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Face-to-Face and Audio Teleconference Problem Solving: An Examination of Effectiveness and Group Member Satisfaction

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Face-to-Face and Audio Teleconference Problem Solving:

An Examination of

Effectiveness and Group Member Satisfaction

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ABSTRACT

Face-to-Face and Audio Teleconference Problem Solving:

An Examination of

Effectiveness and Group Member Satisfaction

        Is a teleconference just as good as being there? This claim has

been made, but is there research to substantiate it? A review of the

literature indicates some basis for this claim. Research has identified

some situations and tasks which seem to be able to be addressed just as

effectively over the phone as face-to-face; however, there are other

situations and tasks which are not as effective done over the phone. In

addition to this ambiguity, none of the research attempts to determine

how satisfied participants were in their use of teleconferencing in

solving tasks.

        This research study is designed with two purposes in mind. The

first is to determine if there is a significant difference in time

between groups completing a problem-solving task via teleconference and

groups working face-to-face. The second is to determine if there is a

significant difference in the level of satisfaction between participants

working via teleconference and those working face-to-face.

        The research involved ten groups working in each mode of

communication. A problem-solving task using numbers and requiring all

participants to share information was used. The first measurement was

how long it took each group to complete the task. The second

measurement involved completing a survey which addressed both group and

individual satisfaction. T-tests were used to compare the results between groups.

Results of this study showed that face-to-face groups completed the task over twice as quickly as groups working via teleconference. There was a significant difference between groups on this measure. On the measure of satisfaction, there was not a significant difference in the level of satisfaction of the participants between the two groups.

Regardless of what research indicates, business will continue to use teleconferencing on an ever-increasing basis -- especially as business becomes more global. Additional research may be needed to gather more detailed information on tasks which can be difficult to complete over the phone. There is also room for more research in the area of participant satisfaction. In this, as in past research, participants have nothing with which to compare their experience. It may be that after experiencing both modes, there may be significant differences in the level of satisfaction or in preference of one mode over the other.

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INTRODUCTION

Were Alexander Graham Bell alive today, he would undoubtedly be surprised at the developments made since his invention of the telephone. Technology has created a network of lines across the continent, under the oceans and virtually around the world. Fiber optics has expanded capabilities tremendously and the satellite has made those thousands of miles of wires nearly obsolete. What began as curiosity has become an indispensable part of modern life.

As businesses have grown to cover states, regions and continents, the need for improved communication has increased accordingly. Communication that was once held face-to-face or through the mail can now take place instantaneously over the phone. Meetings linking people all over the world take place over the phone. These teleconferences are changing the way information is communicated. New technology has created new options.

As with any new technology, users must make adaptations if it is to be utilized effectively. Holding meetings over the phone has certainly required some adaptations. No longer are all the nuances and visual cues of a face-to-face meeting available. How has voice-only communication affected the users of these systems? Are teleconferences as effective as face-to-face meetings? Are users of teleconferences as satisfied with outcomes generated via the telephone? These are some of the questions that need to be answered before it can be said that "it's just as good as being there."

CHAPTER I

REVIEW OF THE LITERATURE

AT&T advertises it. Bill Dunne, a conference consultant, and Robert Browse, the Executive Director of the International Teleconferencing Association agree that it's true (Rosenthal, 1985). A teleconference is just as good as a face-to-face meeting—that's what they're saying. Is this just a marketing ploy or is there a solid basis in research for this claim? There is an abundance of literature in the area of face-to-face small group processes, but what about small group processes in a mediated mode such as a teleconference? Participants can be separated by long distances, and may or may not know each other. Are they able to work just as effectively over the phone and be as satisfied with their work and the process as they might be had they met face-to-face?

This review is directed toward discovering and summarizing the pertinent research literature in the area of small group processes via teleconferences. Special attention will be given to the areas of "effectiveness" of the decision-making process and the "satisfaction" of the participants involved. A chronological summary of the research will be presented.

In 1971, John Short advocated the use of laboratory research to evaluate the usefulness of telecommunications media because he felt these studies could provide better controls than field research in the area. He did three studies examining cooperation and competition across media. In two studies face-to-face was compared with teleconferencing,

and in the third study he added a video mode. Two tasks were used, a negotiation and a bargaining task. The subjects were paired (dyads) and the general findings after all three studies were that no media differences in the solution or the method of arriving at the solution were detected. Participants were not questioned about their experience of the process or their satisfaction in any of the three media modes.

