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Teleconferencing: a comparison of attitudes

by J. R. Weston and C. Kristen

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AVANT-PROPOS

Premier d'une série, le présent rapport expose les résultats d'une
expérience fort élaborée portant sur des aspects essentiels de la " télé-
conférence " relativement à divers modes de télécommunication.

L'objectif de l'expérience est de déterminer et de tenter de saisir
le comportement spécifique des individus et des groupes qui participent à
des téléconférences : qu'il s'agisse de rencontres réalisées par le truchement
de circuits à fréquence vocale auxquels on ajoute la télétransmission de docu-
ments et de graphiques ou par le moyen de voies audio-visuelles exploitées
en temps réel. À titre de comparaison, notre analyse a aussi porté sur la
conférence traditionnelle où les participants sont en contact immédiat.

Comme il s'agissait, à notre connaissance du moins, d'une première
tentative du genre (l'observation contrôlée et comparative de l'attitude
des individus et des groupes au cours de conférences audio, télévisuelles
et en contact direct), nous avons tout mis en oeuvre pour en tirer le plus
d'information possible. À cette fin, nous avons utilisé différentes
méthodes de collecte de données, chacune correspondant aux divers types
de recherche auxquelles nous nous adonnions. Notamment : a) la méthode
d'auto-analyse sur laquelle se fondaient les questionnaires touchant les
séances qui ont précédé et suivi les conférences; b) l'enregistrement
sur bande magnétoscopique des conférences selon la technique du découpage
électronique permettant d'enregistrer en dyptique les groupes en interaction;
c) la transcription textuelle des échanges.

Dans ce premier rapport, nous analysons la plupart des données recueillies par le moyen des questionnaires d'auto-analyse. Elles portent essentiellement sur les attitudes des participants et leur intelligence des paramètres intéressant le comportement des individus au cours de ces conférences. Les résultats que nous exposons, comme l'examen que nous faisons de ce premier groupe de données, sont donc provisoires et n'ont valeur que d'indication. Ils se feront plus définitifs avec l'introduction de mesures des différences entre les attitudes des participants selon le type de conférences auxquelles ils participent : il sera alors possible d'interpréter, par rapport à un cadre plus large et à des données plus exhaustives, les perceptions qu'ils ont de leur comportement.

On trouvera au chapitre I une rapide description de notre projet de recherche ainsi qu'un exposé des principales questions auxquelles nous tentons de répondre. Elles n'acquièrent leur pleine signification qu'en relation avec les théories courantes et les hypothèses qui fondent notre recherche.

Nous avons consacré le chapitre II à la description de nos méthodes d'expérimentation et de recherche. Sans doute n'offrira-t-il pas un intérêt égal pour tous les lecteurs : il est cependant essentiel à une juste interprétation des résultats.

Le troisième chapitre expose les résultats de l'auto-analyse à laquelle les participants aux conférences se sont livrés. Sans accorder pour autant une importance indue aux différences entre les participants ou même entre les sous-

groupes ou groupes relativement aux divers moyens de communication, nous y exposons les réflexions personnelles des participants face à chacun des modes de communication.

Dans le chapitre IV, nous examinons les difficultés d'adaptation qui surgissent au sein des groupes en interaction au cours d'une téléconférence. Cette analyse permet de déterminer les facteurs d'explication des différences dans l'évaluation des conférences.

Dans le cinquième chapitre, nous traitons de la perception interpersonnelle et de la structure sociométrique des groupes dans le cadre d'une téléconférence, telles qu'elles ressortent des attitudes des participants les uns envers les autres. Ces données facilitent l'analyse des différences dans le climat des séances eu égard au mode de communication utilisé.

On trouvera au dernier chapitre un résumé des principales conclusions du rapport ainsi qu'une analyse de leurs incidences.

Nous tenons à remercier les personnes et les organismes suivants de l'aide qu'ils nous ont fournie tout au long de nos travaux :

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- Claude Plessis, assistant de recherche, Université de Montréal; Susan O'Connor et David Tanaka, assistants de recherche, Université Carleton.

TELECONFERENCING:

A COMPARISON OF ATTITUDES, UNCERTAINTY

AND INTERPERSONAL ATMOSPHERES IN

MEDIATED AND FACE-TO-FACE GROUP INTERACTION

REPORT #1

J. R. Weston
Carleton University
Ottawa

Contract OGR2-0152

C. Kristen
University of Montreal
Montreal

Contract OGR2-0398

Prepared for:

PREFACE

This is the first of a series of reports presenting the results of a large-scale experiment delving into a number of crucial aspects of teleconferencing via different communication modes.

The project is concerned with the discovery, description, and explanation of the particularities of individuals' and groups' behavior when involved in teleconferencing situations carried out over graphically augmented audio or real-time audio-video channels. Face-to-face group interaction, the traditional conferencing situation, was included to establish a base-line of comparison.

Since this is, to the authors' knowledge, the first attempt to systematically compare the effects of audio, video and face-to-face conferencing between groups under realistic, yet controlled conditions, considerable effort was made to structure the investigation to yield as rich a data base as possible. For this reason, a variety of different data collection techniques, each appropriate for a particular set of questions or research concerns, were used. These include (a) self-reporting techniques which were central to the pre- and post-conference session questionnaires, (b) video-tape recordings of the ongoing conferences (by means of split screen techniques it was possible to simultaneously record both interacting groups or nodes),and (c) verbatim transcripts of the verbal interactions during the conferencing sessions.

