a group performance varies depending on other outcomes such as objectives of a meeting, participant’s motivations, members’ familiarity, and participant’s familiarity to the medium and the levels of adoptability to the ambiance provided by the medium. If participants have high motivations and cohesiveness to achieve goals, those factors would cover the inferiority of videoconferencing. It also means that users maximize the characteristics of the medium and make it work as equal to face-to-face meetings, or potentially more powerful to get the job done among participants located in multiple places.

While the consensus seems to reach that a face-to-face meeting is preferred; it does not always lead to a productive decision-making process no matter how rich the situation would be and how much it has been believed. Therefore, concluding that the ‘richest’
medium is always the best medium is inadequate, especially if participants would prefer to achieve a goal that is not dependent on making nuanced judgment of other participants based on subtle visual cues. After all, user’s attitudes always change the effectiveness of the performance and bring different results to a group no matter which medium we adopt and how much the ambiance created by the medium influences an individual’s and group’s performance.
CHAPTER 7
LIMITATIONS AND SUGGESTIONS FOR FUTURE STUDIES

Limitations

There were limitations in terms of research design and validity issues:

(1) The participants recruited for the experiment of this study were native English
speakers, and they could not necessarily be representing a whole population.

(2) Although interviewees and focus group participants are those who used
videoconferencing on a regular basis from a few times per week to once a month,
there are other populations who have used the medium more often than the
samples in this study. This study may have had different results by recruiting
different population of participants who use the medium on a regular basis.

(3) Although participants for the experiment were assigned to groups based on the
convenience of their schedule, this study could have explored different
perceptions in case individual participants in each condition could participate in
both communication conditions. However, in this case, the effects of each
communication condition on the other condition must be considered carefully;
because participant’s perceptions on each condition would be influenced by the
condition in which they participate first.

(4) It is challenging to confirm to what extent the study could operationalize the
problematic variables which may affect the study.

(5) This study intended to observe several variables to answer research questions, and
a questionnaire was developed to maximize exploring the possible relationships
among those variables: videoconferencing and face-to-face settings as
communication conditions; cohesiveness; social presence; sense of presence; and member’s familiarity. However, the different methods for analysis might reveal other realities which were not investigated in this study.

(6) The study did not focus on the differences between the terms explaining presence, such as telepresence, co-presence, remote presence, virtual presence and so on. Although it is challenging, observing the user’s perceptions of differences among these terms is necessary.

(7) Participants for the focus group who were recruited as representatives of experienced users of videoconferencing might have overemphasized and performed positively in order to support the usefulness of videoconferencing due to their professional dependence on this medium. In addition, their performance might vary depending on the occupations and power relationships with other members in the system.

Suggestions for Future Studies

This study brought several possibilities and suggestions for future studies:

(1) Participants for interviews, focus groups, experiment, and surveys can be recruited from frequent videoconferencing users in order to reveal the different levels of understanding, recognition, and perceptions on the medium as opposed to the experience they have in a face-to-face meeting. Other possible populations for volunteers would be: university students, teachers, professors, business people, and professionals in the field with appropriate experience not only in Hawai‘i but also in U.S. mainland, and other Pacific islands. It is also
possible to compare experienced and inexperienced users among the same population to obtain different perceptions among different populations of experienced users.

(2) The number of participants for the experiment and surveys can definitely be increased to allow for generalizing the findings regarding the usefulness of videoconferencing, the effects on cohesiveness and group performance in a real business setting.

(3) Participants for the experiment were assigned with one member whom he or she knew and with two members whom they did not know in a face-to-face setting: and members who knew each other were assigned to two different locations in the videoconferencing experiment. A repeat study could try to arrange the pair of participants differently: if the two members who knew each other were asked to sit in one location and interact with two others they had never met, the outcome might be completely different, or similar to the results in this study. In addition, it would be possible to arrange for four volunteers who knew each other or four who did not know each other as other variations in the experimental group.

(4) Conducting an experiment by using different types of mediated conferencing (audio, video, and computer conferencing) would be necessary to explore the different effects of videoconferencing and the proper way of using the medium in terms of meeting objectives, participants' characteristics, and their locations. In addition, different variables mentioned in the model could be observed as
affecting individual’s perceptions and group performance with regard to group cohesiveness in the context of decision making.