At about the same time, Champness and Davies (1971) performed another experiment comparing an open-ended human relations task in audio and face-to-face modes. They found no differences in final solutions or in the participants' satisfaction with the solution between the two modes. The participants were not asked about their satisfaction of the decision-making process in each mode, only their satisfaction with the solution reached.

Champness followed this study with two projects in 1972. In the first study (Champness, 1972a) he examined attitudes toward person to person communications media. He asked participants their attitude toward face-to-face, video, and audio conferencing. The results indicated that face-to-face and video were found to be more aesthetically pleasing than audio and were perceived as significantly more beautiful, colorful, large, spacious and interesting than audio. Face-to-face and video modes were also rated more positively and more true, reputable, good, successful and sensitive than the audio mode.

Champness' second study (1972b) compared four types of tasks (factual information exchange, general discussion, conflict, interpersonal relations) across three media (face-to-face, video, and

audio). Results of the study found that for the first two tasks (information exchange and general discussion) the three media were equally effective and that for the last two tasks (conflict and interpersonal relations) face-to-face was more effective. Overall, face-to-face was preferred in a general discussion task and the audio mode was preferred in a priorities task (information exchange).

Westin and Kristen (1973) compared attitudes, uncertainty, and interpersonal atmosphere in mediated and face-to-face groups. They found that when communication is mediated there is less sensory data available and less variety in the communication. The quality and diversity of communication is greatest in face-to-face, less in video, and least in audio-only systems. Participants evaluated face-to-face higher than video, and video higher than audio.

Albertson (1973) compared communication efficiency across three media (face-to-face, video, and audio). Various tasks were performed in each condition and the participants' perceptions of each other and attitudes toward each medium was measured. The key result was that communication was not always more efficient with a visual channel and that the telephone was the most accurate medium for conveying objective information. Transmission of information took about equal amounts of time in each mode, but even though the audio mode was most accurate in data transmission, the participants took longer to assimilate the data through that medium.

Christie (1974) conducted a field study with a large corporation's experimental audio conference system. Using a questionnaire, he found

almost all of the twenty-four regular users of the system reported the audio conference was as effective as face-to-face meetings for conducting routine business meetings with a detailed agenda.

Williams (1975a) conducted a study using a brainstorming task across three media (face-to-face, video, and audio). For this task (generation of ideas), he found no differences in the number of ideas generated per minute, or in the originality or quality of the ideas. In another study (1975b), Williams examined the effects of medium of communication upon interpersonal evaluation. He used dyads working on two types of tasks (priorities and free discussion) across three media (face-to-face, video, and audio). He hypothesized that there would be significant effects of the medium of communication on interpersonal evaluation. He predicted that face-to-face would receive the most favorable with the video falling in between. In the free discussion task the hypothesized order was validated at a significant level. In the priorities task, participants rated video the highest, then audio, and face-to-face received the lowest evaluation. He concluded that if the task is more intimate, participants prefer a more impersonal mode of communication.

Ryan and Craig (1975) studied the influence of conferencing medium and status on attitudes toward the medium, attitudes toward the discussion, and the participants mood across three media (face-to-face, video, and audio). They found participants held more positive attitudes toward the medium and the interaction, and had more positive mood reactions to face-to-face and video than to audio teleconferencing.

Westin, Kristen, and O'Conner (1975) researched the area of problem solving and communication climate. Their field experiment investigated the levels of task accomplishment and the nature of interpersonal relationships in face-to-face, video, and audio modes. Working in different modes, students were asked to discuss all aspects of a communication course and make recommendations for changes and improvements in the course. Audio groups spent less time in task analysis and more time in group development and organization than the face-to-face groups. Audio groups also made far fewer recommendations. The conclusion of the authors was that if the task is complex and requires comprehensive decision-making, audio conferencing was not desirable.

In another field study, Thomas and Williams (1975) analyzed the University of Quebec Audio Conferencing system. With participants at four different locations and conferences averaging about 110 minutes, users reported the system easy to use, but low in social contact and privacy. They reported the atmosphere as being less aggressive, but also less friendly than face-to-face meetings. A variety of tasks were studied, with information exchange, opinion exchange, problem solving, and giving orders being tasks that could be adequately handled via audio conferencing.