This report presents the analysis of much of the data collected by means of self-reporting questionnaires. The data, therefore, are fundamentally attitudinal and focus on subjects' perception of different parameters of conferencing behavior. The results and interpretations of this first set of information should therefore be considered as tentative statements, suggestive of differences in human behavior conferencing systems. Evidence will become more compelling when additional measures for other variables concerning the differences between several types of mediation in conferencing phenomena have been developed from the other available data sources and the participants' perceptions are thus placed in a more complex and comprehensive context.

Chapter I briefly describes the background of the research project and outlines the major blocks of questions that the report is attempting to answer. The significance of the research questions is elucidated within the framework of available theory and a set of general hypotheses that are developed.

Chapter II describes the experimental procedures and research methods that were used. This chapter may not be of particular interest to the general reader but is necessary for a clear understanding and meaningful interpretation of the research results.

Chapter III presents the findings of participants' evaluation of the conference discussions. Without unduly stressing differences between individual participants or even subgroups or groups using the same medium of communication, this chapter concerns the general understanding of differences between the three modes as they were felt by the subjects.

Chapter IV explores uncertainties and problems of adaptation arising in teleconferencing within the social contexts of the immediate group, the mediated group and their interaction. These analyses permit the specification of factors that contribute to and best explain differences in evaluations of the conference.

Chapter V centers on questions of interpersonal perception and the sociometric structure of teleconferencing groups as expressed in attitudes of each participant towards each other person in the conference session. The indicators derived from these data permit formulation and analyses of differences between session atmospheres due to communication mode.

The final chapter summarizes the major findings of the report and discusses their implications.

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CHAPTER I
INTRODUCTION

This investigation represents part of a large-scale project
conducted by the Social Policy and Program Branch of the Federal
Department of Communications. The broad program is aimed at determining the
social desirability and economic feasibility of teleconferencing,
particularly as a communication tool for agencies of the Federal
Government.[1] This requires, among other things, a basic knowledge of the
particularities of communication events that take place via these new
conference media. This study is concerned with elaborating this fundamental
understanding and is, therefore, an exploratory investigation of crucial
parameters of teleconferences. The approach taken is that of comparative
analyses of communication, other behavior and attitudinal variables in
three fundamentally different types of conference situations--augmented audio
conferences, real-time audio-video conferences and the traditional face-
to-face conference.[2]

Defining "the essential characteristics of good communication"
in a way that will satisfy a majority of people is a problem that has
not yet been solved. Similarly, determining what constitutes a "successful"
and "productive" meeting or conference is neither clearly understood nor
generally agreed upon, even when the conference takes place in the familiar
face-to-face communication mode. The problem is compounded when the
technological factor is added. Despite these inherent problems of

definition and concensus about conference effectiveness, a number of criteria were selected for this study which, it will be argued, appear to be necessary antecedents for other more specific variables that define effectiveness for particular uses to which teleconferencing systems can be put. In this sense, the study reported herein is exploratory and answers questions like 'Does it work at all?', 'How does it work?' and 'What works well or badly?'. Precise elucidation and explanation of fine points of manifold particularities of teleconferencing phonomena will have to be left to later, more rigorously controlled studies. Indeed, it will only be on the basis of these that comprehensive evidence will be gleaned and rational multi-dimensional systems planning with respect to socio-psychological and communicational variables will be possible.

In addition to this fundamental epistemological shortcoming, one must bear in mind when reading the results and their interpretation that any differences between communication systems are derived from measures of statistical differences and that their "significance" refers to statistical significance of the observed difference rather than their social or pragmatic significance. Significance of results is a research issue. It has pragmatic value inasmuch as it points to the factors that, beyond a known level of reasonable doubt, are influencing events in the system. Whether certain of these factors warrant the economic and/or

social expenses necessary for their incorporation into any specific system is not a research question but a value judgement to be taken by the planning institution. In the sense that there is no truly non-applied research and, in particular, given that this project is part of a 'mission-oriented' program, however, it is hoped that the results of this report will provide pertinent evidence for consideration in such value judgements.

THE RESEARCH PROBLEM

As mentioned, the study is fundamentally exploratory in nature. Lacking formal models of both mediated group interaction in general, and of differences between specific modes of group communication, the research problem was obviously not one of testing models.[3] Rather, the problem was one of formulating questions that seemed critical to the understanding and design of teleconferencing systems, and then devising instruments that would permit a fairly clear and unambiguous answer to these questions. When a sufficient number of central questions have been asked, begun to be answered, and their interdependencies investigated, increasingly formalized models can be developed and, under rigorously controlled experimental conditions, be submitted to empirical test.[4]

Three separate but related sets of basic questions were initially posed as the central concern of this phase of the study:

(1) Questions concerning user evaluation of the conference

Does the conference medium differentially effect users' evaluations of the characteristics and dynamics of the conference?

Does the satisfaction level vary from mode to mode?
If so, do these perceptions and evaluations change over time?
If so, what are the directions and magnitudes of these changes?