(5) A longitudinal study can be conducted especially among inexperienced users to explore how their perceptions of the medium changes over a certain period of time. In addition, it is also possible to explore the different perceptions on communication conditions and the effects of conditions on a small group interaction in terms of performance and cohesiveness by looking at gender, ethnicity, and age.

(6) In a large scope survey, questionnaires could be distributed among the people who work for the State of Hawai‘i in the Legislative and Executive Branches, as well as the Judiciary to observe the perceptions of using videoconferencing and its effects on a variety of jobs. The researcher began collecting surveys from the Judiciary in the State of Hawai‘i, but time and resources did not permit continuation of that method for data collection. It would be intriguing to continue conducting surveys among the Judiciary since the Judiciary Information Management System was designed to be implemented on a seven-year plan from 2003 to 2010.
APPENDICES

Appendix A: Interview Questions

1. Would you please tell me about your occupations?

2. How often do you participate in a meeting via videoconferencing?

3. What were your experiences of participating in a meeting via videoconferencing? How similar/different is it from a face-to-face meeting?

4. Would you please tell me about your perceptions of interaction via videoconferencing in terms of social presence (characteristics of media) and sense of presence (user’s perceptions)?

5. How different is the interaction between via videoconferencing and in face-to-face settings in terms of sense of presence?

6. How different is the interaction via videoconferencing when participants see others whom they know and they don’t know in terms of sense of presence and cohesiveness?

7. Would you please tell me about your perceptions of the role of using videoconferencing in a future?
Appendix B:  
Focus Group Guide

1. Let’s get better acquainted. Let me introduce myself. (M.A. student, working for my thesis, about my experience of videoconferencing)

2. Please introduce yourself to other members.  
a. What you are working for?  
b. How often do you participate in a meeting via videoconferencing?  
c. Do you ever meet other members in this focus group face-to-face, or via videoconferencing?  
d. How long have you known others?

3. Explain about the purposes of this focus group and give a lecture of definition of social presence (characteristics of media) and sense of presence (user’s perceptions). Ask participants to keep in mind these two distinctions and consider traits during a focus group.

A. the characteristics of videoconferencing  
(How a medium conveys sense of other’s presence, capability of medium) and  
B. user’s sense of presence- How they (users) feel their presence, other’s presence, and other presence of yours joint sense (nearness, togetherness).

The items developed by Short et al. (1976); such as sociable-unsociable, insensitive-sensitive, cold-warm, and impersonal-personal)

4. How do you think about a meeting via videoconferencing compared with face-to-face in terms of your feelings of sense of other’s presence? How do you feel about other people’s presence in videoconferencing(face-to-face)?

5. How different or similar do you think you feel sense of other’s presence in communication via videoconferencing and face-to-face setting? If it is different, what causes this difference?

6. What is attractive about videoconferencing(face-to-face)?

7. How well do media (videoconferencing versus face-to-face) provide social presence to users?

8. How can you describe social presence that media convey by using adjectives or nouns?

9. What do you think are the main advantages and disadvantages of videoconferencing and face-to-face meeting?
Appendix B (continued)

10. Even if you have an access to videoconferencing, are there any situations you prefer
to go to see someone face-to-face?

11. Which do you prefer videoconferencing or fact-to-face meeting if both are available?

12. Are there any tasks that you absolutely want to see others face-to-face?
   In other words, are there any tasks that you cannot see others using
   videoconferencing?

13. Do you ever imagine how the same discussion would go if you interacted with your
   members face-to-face?

14. How different it is if I ask you the same questions in survey questionnaire, and
    distributed to you instead of having this focus group? Would you be less
    cooperative?

15. Does it matter to see someone face-to-face or videoconferencing if you have “to get
    your tasks done”?

16. How long do you think it takes for building trust with other members in
    videoconferencing? How quickly can you establish your sense of familiarity?

17. Are there any differences of talking with others who you know or don’t know each
    other in videoconferencing?

18. Are you comfortable talking with someone you don’t know for the first time?
    If not, then what makes you to feel difficult?