Short, Williams, and Christie (1976) suggested, after conducting similar research, that face-to-face interaction may involve visual distractions which reduces concentration levels of the participants. Birrell and White (1982) followed this tack also by postulating that the

group as a decision-making entity is flawed. They go on to show how the intervention of an electronic alternative may be used to increase decision-making effectiveness. They specifically recommend the use of video conferencing.

Strickland, Guild, Barefoot, and Paterson (1976) conducted an across-media study where participants discussed human relations problems for twenty to thirty minutes, then completed a questionnaire giving their opinions on the quality and quantity of ideas produced by others and indicated who they would want to work with in the future. The results generally indicated that role differentiation was less pronounced and the internal group structure and hierarchy that usually emerge in face-to-face groups do not emerge so clearly in mediated communication.

Williams (1977) brought the relevant literature together in his review of face-to-face and mediated communication. Commonalities found in the research were: 1) the comparisons of face-to-face with mediated communication (usually audio and video, but also teletype), 2) the communication between two or more people, and 3) the studies followed the normally rigorous standards expected in research. He focused on tasks used in the study (cooperative and conflictive), interpersonal perceptions, and group dynamics. Through a discussion of some theoretical explanations of media differences and practical implications, he came to the following conclusions: 1) teleconferencing seems to be adequate for relatively routine meetings involving people who know each other, and for tasks such as information exchange and

problem-solving; and 2) audio-video media is not as effective as face-to-face communication--it is more like audio-only in most instances.

Williams (1978) followed up previous work by analyzing social and psychological factors of mediated communication. He specifically reviewed research which examined the effectiveness and acceptability of teleconferences as compared with face-to-face interaction. His general conclusions state:

1)   tasks which are low on interpersonal involvement and are generally cooperative in nature are relatively insensitive to the use of audio or video conferencing as a substitute for face-to-face communication. Such tasks are information transmission, problem solving and the generation of ideas.

and

2)   tasks which are higher on interpersonal involvement are sensitive to the substitution of telecommunications for face-to-face interaction. Such tasks are negotiation, conflicts of opinion and getting to know someone.

Based on user surveys, teleconferences have been described as less private, less friendly, less aggressive, and less emotional, but more serious and business-like and more tiring than face-to-face meetings, even though teleconferencing seems to make meetings shorter.

Krueger and Chapanis (1980) studied conferencing across media as a function of the number of participants. They used three group sizes (2, 3, or 4 members) across three media (face-to-face, audio, and teletype). The groups performed a series of tasks in different media over three successive days. Their results indicated that neither the size of the group nor working together over the three-day period affected the time it took to reach a solution. The audio mode generated the fastest solutions to the problems and there was no evidence that the larger groups produced any different solutions than the smaller groups, or that the solutions differed across the media. Questionnaire results indicated that the audio mode was described as quick, fast, efficient, effortless, fun and relaxing. In the audio mode, participants reported concentrating more on what was said and the problem at hand. Nineteen of the twenty-seven respondents said that meeting face-to-face would not have made getting to the solution any easier.

In another review and synthesis of the literature, Fowler and Wackerbarth (1980) examined and compared process and outcome variables that may be affected by the medium of communication. They take the approach that neither type of communication mode (mediated or face-to-face) has been effectively proven as superior. Each mode has positive and negative aspects depending on a number of factors, particularly the task to be accomplished. The authors review both experimental and field study research. One of the main purposes of the review is to attempt to clarify the strengths and weaknesses of face-to-face and teleconferencing in terms of task, group processes, interpersonal

dynamics and affective responses to the medium. With the original

purpose of this entire review in mind, the key points regarding

effectiveness and satisfaction will be presented here.

In terms of teleconferencing strengths, the authors conclude:

1. Simple problem solving and meetings which emphasize information

   seeking and general discussion can be effective over the phone.

2. Teleconferencing is just as effective as face-to-face for

   brainstorming sessions.

3. Participants feel that they pay more attention to what is being said

   in teleconferencing situations as opposed to face-to-face.

Weaknesses of teleconferencing are seen as:

1. It may be less productive because it requires more time for

   developing and maintaining group organization.

2. It is less personal and less desirable when trying to get to know

   someone.