(2) Questions considering uncertainties and adaptation to teleconference systems

Since any form of teleconference is, in part, a vicarious experience, are people able to communicate with participants in a spacially removed conference node in the same way as they do with those who are physically present?
Do they view cross-nodal values, roles, and behavioral rules as similar or different from the conference node of which they are a member?
If not, are the magnitudes of the differences alternative forms of teleconferencing?
Do any differences in these patterns change with increasing familiarity with the system?

(3) Questions concerning the potential for and nature of interactions in teleconferencing systems

Does being physically removed from some members of the conference systematically alter one's ability to comprehend them?
Conversely, does it alter one's feelings of being understood?
To what extent is physical immediacy related to patterns of agreement and disagreement?
How accurate are all of these perceptions?

Are the answers to any of the above questions different for alternative forms of teleconferencing? Do the patterns change over time?

Basic Considerations

The rationale underlying the hypotheses that are developed is based upon (1) the researchers' own experiences in teleconferencing systems and their subjective interpretation of these experiences,

(2) formal and informal discussions with others who had experienced teleconferencing, (3) a systematic review of the available literature on two-person mediated interaction; and, (4) the incorporation of communication and social psychological theories with apparent implications for mediated group interaction. Derived from these deliberations, the following parameters seem central to the investigation of teleconference phenomena.

A. Channel Capacity of Conferencing Modes

Comparative analyses of the behavioral effects of non-mediated and mediated human interaction must begin with the obvious consideration of channel capacities. It is hardly debatable that the greater the quantity and quality of sensory channels available in a communication link, the greater the information potentially put in, through, and out of the system.[5] It follows that face-to-face human communication with its capability for engaging all of the senses provides participants with the maximum quantity and diversity of sensory data.[6] Relative to face-to-face communication, technologically mediated communication degrades both the quality and the diversity of the raw sensory data available in the system. In this sense, the more sensory channels that are unavailable in a mediated communication system, the less the variety of communication cues. Simply stated, the quality and diversity of data available for processing is greatest in face-to-face communication, less in video systems, and least in audio systems.

To the extent that the richness of the available information
base in conference situations is directly related to such things as
mutual stimulation among participants, greater awareness and appreciation
of each other's intentions, reactions, and attitudes,[7] it follows that
the face-to-face conference mode will generally be most intensive and
"audio only" teleconferencing the least intensive on a wide array of
conference parameters.

The simplicity and apparent power of the formulation tempts one
to predict the general effects of alternate communication modes solely
in mechanistic terms of the richness of the information channel employed.
However, the channel capacity of the communication mode is clearly only
one of a multitude of factors affecting communication behavior and
attitudes in a conferencing situation. While it is neither possible nor
necessary to discuss all such factors, it is useful to speculate on the
likely effects of a few, if for no other reason than to underline the probable
complexity of teleconferencing phenomena. Such speculation is particularly
fruitful for the development of future theoretic and system design models
of teleconferencing when the factors considered yield a set of predictions
that oppose those based solely on channel capacity.

B. Novelty in Conferencing Modes

Whenever a person enters a group communication situation, he does
so with a set of expectations about his own behavior and the
behavior of others. This is based upon his prior experiences in group

situations. These central beliefs are fairly stable over time and are

independent of the particular group of people at hand and the particular

reason for their being in any group. They are the expectations a person

has about individual behavior and the structure and dynamics of groups as

a whole. Moreover, this study being a comparative analysis of different

modes of group interaction, it is also necessary to consider his feelings

about his past experience with communication technologies.

Considering the non-mediated or face-to-face group situation first,

it is reasonable to assume, at this time and for most people, that this

is not only the group communication mode that is most familiar, but that it

is the only familiar mode. Engaging in non-mediated group interaction

has little or no modal uncertainty and violates no expectations. The

face-to-face medium of group interaction is neutral with respect to novelty.

While people are generally unfamiliar with video and audio

technologies for group interaction, they do have a wealth of experience

with both video and audio communication systems that they bring with

them to the conference situation.

A person's past experience with video systems is almost entirely

as a member of the "audience" of mass television. As such, he has been a

passive consumer of this medium, unable to control the minute-by-minute

events that appear on his monitor. However, as a member of a video

conference he is suddenly able to manipulate and control the events
on his monitor to varying degrees. Being able to engage in this form
of mediated interaction is a novel experience and sharply contrasts all
his prior familiarity with television. Unlike the face-to-face
medium of group interaction which is neutral in novelty effect, video
conferencing is, therefore, likely to have a novel and positive effect on
his perceptions of the conference.

A similar line of reasoning for audio systems is not as
compelling since, prior to audio conferencing, a person is thoroughly
familiar with two very different audio technologies--the radio and the
telephone. A person's previous experience with radio and television
is similar on at least one dimension, namely both have been non-interactive
technologies and, were it not for an alternative model of audio interaction,
one would predict that both audio and video teleconferencing would
elicit positive novelty effects on the person thrust into a teleconferencing
situation.

However, while a person is unlikely to have an interactive
video model to set his expectations for video conferencing, he does
have the telephone experience as an interactive audio model.
Most of this experience will have been dyadic, a situation in which the
individual's potential for determining the nature of the communication
events that occur in the system is maximized. In audio conferencing,
where the number of participants increases, the individual's potential
for determining the events and actively participating is reduced. It

follows from this, that although audio conferencing like video conferencing
will be in contrast with his previous experience with these media, the
video represents an increase in personal control while audio represents
a loss. For this reason, the novelty effects of audio conferencing
are predicted to be negative.