19. For some people, sitting separately in multiple locations works better than seeing
    someone face-to-face in order to get the job done? How do you think about this?

20. How it is different when you can have physical interaction in face-to-face, and no
    physical interaction in videoconferencing in terms of sense of presence and
    achieving goals?
Appendix C:
Agreement to Participate in Experiment

This research project is being conducted as a component of a master’s thesis in the School of Communications, University of Hawaii at Mānoa. The purpose of the project is to investigate the effects of user’s presence on cohesiveness in face-to-face and videoconferencing meetings. The experiment will focus on investigating user’s perception of presence in face-to-face and videoconferencing meetings by those who have never used videoconferencing before.

Participation in the project will include filling out a form on background information about yourself. Data from this survey will be aggregated into broad categories. No personal identifying information will be included with the research results. Completion of the form containing background data should take no more than 5 minutes. You will be assigned to either a face-to-face or videoconferencing setting. The experiment will take about 45 minutes. Approximately 80 people will participate in the study. Experiment will be either audio or video recorded for the purpose of transcription and analysis.

Participation in this research project is completely voluntary. Participants in the experiment will involve no foreseeable risk of discomfort for its subject. All responses will be analyzed anonymously and there will be nothing to identify individuals or connect to their responses.

Audio or video tapes will be destroyed immediately following transcription and all other research records will be destroyed upon completing of the project. You are free to withdraw from participation at any time during the duration of the project with no penalty, or loss of benefit to which you would otherwise be entitled.

If you have any questions regarding this research project, please contact the researcher, Miwa Yamazaki, at (808) 957-1565, or the primary supervisor for Ms. Yamazaki’s research: Dr. Dineh Davis, at 956-3332 or via e-mail: dineh@hawaii.edu.

If you have any questions regarding your rights as a research participants, please contact the UH Committee on Human Studies at (808) 956-5007.

Participant:
I have read and understand the above information, and agree to participate in this research project.

Name (printed)

Signature

Date

*Copy to participants
Appendix C (continued)

Task 1:

You are students who are working as residential dormitory managers for the University. The housing office is planning to have a new campaign for a new semester to make dormitory life more fulfilling.
As the idea for this campaign is based on a sudden decision that the housing office took, the campaign is planned to start from next week. Your group, as managers, has to consider the options and discuss the important elements for student life in the dorm with other managers. Final decision must be reached within the next half-hour in this meeting so that it can be reported to the housing office by tomorrow.

A desirable environment can be broken down into three categories: educational, recreational, and residential. You have to rank them from the most important (“1”) to the least important (“3”) for dormitory living.

Educational (e.g. plan to concentrate on keeping the dorm quiet for studying)
Recreational (e.g. plan to have recreations such as parties and gatherings with other residents)
Residential (e.g. plan to have common spaces for residents, provide living equipment for household chores (cleaners, light bulbs etc) to keep discipline for safe living)

A. Before speaking to others, please rank from the most important “1” to the least important “3” by yourself.

   _______ Educational _______ Recreational _______ Residential

B. Please discuss with other managers and reach a consensus in ranking with others in this meeting.

   _______ Educational _______ Recreational _______ Residential

C. Please discuss other possible categories (or elements) for students living in the dorm, and come up with other ideas (in addition to the three items noted above) for the next campaign.

   ......................................................................................
   ......................................................................................
   ......................................................................................
Appendix C (continued)

Task 2:

You and other three participants in this project are the manager in Department of Human Resource Management. During the last three months, HRM has been asking employees whether they are interested in going overseas. The job overseas is to join the construction plan in a city in Mexico as an architect from the construction company. The approximate length of stay would be one year to three years.

You had fifteen candidates (all are architects) and narrowed the field to three people. You have already interviewed them and must make your final decision to choose one in this meeting.

Person A: (26 years old, Male, Architect) A has been working for 4 years and this is the first time for him to go abroad for business. He is enthusiastic and a hard worker, so expects this is to be a growth opportunity for him.