3. It is not suitable for complex problem-solving tasks.

Face-to-face groups have some advantages which can be summarized by the

following:

1. Face-to-face is better for interpersonal relations, conflict

   situations and for the presentation of statistical information.

2. Less time is spent on developing and maintaining group organization.

3. Participants rate face-to-face interaction more favorably.

Disadvantages involved in face-to-face groups are:

1. They seem to be necessary only about one-third of the time in

   regular business tasks.

2. In some situations (not defined in the literature), face-to-face contact may create visual distractions which can reduce concentration.

The authors' conclusion is essentially that the nature of the task is the most important consideration when trying to decide to have a face-to-face meeting or a teleconference. Time and cost of travel also need to be considered.

SUMMARY

There has been surprisingly little research done in these areas in the 1980's. Teleconferencing is widely used and accepted, especially for routine business meetings or special meetings where time and cost considerations rule out face-to-face meetings. The research indicates that video conferencing is generally not any more effective than audio conferencing.

The key elements of this review of the literature examining the nature of audio conferencing seem to indicate that for many tasks the phone conversation can be just as effective as a face-to-face conversation. What the research fails to do is indicate conclusively how satisfied the users of audio systems are with the process and outcome of the teleconference. Participants tend to prefer face-to-face meetings but they are not questioned as to why they prefer face-to-face. Most of the pertinent studies compare face-to-face with audio, and focus on the process of the group and outcomes of the task. The few studies where participants are asked their reactions focus more on their

responses to the process and the medium used, not with how satisfied they were with the results obtained during the process. Champness and Davies (1971) is one of the only studies where participants were specifically asked about their satisfaction with the solution reached after completing a task in both audio and face-to-face modes. Those participants were equally satisfied with solutions obtained via the two modes.

In field studies such as Thomas and Williams (1975), and Krueger and Chapanis (1980), participants reported that audio conferencing was just as effective as face-to-face meetings, but just because they report it as being equally effective, does this mean they are equally satisfied with the processes and solutions across the two media? This question has not been addressed in a systematic or comprehensive manner in teleconferencing research.

CHAPTER II

PURPOSE OF THE STUDY

Based on the review of the literature there was room for additional study in the area of group processes across media, especially face-to-face vs. audio teleconferencing. While results were fairly conclusive in some areas, other areas seem not to have been addressed adequately.

It was fairly well established that audio teleconferences were as effective as face-to-face meetings for certain types of tasks. For other tasks, face-to-face meetings appear to work better. While researchers have spent some effort in gathering information from the participants, most of the information centers on evaluating the medium, or the participants' responses to the group process in performing tasks using different media.

The purpose of this study was to examine the two variables of effectiveness and satisfaction in more detail. Specific research questions analyzed were:

1. Is there a significant difference in the time it takes to determine a solution to a problem between groups working face-to-face and groups working via audio teleconference?

2. Is there a significant difference in satisfaction of the groups' performance or in satisfaction of individual performance, between individuals working face-to-face and individuals working in groups via audio teleconference?

METHODOLOGY

Definitions

In order to gather information related to the variables being studied in this project, it was necessary to operationalize the dependent and independent variables. The independent variable was the mode of communication; face-to-face or audio teleconference.

The dependent variables to be studied were effectiveness and satisfaction. Effectiveness was defined as the time it takes the group to reach a solution for the task. Satisfaction was a subjective measure of the participants' attitudes toward their satisfaction of the process and the solution reached. These subjective measures were gathered through the use of a questionnaire administered at the end of the task. This questionnaire was adapted from a Team Effectiveness Critique designed by Mark Alexander and presented in the 1985 Annual of Developing Human Resources by University Associates.

Task

The task used in this study was an adaption of a group problem solving task taken from Guido B. Cohen's book, The Task-Tuned Organization of Groups. Groups consisted of four members each. Each person received a slip with 16 numbers in four rows/columns each. Working together, they were asked to do a two-part task: 1) identify and mark common numbers, and 2) add additional marks in such a manner as to achieve a particular number of total marks. Examples of the slips and task instructions may be found in the Appendix A and Appendix B.

In order to complete the task successfully, each person was required to participate and share information that only they had. During the completion of the task, the group was free to discuss, negotiate and confirm any aspect of the process or solutions reached.