C. Uncertainty in Group Interaction

The previous section dealt with the novelty effects that violate
a person's experiential definition of a communication medium. The
argumentation was relevent to the understanding of feelings and attitudes
about the novel situation and the likelihood of a person being favourably
or unfavourably disposed to the changed communication conditions in
teleconferencing. Beyond a person's predisposition to accept novel
communication modes, effective teleconferencing is also likely to be a
function of the behavioral uncertainties such modes engender.
To avoid redundancy, a discussion of the behavioral concomitants of
uncertainty is omitted from the general rationale and reserved for a
later section. For the present, it is sufficient to note that medium
related uncertainties concerning values, group and sub-group norms,
role expectations and the definition of the situation other than those
normally found in non-mediated group interaction are likely to be
encountered in all forms of teleconferencing.

Since it is reasonable to assume that video conferencing simulates
face-to-face group behavior more closely than does audio conferencing,

uncertainties would be expected to be greater in an audio system. Uncertainty should be least in the face-to-face conference mode. Unlike the predictions concerning novelty effects, those based on uncertainties in group interaction, show essentially the same pattern as those based on channel capacities of the conference medium.

In summary, three factors (1) channel capacity, (2) novelty, and (3) uncertainty, have been posited as having generalized effects upon a wide array of conference attitudes and behaviors. Degrading the quality and diversity of the channel is predicted to have a negative effect. In terms of positive effects, $F > V > A$. is predicted. Technological novelty is expected to have a positive effect in video conferencing, no effect in non-mediated conferencing, and a negative effect in audio conferencing $(V > F > A)$. Certainty as to values, group norms, role expectations, and situation definition is expected to be positively related to attitudes and behaviors $(F > V > A)$.

. The coactions of these three factors yields the following general hypothesis:

H1   On any array of attitudinal and behavioral dimensions
     face-to-face conferencing and video conferencing will
     be evaluated more favourably than audio teleconferencing.

This hypothesis is consistent with the predicted separate effects of channel capacity, novelty and uncertainty.

While the hypothesis comparing face-to-face or video with audio systems is unambiguous, any hypotheses comparing face-to-face and video

would involve opposing vectors: Channel capacity and behavioral certainty predict that face-to-face will be more favourably evaluated than video but novelty predicts just the opposite. To favour one prediction over the other is unwarranted at this time, in that it would be attempting to determine the resultant of opposing vectors without knowing their magnitudes or vector strengths. Furthermore, to attempt such hypotheses would introduce spurious precision, since the design of the study does not permit separating the individual effects of channel capacity and novelty on the behavioral measures. Since it is as difficult to find people who have not experienced face-to-face group interaction as it is to find those with considerable teleconferencing experience, the effects of channel capacity and novelty are necessarily confounded in any research design.

In addition to the above three factors, one further dimension must be introduced. It was assumed that initial unfamiliarity with teleconferencing systems would result in a variety of uncertainties and novelty effects for the user. To simply empirically demonstrate these would have minimal pragmatic or theoretical value. A more important consideration is the determination of the <u>manner and rate of adjustment</u> that people are able to make to any demand characteristic of teleconferencing systems.

Considering the novel aspects of teleconferencing first, an initial advantage to video conferencing and disadvantage to audio conferencing was posited. However, by definition novelty is not a durable characteristic and, over time, any attitudinal and behavioral bias attributable to novelty will wear off. It follows that any differential effects that might endure must be attributed to something other than novelty.

Considering the degradation of channel capacities and behavioral uncertainties in teleconferencing, it is assumed that, with repeated participation in teleconferencing, users will make the necessary adjustments if they are able to do so. The previously stated hypothesis must then be tempered by the consideration of time. In general terms, this may be stated as:

> H2 Over time, attitudinal and behavioral evaluations
> in different teleconferencing configurations will
> become increasingly similar, and these will
> increasingly approximate attitudinal and
> behavioral evaluations in non-mediated conferencing.

This is a general expectation and based on the assumption that any stresses exerted by mediated interaction are within an acceptable range that allows adjustments to be made; however, there is no specific empirical evidence to justify this assumption. It is entirely possible that some forms of teleconferencing will produce stresses that either cannot be overcome or where the rate of adjustment is so slow as to seriously limit the utility of the system as a conferencing tool. To

the extent that the second general hypothesis is either not supported or even reversed for a particular factor, it would suggest that stresses are produced that are beyond the range of acceptance and adjustment for that factor. It is a major objective of the study to attempt to identify any such constraints.

Footnotes:

1. The telconferencing study program is detailed in the document
   Teleconference Canada Research Plan, Ottawa, Canada, Department of
   Communications, August, 1972, prepared by the Social Planning and
   Programs Branch.

2. For a more complete statement of the existing and possible array
   of teleconference systems see Planning Research in Teleconference
   Systems by Stahmer and Havron, Social Planning and Programs Branch,
   DOC, Ottawa, Canada, 1973.