Person B: (35 years old, Female) B has been working for 13 years for this company, and is established in her career. She has lived abroad (England, India, and Thailand etc) for business. Going abroad again in this time gives her a good chance for her upcoming promotion.

Person C: (47 years old, Male) C has been employed for 10 years in this company. He has experience working for this company in China. He is an experienced professional business man.

A. Discuss with other managers and choose one candidate.

B. What are the reasons for choosing this person?

C. What are the important elements for the candidate who is sent overseas? Please discuss with managers and note your result.
Appendix D:
Post-experiment Questionnaire
(Videoconferencing meeting)

1. **My perceptions on interactions**
   Please circle the best answer to the following questions based on your experience in the experiment.

<table>
<thead>
<tr>
<th>Strongly Disagree (SD)</th>
<th>Disagree (D)</th>
<th>Neutral (N)</th>
<th>Strongly Agree (SA)</th>
<th>Not applicable (NA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree (A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>With whom you were familiar</th>
<th>With whom you were not familiar (whom you met today)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>D</td>
</tr>
</tbody>
</table>

1. I could give suggestions and helped other members.
   SD  | D  | N  | A  | SA | NA | SD  | D  | N  | A  | SA | NA |

2. I could say what I wanted.
   SD  | D  | N  | A  | SA | NA | SD  | D  | N  | A  | SA | NA |

3. Other members gave suggestions and helped me.
   SD  | D  | N  | A  | SA | NA | SD  | D  | N  | A  | SA | NA |

4. I could rely on other group members to complete tasks.
   SD  | D  | N  | A  | SA | NA | SD  | D  | N  | A  | SA | NA |

5. I could count on others to help me if I had difficulties.
   SD  | D  | N  | A  | SA | NA | SD  | D  | N  | A  | SA | NA |

6. I could focus on completing tasks.
   SD  | D  | N  | A  | SA | NA | SD  | D  | N  | A  | SA | NA |

7. I could work effectively in getting tasks done.
   SD  | D  | N  | A  | SA | NA | SD  | D  | N  | A  | SA | NA |

8. I accomplished the objectives successfully.
   SD  | D  | N  | A  | SA | NA | SD  | D  | N  | A  | SA | NA |

9. I would have been willing to remain in the same group and work together again.
   SD  | D  | N  | A  | SA | NA | SD  | D  | N  | A  | SA | NA |

Please continue to the next page.

94
II. **My perceptions** of social presence

*Social presence* is the characteristic and capabilities of videoconferencing (a camera, a microphone, and a TV screen), and how videoconferencing as a medium conveys sense of other’s presence during interaction.

Please read the given sentence, put each item in the blank, and circle the best answer.

<table>
<thead>
<tr>
<th>Strongly Disagree (SD)</th>
<th>Disagree (D)</th>
<th>Neutral (N)</th>
<th>Agree (A)</th>
<th>Strongly Agree (SA)</th>
<th>Not appreciable (NA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When I participated in the meeting, I felt the medium provided ___ interaction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With whom you were familiar</td>
<td>With whom you were not familiar (whom you met today)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
<td>NA</td>
</tr>
<tr>
<td>10. Sociable</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>11. Sensitive</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>12. Warm</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>13. Personal</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
</tbody>
</table>

2. When I participated in the meeting, I felt that interactions were ___.

<table>
<thead>
<tr>
<th>With whom you were familiar</th>
<th>With whom you were not familiar (whom you met today)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>D</td>
</tr>
<tr>
<td>14. Formal</td>
<td>SD</td>
</tr>
<tr>
<td>15. Inclusive</td>
<td>SD</td>
</tr>
<tr>
<td>16. Attentive</td>
<td>SD</td>
</tr>
<tr>
<td>17. Comfortable</td>
<td>SD</td>
</tr>
</tbody>
</table>

3. When I participated in the meeting, I felt ___ to/with/from others.

<table>
<thead>
<tr>
<th>With whom you were familiar</th>
<th>With whom you were not familiar (whom you met today)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>D</td>
</tr>
<tr>
<td>18. Close</td>
<td>SD</td>
</tr>
<tr>
<td>20. Distance</td>
<td>SD</td>
</tr>
<tr>
<td>21. Together</td>
<td>SD</td>
</tr>
<tr>
<td>22. Commitment</td>
<td>SD</td>
</tr>
</tbody>
</table>

If you have some comments on your answers, please write down here:
III. My perceptions of sense of presence

*Sense of presence* is user's perceptions of presence, and how users feel their own presence, other's presence, and other's sense of yours.