Procedure

Twenty groups of four persons each were utilized. Ten groups worked face-to-face. Ten groups worked via audio teleconference. Each group was read a standard set of instructions to complete the task. During the face-to-face groups, the researcher stayed in the room to observe. In the audio teleconference groups, the researcher stayed on the telephone line and listened as the group performed the task.

After instructions were completed and any questions answered, the researcher told the groups to begin and started a timer. The groups worked through the task to completion. The researcher was available to answer procedural questions and provide clarification, but did not provide additional information beyond the original instructions.

Upon completion of the task, the participants completed the questionnaire, the researcher thanked them for their participation time required to complete the task was noted.

Examples of the task, the instructions, and the questionnaire may be found in the Appendicies.

Data Analysis

The primary purpose of the research was to compare face-to-face groups with audio teleconferencing groups. A series of "t" tests were computed. These tests were based first of all, on the time taken to complete the task (dependent variable one). The results indicated whether or not there was a significant difference between the groups in the time it took to complete the task.

Next, surveys were coded according to their responses and another set of "t" tests were run. By comparing the two sets of groups' responses, it can be determined if participants from the audio teleconferencing group were as satisfied with the problem-solving process and results as their face-to-face counterparts (dependent variable two.)

The .05 level of significance was used.

Subjects

Participants in the study were University of Nebraska-Omaha students and employees at a local business. Research was conducted during the spring and summer of 1991.

CHAPTER III

RESULTS

Results of the statistical analysis are presented in TABLES I and

II. TABLE I presents a global look at the data. TIME was the first

TABLE I
DISTRIBUTION OF SAMPLE RESPONSES

QUESTION/ITEM	MEAN	STD DEV	RANGE (N=80)
TIME (in seconds)	967.75	639.39	2655.00 (430-3085)
GOALS	3.80	.973	4.00 (1.0-5.0)
PARTICIPATION	4.08	.759	3.00 (1.0-5.0)
COMMUNICATION	4.26	.707	3.00 (1.0-5.0)
CREATIVITY	3.81	.658	2.00 (1.0-5.0)
EVALUATION	3.99	.738	3.00 (1.0-5.0)
EFFECTIVENESS	4.15	.677	3.00 (1.0-5.0)
SATISFACTION/GROUPS	4.19	.677	3.00 (1.0-5.0)
SATISFACTION/SELF	4.01	.803	4.00 (1.0-5.0)
SCALE TOTALS	32.29	4.38	20.00

dependent variable studied, measured in seconds. The items following

the time represent separate questions on the questionnaire administered

to the participants. The questionnaire made eight statements and asked

the participants to respond on a 1 to 5 scale. A copy of the

questionnaire may be found in Appendix C.

TABLE II breaks out the data by groups, and shows the T-Test results. As the data indicate, there was a statistically significant difference in three areas of research. They are: time, goals, and participation.

TABLE II

DISTRIBUTION OF RESPONSES BY MODE/

DIFFERENCES BETWEEN USER GROUPS

GROUP 1 = AUDIO TELECONFERENCE (N=40)

GROUP 2 = FACE-TO-FACE (N=40)

QUESTION/ITEM	MEAN	STD DEV	T VALUE/ SIGNIFICANCE
TIME (in seconds)			5.49*
Group 1	1303.00	760.459	
Group 2	632.50	138.828	
GOALS			3.15*
Group 1	3.475	.987	
Group 2	4.125	.853	
PARTICIPATION			2.76*
Group 1	3.850	.864	
Group 2	4.300	.564	
COMMUNICATION			NS
Group 1	4.150	.770	
Group 2	4.375	.628	
CREATIVITY			NS
Group 1	3.825	.781	
Group 2	3.800	.516	
EVALUATION			NS
Group 1	3.925	.859	
Group 2	4.050	.597	

(Table continues)

EFFECTIVENESS			NS
Group 1	4.125	.822	
Group 2	4.175	.501	
SATISFACTION			NS
Group 1	4.175	.813	
Group 2	4.200	.516	
SATISFACTION/SELF			NS
Group 1	3.900	.900	
Group 2	4.125	.686	
SCALE TOTALS			NS
Group 1	31.425	4.981	
Group 2	33.150	3.527	

*p<.01

The audio teleconferencing groups' mean time was over twice the mean time of the face-to-face groups. This is significant at the .001 level.