3. The existing scientific literature offers formalized models
   of group interaction via the traditional face-to-face mode on
   one hand (cf. for example Barry E. Collins and Harold Guetzkow:
   A Social Psychology of Group Processes for Decision-Making, J. Wiley
   and Son, New York 1970 or Joseph Berger et al.: Types of
   Formalization in Small-Group Research, Houghton Mifflin, Boston 1962),
   and some rudimentary parameters of dyadic mediated interaction (cf.
   for example: Communications Study Group, Joint Unit for Planning
   Research: Interim Report, London: University
   College, 1971 or Mary Heilbronn and Wm. J. Libby, Jr.:
   Comparative Effects of Technological and Social Immediacy upon
   Performance and Perceptions during a Two Person Game, unpublished
   article, Windsor 1973 or James P. Duncanson and Arthur D. Williams:
   Video Conferencing: Reactions of Users, to appear in Human
   Factors, Fall 1973) on the other. However, extensive search of
   literature on the specific topic of mediated group interactions
   has only yielded very meager results.

4. This procedure is reflected in the work plan as specified in the
   contracts for the three phases: With increasing clarification of
   individual data blocks and their subsequent integration it will be
   possible to arrive at a complex, possible even rather explanatory and
   causal model of the interrelations between crucial factors affecting
   the efficiency of teleconferencing modes.

5. cf. Wiener and Mehrabian: Language within Language, 1968. For a
   more formalized formulation see Claude E. Shannon and Warren Weaver,
   The Mathematical Theory of Communication, Urbana, Ill.: Illini Books
   1949 p. 16, p.76.

6. cf. Edward T. Hall: <u>The Hidden Dimension</u>, Garden City: New York, Doubleday, 1966 who has paid special attention to the social and cultural meaning of interaction types as defined along continua of transmitted information and sensory variety.

7. Considerable research data is available to support these general propositions. They have been collected by numerous experimental projects during which group processes and individual participants' states were influenced by imposing conditions on the interaction such as the exclusive use of a particular network, the activation of communication in certain directions only, limited access and cues for certain members of the experimental session etc. Rather extensive discussion of these projects can be found in Joseph E. McGrath and Irwin Atlman: <u>Small Group Research: A Synthesis and Critique of the Field</u>, Holt Rinehart and Winston: New York 1966.

CHAPTER II
RESEARCH DESIGN AND METHODS

This chapter discusses the general methodological approach taken in the study and the limitations of the approach. Also described are the independent variables that are manipulated; the selection of subjects and their organizational setting; the task or conference objectives; the specific experimental design; a step-by-step account of the actual experimental procedures; and, the statistical models applied.

General Methodology

A major problem in developing an approach to the study design was the extent to which already existing studies in related fields could be considered as adequate models. Although there is little literature available on teleconferencing per se, i.e., mediated group interaction, there is a wealth of information concerning issues that are somewhat related to teleconferencing phenomenon. Most of these studies can be loosely cast into one of two types, namely (1) small group research, and (2) dyadic mediated communication.

Both types have serious limitations as models for teleconferencing. The small group literature, although it has dealt with sufficiently large numbers of people in a group to satisfy the criteria of the definition of a conference, has, for obvious reasons, been concerned only with face-to-face groups. Studies of dyadic communication, while they have

investigated communication technology, have not dealt with groups of
people interacting as a group in the normal sense of the term "conference".
Since it could not be assumed that teleconferencing is a natural
extension of either face-to-face group communication or mediated two-
person communication, the decision was made to design a teleconferencing
field experiment that, although highly exploratory, would permit the observation
of a large number of communications and behavior variables. This meant that
precise manipulation and rigorous control, the hallmarks of the laboratory
experiment designed to test specific theoretical hypotheses, would necessarily
be relaxed.

While the decision is likely to produce more generalizable results,
in the sense that the observable behaviors of the participants are unlikely
to be artifacts of experimenter-induced manipulations, the explanatory
power of any interpretation is reduced. Unlike the laboratory experiment,
which is designed to systematically rule out alternative interpretations of
results other than those hypothesized, the interpretations of field project
results are somewhat more tentative. Despite this limitation of a field
project, the researchers felt, that given the current state of knowledge
about the behavioral and communication aspects of teleconferencing,
this approach was most useful for the discovery, description, and a
beginning explanation of the important aspect of teleconferencing.

Any interpretations, must therefore be evaluated in terms of the internal consistency of the argumentation and the modest level of control attained, rather than in terms of any theoretical and methodological elegance reflected in the research design.

Independent Variables

There are two independent or manipulated variables in the study-- (1) Conference Mode, and (2) Number of Conferences.

(1) Conference Mode

Although conference mode is obviously multidimensional, for purposes of this study mode is taken to mean quality and diversity of the communication channels available, and can take one of three states: the face-to-face conference mode is designated high, video conferencing medium, and audio conferencing low.

(a) Face-to-face Conference These conferences took place in a well-lighted small seminar room. The six participants sat across from each other, three on either side of a standard-sized table with a writing pad and pencil at each position. Centered behind each side of the table was a fixed TV camera linked to a VTR camera that recorded the interaction of all six participants on a horizontally split screen. No operator was ever present in the room and the recording equipment was in another location.