Please circle the best answer to the following questions based on your experience in the experiment.

<table>
<thead>
<tr>
<th>Strongly Disagree (SD)</th>
<th>Disagree (D)</th>
<th>Neutral (N)</th>
<th>Strongly Agree (SA)</th>
<th>Not appreciable (NA)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agree (A)</strong></td>
<td>SD D N A SA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23. I was able to control events.  
24. The environment was responsive to actions that I initiated (or performed).  
25. The interaction was natural.  
26. All my senses were being completely engaged.  
27. I was involved in the visual aspects of the environment.  
28. I was involved in the auditory aspects of the environment.  
29. I experienced a sense of being 'really there' during the experiment.  
30. I was aware of events occurring in the real world around me.  
31. The information coming from my various senses was inconsistent or disconnected.  
32. I was able to anticipate what would happen next in response to the actions that I performed.  
33. I was completely able to actively survey or search the environment using vision.  
34. I could quickly adjust to the environment.  
35. I could concentrate on the assigned tasks rather than on the environment.  
36. I was involved in the experimental task to such an extent that I lost track of time.

Please answer to this question.
Were you distracted by something other than solving problems during the interaction with other group members?  
a. Yes  
b. No

If yes, please specify below.

Please continue to the next page.
IV. About my demographics

Please answer to the following questions.
1. I participated in.... a. Videoconferencing b. Face-to-face meeting
2. My sex is..... a. Male b. Female
3. The person I was familiar with was... a. Male b. Female
4. The composition of our group was.... a. 4 men b. 3 men and 1 woman c. 2 men and 2 women
d. 1 man and 3 women e. 4 women
5. Age a. Below 20 years old b. 20-29 years old c. 30-39 years old d. 40-49 years old
e. 50-59 years old f. Over 59 years old
6. With which ethnicity do you identify the most? __________________________
7. Are you a college student? a. Yes b. No
8. Have you ever taken a class by using videoconferencing (as in HITS)? a. Yes b. No
9. Were you destructed by something rather than solving problems during the interaction with other group members? a. Yes b. No
If yes, please specify below.
__________________________________________________________
__________________________________________________________
10. Would you be available for a follow up-interview? If yes, please provide name, and email and/or phone number where I can reach you.
Name ______________________________
Email ______________________________
Phone ______________________________

Thank you very much for your participation.
Appendix E:
Post-experiment Questionnaire
(Face-to-face meeting)

I. My perceptions on interactions

Please circle the best answer to the following questions based on your experience in the experiment.

<table>
<thead>
<tr>
<th>Strongly Disagree (SD)</th>
<th>Disagree (D)</th>
<th>Neutral (N)</th>
<th>Strongly Agree (SA)</th>
<th>Not applicable (NA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree (A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>With whom you were familiar</th>
<th>With whom you were not familiar (whom you met today)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I could give suggestions and helped other members.</td>
<td>SD  D  N  A  SA  NA</td>
<td>SD  D  N  A  SA  NA</td>
</tr>
<tr>
<td>2. I could say what I wanted.</td>
<td>SD  D  N  A  SA  NA</td>
<td>SD  D  N  A  SA  NA</td>
</tr>
<tr>
<td>3. Other members gave suggestions and helped me.</td>
<td>SD  D  N  A  SA  NA</td>
<td>SD  D  N  A  SA  NA</td>
</tr>
<tr>
<td>4. I could rely on other group members to complete tasks.</td>
<td>SD  D  N  A  SA  NA</td>
<td>SD  D  N  A  SA  NA</td>
</tr>
<tr>
<td>5. I could count on others to help me if I had difficulties.</td>
<td>SD  D  N  A  SA  NA</td>
<td>SD  D  N  A  SA  NA</td>
</tr>
<tr>
<td>6. I could focus on completing tasks.</td>
<td>SD  D  N  A  SA  NA</td>
<td>SD  D  N  A  SA  NA</td>
</tr>
<tr>
<td>7. I could work effectively in getting tasks done.</td>
<td>SD  D  N  A  SA  NA</td>
<td>SD  D  N  A  SA  NA</td>
</tr>
<tr>
<td>8. I accomplished the objectives successfully.</td>
<td>SD  D  N  A  SA  NA</td>
<td>SD  D  N  A  SA  NA</td>
</tr>
<tr>
<td>9. I would have been willing to remain in the same group and work together again.</td>
<td>SD  D  N  A  SA  NA</td>
<td>SD  D  N  A  SA  NA</td>
</tr>
</tbody>
</table>