The other data after "time to solution" came from the post-activity questionnaire. Results show two items with significant differences. They are: 1) understanding the goals of the task, and 2) level of participation of the members of the group. In both cases, these differences were in favor of the face-to-face groups. Other questionnaire measures, including "satisfaction" were not significant (NS).

To summarize, face-to-face groups completed the task faster, had a better understanding of the goals of the task and greater member participation than the audio teleconference groups.

CHAPTER III

<u>DISCUSSION</u>

Face-to-face groups completed the task over twice as fast as the audio teleconference groups. Based on the other items that showed significant differences, the reasons why may be deduced:

1) The face-to-face groups indicated a better understanding of the <u>goal</u> of the task;

2) The face-to-face groups indicated a higher level of <u>participation</u>.

TABLE II shows significant differences in the responses of the participants in these two areas. Both "understanding of the goals of the exercise" and "participation of all members of the group" were significant at the .01 level of probability. (See Appendix C for specific questions.)

In the face-to-face groups there was more participation than in the teleconference groups. There were several audio teleconferencing groups, for example, where one or two people dominated and even "solved" the task for the rest of the group. In these cases, the individual(s) gathered all the data from the other participants, found a solution, then reported back to the group, telling each person how to mark their worksheet. This phenomenon never occurred in the face-to-face groups. Interestingly, though, when those audio teleconferencing groups let one or two people solve the task, while not among the fastest times, they did solve the task more quickly than some of the other audio groups.

The face-to-face groups also got off (as a whole) to a faster start in arriving at the solution. The first part of the task was to identify any numbers that all members held in common. In order to accomplish this, one member would have to read their list of numbers. In half of the audio groups, all four participants went through their lists, only to find no additional common numbers after the first one had read. In three more audio groups, it was only during the second or third list reading that someone realized that these extra readings were unnecessary. In the face-to-face groups, there were only two groups that went beyond the second list before realizing it was not necessary. None of these groups had all four participants read their list. In one face-to-face group, before any lists were read, a participant recognized that only one person would need to read their list. This group recorded the fastest time to solution of any of the groups.

This finding supports the literature which indicated that teleconferencing may be less productive because it requires more time for developing and maintaining group organization. It is also less personal and less desirable when trying to get to know someone.

The other variable being studied was satisfaction. The survey covered two aspects of this variable:

1)   satisfaction of the group's performance in solving the task, and

2)   satisfaction of individual performance in the task.

Neither variable uncovered significant differences in the levels of satisfaction between the two sets of groups. One consideration in this lack of significant differences is this: the face-to-face groups had

nothing with which to compare their experience. Participants in the audio groups have had face-to-face experience in solving problems. There might be different results if groups had the opportunity to perform tasks in both modes, then compare their experiences. While audio groups were not dissatisfied, would they have been more satisfied working face-to-face? This is not known.

CONCLUSIONS

The data from this research leads to three fundamental conclusions:

1) Face-to-face groups reached a solution to the task over twice as fast as groups working via audio teleconference ($p < .001$).

2) Face-to-face groups reported a higher level of understanding of the goal of the task ($p < .005$).

3) Face-to-face groups reported a higher level of participation of participants than the audio teleconference groups ($p < .01$).

As noted in the previous section, it is possible to conclude that because face-to-face groups had a better understanding of the task and more member participation, they were able to solve the task more quickly than their audio counterparts.

It is interesting to note, however, that even though these conditions existed, the face-to-face groups were not any more satisfied with the group's, or their individual performance than the audio teleconference groups.

In summary, this research study demonstrated that face-to-face groups were able to solve the problem more quickly, had a better understanding of the goal of the task, and had more member participation than groups working via audio teleconference. The level of group and individual satisfaction was not significantly different.

LIMITATIONS

All research has limitations, and this study is no exception. The first limitation involves the participants. Ten groups in each condition is a small sample. The groups were homogeneous, but from two sources. The location of the teleconference was directed to where the subject participants were located -- on campus. Time of space usage and telephone rental costs dictated quick completion of those groups. All ten teleconference groups were made up of volunteer student participants.

However, not enough students volunteered to complete the study, so employee volunteers from a local business completed the face-to-face groups.