(b) Video Conference The video conference facility was adapted for this study from the Scientific Wired City Laboratories at Carleton

University. The facility consisted of two media interactive conference rooms. The rooms (nodes) were located in different parts of the same building and connected through a patch panel providing for video recordings with a 5 MHZ bandwidth. Each node accommodated three conferees who sat side-by-side facing a five foot conference table. On the other side of the table, four feet from the participants was a panel of four television monitors. This arrangement is diagrammed in Figure 1. One monitor provided a view of the participants at the other node. An outgoing monitor provided the view of the participants themselves that the other node would recieve. Directly below these were two "graphics" monitors. One incoming and one outgoing monitor provided for the exchange of graphic material. Each participant was provided with a writing pad and dark felt pen. Written material could be placed on a register located in the center of the table which could be easily reached by any of the three conferees. The graphics camera was mounted above the table, locked in position, and focused on the 4½ by 6 inch field of view register. Another camera centered between the four monitors provided the outgoing video of the interaction. The video conference facility was entirely "hands-off" and no special instructions were required to familiarize conferees. Audio was provided over a 4-wire, 10 KHZ audio channel feeding one loudspeaker on the conference table at each node. Panasonic TN-93 9" monitors and 1" Vidicon cameras (CBC ctc-5000) were used.

(c) <u>Audio Conference</u> This facility was identical to that of the video conference with the exception that the incoming and outgoing monitors displaying the interaction were removed. Since the graphic monitors were retained, the audio conference was augmented by this graphic capability (see Figure 2).

(2) <u>Number of Conferences</u>

Because of predicted novelty effects of teleconferencing that are unavoidably confounded with channel capacity effects, and to permit users to adjust to the technological communication systems, a series of three conferences was held. Each conference lasted approximately 45 minutes and was held at the same time and over the same conference mode for each subject for each of three consecutive weeks.

<u>Subjects and Their Organizational Setting</u>

Conferees for the field experiment were drawn from a population of some 650 university students enrolled in a Human Communication course at Carleton University. The course is organized so that students attend a large lecture once a week and meet in a small 20 person tutorial group for upwards of two hours per week. At the time the conference sessions were held, subjects in a tutorial group had been working together as a group for half the university year on a variety of course projects.

Subjects did not volunteer for the conference. Tutorial groups were selected at random, and all members of a selected tutorial group were required to attend conference sessions as part of their formal

requirements for the course. Subjects were about evenly split on sex and were a fairly homogenous age group. No attempt was made to control either variable in the assignment of subjects to conferences.

The Experimental Task

The selection of the task, the reason for having the conference and the conference objectives was critical for satisfying the conditions for a field experiment as opposed to a laboratory experiment. Four criteria had to be met:

(1) Generalizability The task, or reason for having the 'conference' had to take the form or structure of an activity that would reasonably approximate a non-experimental or "real" conference situation.

(2) Credibility The task had to be one that the conferees could normally expect to be part of their work program. It had to permit the de-emphasis of the experimental aspects of the activity to the participants by having them engage in a very "plausible" conference.

(3) Complexity The task should be complex rather than relatively simple.

> (a) Potential teleconferences will involve complex rather than simple issues. Regardless of whether the 'purpose' of the meeting is 'negotiation' or 'problem solving'. 'policy planning', etc., it is likely that the issues and therefore the processing of information involved will be multi-dimensional and complex. Decisions resulting from such meetings will not usually be either simple or obviously "correct".

(b) A simple task, because it would be atypical or 'normal'
conference deliberations, would likely so contaminate other
latent and manifest effects of the teleconferencing situation
to limit generalizability beyond the specific experimental
situation. The task, therefore, had to be sufficiently
complex to justify multiple conferencing sessions.

(c) A major concern of this research is with peoples'
adjustement to mediating communication technologies.
Presumably any adjustments that take place will take a
period of time. For this reason conferees participated in a number
of conference sessions, over the same configuration, to maximize
the likelihood of detecting any adjustments they make.

(4) Importance and Salience This is not a separate criterion but rather an
antecedent condition for satisfying the conditions of generalizability,
credibility and complexity of the conference activity.

By applying these criteria, two types of group tasks that have been
traditionally used in group interaction research had to be eliminated.
Both the 'case study' and rational game' task material would seriously
violate most of the criteria set. The decision to abandon these closed
approaches was not taken lightheartedly. Despite their obvious
limitations, simpler tasks do allow for the fairly precise and 'objective'
measurement of a number of performance criteria, particularly productivity
measures. However, the price of attaining this degree of precision and

accuracy on the single concept of 'performance' is paid in losses of external

validity of all observations, including other 'performance' criteria.

At this initial stage of teleconferencing investigation, a careful

description of the communication behaviors exhibited when solving such

things as logic or other contrived problems could not be justified.

After considering a number of open problem conference tasks, one

emerged as closely satisfying the conditions. Conferees were asked:

> to discuss all of the substantive and procedural aspects
> of their Human Communication course and to make
> recommendations for the changes and improvements that
> they felt should be made, along with detailed plans for
> implementing the recommendations.

In addition, the institutional situation impinged on the choice of

subjects and conference task, insuring the conditions of 'realism' which

differentiates a field experiment from a laboratory experiment.

(1) As previously mentioned, The Human Communication course has a large

enrolment with an extremely high student/faculty ratio. Therefore, it

is difficult for the faculty to obtain a representative picture of

students' attitudes about the course. By its size, student/faculty

personal contacts are very limited. The relative lack of student feedback

had been an issue of continuing concern for a number of years for both

faculty and students. Against this background, it is not surprising that

the course director was immediately enthusiastic when the conferences

and the conference topic were suggested. The researchers' experimental

objectives were of only passing interest to the course director. (It

could be noted here that substantial changes have been made in the course as a direct result of the teleconference study.)