Please continue to the next page.
II. My perceptions of social presence

Social presence is the characteristic of face-to-face meeting, and how the meeting conveys sense of other’s presence during interaction.

Please read the given sentence, put each item in the blank, and circle the best answer.

<table>
<thead>
<tr>
<th>Strongly Disagree (SD)</th>
<th>Disagree (D)</th>
<th>Neutral (N)</th>
<th>Strongly Agree (SA)</th>
<th>Not appreciable (NA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When I participated in the meeting, I felt a face-to-face provided interaction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With whom you were familiar</td>
<td>With whom you were not familiar (whom you met today)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>10. Sociable</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>11. Sensitive</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>12. Warm</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>13. Personal</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>2. When I participated in the meeting, I felt that interactions were</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With whom you were familiar</td>
<td>With whom you were not familiar (whom you met today)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>14. Formal</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>15. Inclusive</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>16. Attentive</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>17. Comfortable</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>3. When I participated in the meeting, I felt to/with/from others.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With whom you were familiar</td>
<td>With whom you were not familiar (whom you met today)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
<td>SA</td>
</tr>
<tr>
<td>18. Close</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>20. Distance</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>21. Together</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>22. Commitment</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
</tbody>
</table>

If you have some comments on your answers, please write down here:
III. My perceptions of sense of presence

Sense of presence is participant’s perceptions of presence, and how they feel their own presence, other’s presence, and other’s sense of yours.

Please circle the best answer to the following questions based on your experience in the experiment.

<table>
<thead>
<tr>
<th>Strongly Disagree (SD)</th>
<th>Disagree (D)</th>
<th>Neutral (N)</th>
<th>Strongly Agree (SA)</th>
<th>Not appreciable (NA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23. I was able to control events.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>24. The environment was responsive to actions that I initiated (or performed).</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>25. The interaction was natural.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>26. All my senses were being completely engaged.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>27. I was involved in the visual aspects of the environment.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>28. I was involved in the auditory aspects of the environment.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>29. I experienced a sense of being ‘really there’ during the experiment.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>30. I was aware of events occurring in the real world around me.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>31. The information coming from my various senses was inconsistent or disconnected.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>32. I was able to anticipate what would happen next in response to the actions that I performed.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>33. I was completely able to actively survey or search the environment using vision.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>34. I could quickly adjust to the environment.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>35. I could concentrate on the assigned tasks rather than on the environment.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td>36. I was involved in the experimental task to such an extent that I lost track of time.</td>
<td>SD</td>
<td>D</td>
<td>N</td>
<td>A</td>
</tr>
</tbody>
</table>

Please answer to this question.

Were you destructed by something rather than solving problems during the interaction with other group members?  
a. Yes  
b. No

If yes, please specify below.

Please continue to the next page.
IV. About my demographics

Please answer to the following questions.

1. I participated in..... a. Videoconferencing b. Face-to-face meeting

2. My sex is..... a. Male b. Female

3. The person I was familiar with was... a. Male b. Female

4. The composition of our group was..... a. 4 men b. 3 men and 1 woman c. 2 men and 2 women d. 1 man and 3 women e. 4 women

5. Age a. Below 20 years old b. 20-29 years old c. 30-39 years old d. 40-49 years old e. 50-59 years old f. Over 59 years old

6. With which ethnicity do you identify the most? ________________________________

7. Are you a college student? a. Yes b. No

8. Have you ever taken a class by using videoconferencing (as in HITS)? a. Yes b. No

9. Would you be available for a follow-up interview? If yes, please provide name, and email and/or phone number where I can reach you.