Another limitation was the difficulty of finding an appropriate validated survey to gather information about the participants' satisfaction. The "Team Effectiveness Critique" (Alexander, 1985) was used as the foundation for the post activity questionnaire given the participants in this study. It is not a validated research survey.

IMPLICATIONS FOR FUTURE RESEARCH

Considering the relatively narrow scope and limitations in this study, there is ample room for additional research in this area. Issues that could be addressed include: 1) better definition of tasks which can be completed effectively via teleconference, 2) more comprehensive analysis of differences in group dynamics and processes across media, and 3) more comprehensive analysis of the satisfaction of the users.

Based on the review of literature, simple problem solving and meetings which emphasize information sharing can be effective over the phone (Fowler and Wackerbarth, 1980). The task selected for this study seemed to fit this description, but results showed it took over twice as long to complete the task via teleconference than it did face-to-face. This can certainly not be thought of as being as effective. One issue brought forth in the literature is the teleconferences may be less productive because they require more time for developing and maintaining group organization. It took the teleconferencing groups longer to get started on the task and it took them longer to complete it. This may be because teleconferencing groups reported a significantly lower understanding of the goals of the task itself. The same instructions were given to the face-to-face groups. Why did these groups report a higher understanding of the goals of the task? Is the process of giving simple instructions made more difficult when done over the phone? The review indicated that participants felt that they paid more attention to what is said in teleconferencing situations (Fowler and Wackerbarth, 1980), but apparently that did not occur in this study. And more

specifically, what tasks really can be done just as effectively via teleconference? With so much business teleconferencing, it would seem field work in this arena would be appropriate.

Another area of this study that could be expanded on is the group dynamics and processes across communication modes. For example, in this study, face-to-face groups communicated more than the teleconference groups, and had more equal participation. As noted, in several of the teleconference groups, one or two people collected all the information from each person, solved the problem for them, and reported back where to mark their worksheet. This also involved the willingness of those marginal participants to defer the problem-solving and decision-making authority to one or two others whom they had not met nor could not see. This phenomenon did not occur in the face-to-face groups. This leads to the question: Are people more likely to assert power, or to give up power in situations such as a teleconference, where they may not know and cannot see the other participants? Does the isolationism of teleconferencing affect power, leadership or decision-making? On a larger scale, do face-to-face groups communicate more than teleconference groups, and how much of the communication is task-oriented vs. casual conversation or "group development" talk? The literature is not conclusive. In Fowler and Wackerbarth's (1980) summary of the literature, they conclude that more time is spent in group development by those working via teleconference, but it's less personal and less desirable when getting to know someone. For those individuals who are more introverted and less social, a teleconference

may allow them a lesser level of participation than may be allowed by a face-to-face group. In this study, the results were mixed. In the teleconference groups, those with the lowest levels of participation fell into the middle of the "time to solution" measure. Some of the very participative teleconferencing groups took much longer to reach a solution. However, none of those less participative teleconferencing groups completed the task as quickly as the slowest face-to-face group.

Additional studies of group dynamics and processes might include the types of comments made by the group (supportive, confirming, contradicting, information seeking, etc.). Are there differences based on the mode of communication? Other areas of study might include communication factors such as communication apprehension or personality type that may affect how people communicate in teleconferences as opposed to face-to-face.

The last area of concern is that of satisfaction. The primary concern with the lack of significant differences in satisfaction has been noted. There was nothing on which to base satisfaction except the singular experience of the participants in one of the two communication modes. Future research may be needed to provide participants multiple experiences for comparison. By doing so, it may be determined if one mode is preferred over another and how strong that preference might be. By providing a variety of tasks at the same time, data on task sensitivity to communication mode may also be collected.

An extension of the satisfaction issue might be to tie satisfaction back to performance. Does higher satisfaction with the

mode of communication lead to better performance (on both a group and individual level)? Or, does high performance lead to greater satisfaction, regardless of the mode of communication?

In summary, there are many opportunities to research communication and compare group dynamics and processes across communication modes. To build on past research, better delineation of tasks which can be done effectively via a mediated mode is needed. A closer look at group dynamics is also needed. It seems that groups working in mediated modes operate differently from groups working face-to-face. And finally, the issue of participant satisfaction must be addressed in greater detail.

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APPENDICIES

APPENDIX A

TASK INSTRUCTIONS

Please open the envelopes on the table in front of you. Set the Post-Activity Survey aside for now. I will read the task instructions enclosed. Use these as your reference during this activity. You will complete your work on the slip enclosed.