(2) The social climate, not only within educational institutions, but within almost all bureaucracies, is one of increasing value and demand for increased individual participation in decision-making. The researchers felt that conferences on the selected topic would create a forum that was consistent with this prevailing social climate. (Again, it could be noted, that the conferences have created widespread interest among students, faculty, and university administrators as a potentially useful model for the purpose of instructional development. This is, of course, again entirely independent of the research objectives that generated the conferences.)

(3) Finally, since subjects were enrolled in a course in Human Communication, and teleconferencing is an emerging mode of human communication, the experiment provided a unique opportunity for the students to participate in an activity that was consistent with the overall course objectives.

Experimental Design

The field experiment is a complete factorial three-by-three design. The treatments are three conference modes and three serial conferences. In addition, there are five (and for face-to-face, six) six-person conferences on each of the three modes for each of the three weekly conference sessions. Thus, data are available for a total of 47

conference sessions.[2] Data was collapsed across conferences within each
mode to provide large enough samples for statistical analyses.
<u>Subject Assignment to Experimental Groups</u> Tutorial course groups
were randomly drawn and all members of a selected tutorial group par-
ticipated in one conference type.   Subjects from a particular tutorial
were assigned at random three at a time to one of the conference
modes. Therefore, in any six-man conference, regardless of mode,
three participants were originally from one tutorial class and three were
from another. Each person at a conference, then, knew and had worked
with two of the other participants but probably did not even know the other
three participants before the initial conference session. Furthermore,
in both the video and audio conference modes, the three who were from the
same tutorial section were at the same conference node. It was felt that
this arrangement more closely simulated probable teleconferencing conditions
where people at the same node would likely know each other better than
they knew those at the distant node.

Except for substitutes for attrition, the same six people met
on the same mode (and in the mediated modes, at the same node) for three
consecutive sessions. For interpreting the research results, it is
important to note that the conference mode comparisons are independent
rather than related judgements.

Since the rationale behind the study demanded repeated exposure
to the conferencing situation, considerable subject attrition, (for a
variety of reasons,) over the three weeks was anticipated. Two design

FIGURE 3   Experimental Design

MODE	REPLICATION (n=6)	SESSION		
		1	2	3
Face - to-face	Conference 1	n=6	n=6	n=6
	Conference 2	n=6	n=6	n=4
	Conference 3	n=6	n=6	n=6
	Conference 4	n=6	n=6	n=6
	Conference 5	n=6	n=6	n=4
	Conference 6	n=6	no session	n=4
Mediated: Audio/vidual Interactive + Graphic visual	Conference 1	n=6	n=6	n=6
	Conference 2	n=6	n=6	n=5
	Conference 3	n=4	n=4	n=5
	Conference 4	n=6	n=6	n=6
	Conference 5	n=6	n=6	n=6
Mediated: Audio Interactive + Graphic visual	Conference 1	n=6	n=6	n=6
	Conference 2	n=4	n=5	n=4
	Conference 3	n=6	n=6	n=5
	Conference 4	n=6	n=6	n=6
	Conference 5	n=6	n=6	n=6

N=17
n=96

N=15
n=84

N=15
n=84

n= subjects
N= sessions

N=47
n=264

options were available. Either the conference size could be permitted to become progressively smaller over the three weeks or substitutes could be allowed to maintain a group size of six. Either alternative would pose substantive and statistical problems, so it was a question of which was the less undesirable.

The decision to attempt to maintain a conference size of six through substitution was based on two considerations. First, two of the major theoretic considerations of the study are uncertainties encountered in conference situations and perceptions of interpersonal relationships. If the number of people in the conference was permitted to systematically decline over sessions, any interpretation of changes and adjustments on these two dimensions would be greatly confounded by wholesale changes in group size.

Secondly, because of the institutional demands placed upon the study, replacements for missing subjects were available. Since the conferences were presented as a course requirement, all tutorial group members had to be placed in some conference for the three weeks. There were more people than could be handled in the design because of the limitation of video and audio conferencing facilities. These "extras", were assigned to face-to-face groups in exactly the same way as the original experimental subjects and their instructions and questionnaires were identical. When necessary, people were randomly selected from these backup groups to maintain an experimental conference size of six. The data for students who remained in backup groups for all three sessions were not analyzed.

Criterion Measures

Three sets of questions that are central to this investigation were previously set out. These questions concerned (1) conferee judgements of the conference itself, (2) conferees' feelings of uncertainties in teleconferencing systems, and adaptations and (3) conferees' perceptions of others in conferencing situations. The manner in which each of the three blocks of questions is operationalized will be fully described in later chapters which deal with each set of questions but, for continuity, they are summarized here.

Judgements of the conference itself are measured solely in terms of a series of fourteen 5-point semantic differential scales of polar adjectives. Judgements on the scales were in response to the request for "your overall feelings about today's discussion." The scales measure the classic evaluation, activity and potency dimensions of meaning described by Osgood, Suci and Tannenbaum (1957) and were selected, in part, from a list these researchers provide. Other polar adjectives pairs were also included that were specific to conference situations. Scales were presented in mixed dimension order with poles randomly reversed to minimize response set.