   Name ________________________________________

   Email ________________________________________

   Phone ________________________________________

Thank you very much for your participation.
## Appendix F:
Demographics of the Participants in Experiment

<table>
<thead>
<tr>
<th>Communication Conditions</th>
<th>Videoconferencing=20</th>
<th>Face-to-Face=28</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td>Male=7</td>
<td>Male=14</td>
</tr>
<tr>
<td></td>
<td>Female=13</td>
<td>Female=14</td>
</tr>
<tr>
<td></td>
<td>Total=20</td>
<td>Total=28</td>
</tr>
<tr>
<td><strong>A person I was familiar with was...</strong></td>
<td>Male=7</td>
<td>Male=14</td>
</tr>
<tr>
<td></td>
<td>Female=13</td>
<td>Female=14</td>
</tr>
<tr>
<td><strong>The composition of our group was...</strong></td>
<td>4 men=0</td>
<td>4 men=0</td>
</tr>
<tr>
<td></td>
<td>3 men &amp; 1 woman=0</td>
<td>3 men &amp; 1 woman=4</td>
</tr>
<tr>
<td></td>
<td>2 men &amp; 2 women=12</td>
<td>2 men &amp; 2 women=16</td>
</tr>
<tr>
<td></td>
<td>1 man &amp; 3 women=8</td>
<td>1 man &amp; 3 women=8</td>
</tr>
<tr>
<td></td>
<td>4 women=0</td>
<td>4 women=0</td>
</tr>
<tr>
<td></td>
<td>(number=a person in a 4-people group)</td>
<td>(number=a person in a 4-people group)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>Below 20 years old=4</td>
<td>Below 20 years old=2</td>
</tr>
<tr>
<td></td>
<td>20-29 years old=15</td>
<td>20-29 years old=24</td>
</tr>
<tr>
<td></td>
<td>30-39 years old=1</td>
<td>30-39 years old=2</td>
</tr>
<tr>
<td><strong>With which ethnicity do you identify the most? (alphabetical order)</strong></td>
<td>Asian=1</td>
<td>American=1</td>
</tr>
<tr>
<td></td>
<td>Caucasian=6</td>
<td>Asian=1</td>
</tr>
<tr>
<td></td>
<td>Chinese=2</td>
<td>Asian (Japanese &amp; Korean)=1</td>
</tr>
<tr>
<td></td>
<td>Filipino=3</td>
<td>Black/White=1</td>
</tr>
<tr>
<td></td>
<td>Hawaiian=3</td>
<td>Caucasian=7</td>
</tr>
<tr>
<td></td>
<td>Japanese=3</td>
<td>Chinese=2</td>
</tr>
<tr>
<td></td>
<td>Japanese American=1</td>
<td>Filipino=1</td>
</tr>
<tr>
<td></td>
<td>Latino=1</td>
<td>Japanese=7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Korean=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Korean American=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mixed=2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Native American=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Portuguese=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No answer=1</td>
</tr>
<tr>
<td><strong>Are you a college student?</strong></td>
<td>Yes=18</td>
<td>Yes=26</td>
</tr>
<tr>
<td></td>
<td>No=2</td>
<td>No=2</td>
</tr>
<tr>
<td><strong>Have you ever taken a class by using videoconferencing (as in HITS)?</strong></td>
<td>Yes=1</td>
<td>Yes=4</td>
</tr>
<tr>
<td></td>
<td>No=19</td>
<td>No=24</td>
</tr>
</tbody>
</table>
REFERENCES


Chapman, D.S. & Webster, J. (2001). Rater Correction Processes in Applicant Selection


http://psychology.wichita.edu/mbernard/articles/dsi2001proceeding.pdf


www.computerworld.com/managementtopics/roi/story/0,10801,69660,00.html


http://search.epnet.com/direct.asp?an=6270830&db=aph


www.uky.edu/~drlane/teams/pavitt/ch3.htm


Publishing Company.