Each of you has a slip of paper with 16 numbers arranged in 4 rows/columns of 4 numbers each. Your first task is to identify numbers that all of you have in common. You are to mark those common numbers with a plus(+) sign. All 4 of you must have the number on your slip in order to mark it. Any number that all the group has must be marked. It does not matter where the numbers are located on the slip. If there is more than one common number on the same slip, mark all.

After that, the group may add plus signs to their slips, working together until the group's total is 36 plus signs. The plus signs may be placed on numbers meeting the following criteria: when finished, each person may only have 0, 2, or 4 plus signs in any given row or column, (this may vary for each person); no one may fill their entire card with plus signs. When finished, the groups total will equal 36 plus signs.

The researcher will be available during the task only to clarify these instructions. Upon completion of the activity, the group will indicate closure. At that time, participants may fill out the Post-Activity Survey.

Thank you for your assistance with this research.

APPENDIX B

PARTICIPANT TASK WORKSHEETS

MEMBER A			
___12	___10	___23	___ 8
___14	___ 3	___11	___ 5
___ 5	___14	___ 4	___26
___26	___11	___ 3	___ 4

MEMBER B			
___14	___31	___28	___16
___37	___18	___40	___21
___31	___22	___14	___20
___20	___16	___22	___28

MEMBER C			
___19	___ 2	___29	___ 7
___25	___29	___ 7	___ 6
___30	___14	___27	___ 1
___ 6	___19	___ 2	___25

MEMBER D			
___34	___36	___14	___35
___33	___35	___36	___32
___32	___34	___36	___14
___52	___38	___39	___59

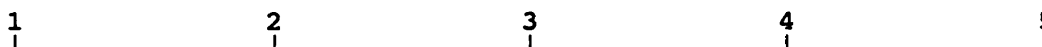APPENDIX C

POST ACTIVITY SURVEY

Instructions: Indicate on the scales that follow your assessment of the
                activity just completed. Please circle the number that
                most closely approximates your thoughts and feelings.

1. GOALS AND OBJECTIVES
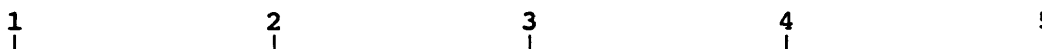The group lacked understanding   The group understood exactly
of the goal of the task.   the goal of the task.

```
1            2            3            4            5
L_____|_____|_____|_____J
```


2. PARTICIPATION OF MEMBERS
There was very limited participation   There was full participation
from all of the group members.   from all the group members.

```
1            2            3            4            5
L_____|_____|_____|_____J
```


3. COMMUNICATION
There was not free and open   There was complete free and open
communication among group   communication among group
members.   members.

```
1            2            3            4            5
L_____|_____|_____|_____J
```


4. CREATIVITY
The group was rigid and not   The group experimented freely
creative in solving this problem.   and was creative in its approach
                                        to solving this problem.

```
1            2            3            4            5
L_____|_____|_____|_____J
```


5. EVALUATION
The group did not evaluate   The group evaluated the process
its progress nor its outcome.   as it worked and its final
                                        outcome.

```
1            2            3            4            5
L_____|_____|_____|_____J
```
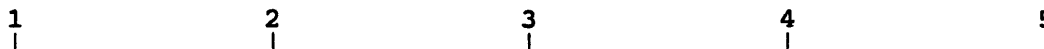
6. EFFECTIVENESS

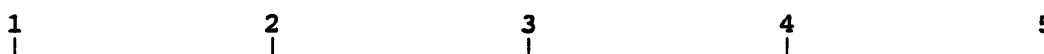The group was not at all effective in solving this problem.

The group was very effective in solving this problem.

```
1              2              3              4              5
L_____I_____I_____I_____J
```

7. SATISFACTION (Group)

I was not at all satisfied with the group's performance in solving this problem.

I was very satisfied with the groups performance in solving this problem.

```
1              2              3              4              5
L_____I_____I_____I_____J
```

8. SATISFACTION (Self)

I was not at all satisfied with my performance in solving this problem.

I was very satisfied with my performance in solving this problem.

```
1              2              3              4              5
L_____I_____I_____I_____J
```