A series of statements was made concerning potential uncertainties that could arise in teleconferencing situations. The statements dealt with value, role, norm, and situational definition uncertainty, as well as selected and specific technological issues, and included consideration of

the immediate node, the mediated node, and the conference as a whole.[3]
Conferees responded to each question on a 5-point Likert scale ranging
from "strongly agree" to "strongly disagree". The statements were
presented in mixed order with positive-negative tone randomly reversed to
minimize response habituation.

To determine an individual conferee's potential for interaction
with others in a conference situation required the precise measurement
of his perceptions of each other person on a series of interaction-
related dimensions. Since this is a procedurally complex undertaking
even for a single dimension, the number of dimensions selected had to
be quite small. Two dimensions seemed critical to an understanding of
interaction potential. First of all, regardless of the ostensible
reasons for holding a conference, which may be many and varied, the extent
to which people are able to comprehend the meaning of statements
made by others, is critical to the satisfactory accomplishment of
objectives. Secondly, the accomplishment of objectives required a degree
of cohesiveness among the members which in turn requires that some pattern
of agreement emerge.

At each conference, each participant was asked to make judgements
concerning comprehension and agreement about each other person at the
conference. In the questionnaire, the physical seating arrangement of
the conference was diagrammed and a matrix was provided for responses
to the three following questions.[4]

.......indicate as well as you can whether or not each of
the other people seemed to agree with the things you said.
(Response categories ranged from "seemed usually to agree"
through "seemed usually to disagree" on a 4-point scale.)

.......indicate whether or not you tended to agree with
what each of the other people said. (Response categories
ranged from "I tended to agree" through "I tended to
disagree" on a 4-point scale.)

.......indicate as well as you can whether or not each
of the other people seemed to understand the implications
of the things you said, regardless of whether or not they
seemed to agree. (Response categories ranged from "seemed
to understand" through "seemed not to understand" on a 3-
point scale.)

From these individual judgements of every other person at the

conference, summary indices were constructed. The indices of agreement

and comprehension which will be described in detail in subsequent chapters

are of three basic types--(1) indices based on judgements of participants

who are physically present (immediate group), (2) indices based on judgements

of participants who are not physically present (mediated group) and

(3) indices involving judgements of all participants regardless of whether

they are physically present or physically removed. A variety of

conceptual dimensions can be operationalized by means of these indices.

Specifically, extrapolations of the interpersonal judgements to the

level of within-group and between-group evaluations allows statements on the

atmosphere of agreement and understanding in the teleconference sessions.

Also, because statements of agreement with others and perceived agreement

by others are complimentary the two statements taken together provide the

basis for developing a measure of the accuracy of perceptions of agreement

and reciprocity. These will be investigated in subsequent reports.

Experimental Procedures

Pre-Conference Introduction

One week before the initial conference sessions began, one of the researchers attended a tutorial group to familiarize the subjects with the conference sessions they would be attending for the next three weeks. Subjects were told that a large number of six-person (student) conferences would be taking place simultaneously in different places on campus and that the conferences were for the purpose of finding out what they thought about the Human Communication course and determining the ways in which they felt the course could be strengthened.

Subjects were then asked to fill out a questionnaire (Initial Questionnaire, Appendix A) which asked them to outline the aspects of the course about which they had strong feelings, the nature of those feelings, the frequency with which they discussed the course, the areas discussed, and the general feelings that seemed to dominate the discussions. (Since this questionnaire was intended only to familiarize subjects with the objectives of the conference and to focus their attention on the objectives, the data from this questionnaire was not analyzed.)

Then, from a previously determined random assignment of subjects to conferences and conference modes, each subject was given a card with his or her name on it that indicated the time and place of the conference he would attend. Subjects were told that they would go to the same conference room for each of three weeks and that two other people from their tutorial group would be at the conference, but the other three people would be from another tutorial group.

The same procedures were followed at each tutorial group.

Conference 1

On arrival at the conference location, subjects were given written instructions about the objectives of the conference (Pre-Session Instructions--Week 1, Appendix A). These took only a few minutes to read and the conference, which lasted about 45 minutes, then began.

Immediately following the session, subjects were asked to complete a questionnaire (one of the post session questionnaires appearing in Appendix A. These were slightly different for the three conference modes.) The questionnaire took about 10 minutes to complete, was handed in, and the subjects left.

Conferences 2 and 3

With slight variations (see Appendix A) the same procedures were followed at the second and third session of the conference. The variations from session 1, were intended to reduce complete rudundancy in instructions from week-to-week and were uniformly followed for each conference mode.

Data Analyses

Following the third conference, session post-questionnaires I, II, and III were matched on the basis of subject name. As expected in a longitudinal study, considerable attrition occured over the three weeks, but the rate was not significantly different between conference modes.

Recalling that the decision was made to attempt to hold the conference size to six through replacement for attrition, some subjects responded to less than three questionnaires. This meant that if "attendance week" and "conference week" were treated as identical terms for purposes of analysis, all those who were absent for any session would have to be discarded from the analysis of temporal effects. This would have greatly reduced the data base. Therefore, in all analyses of hypotheses concerning temporal effects, "week" or "session" refers to "attendance" rather than the actual conference session in the series. E.g., if a person attended the second conference in the series as a replacement for someone who was absent, his data was analysed as Week 1 since this was his first experience with the system. Despite the weaknesses of this approach, it is conceptually clearer than alternative ways of dealing with the inherent problems resulting from attrition.

All hypotheses were analyzed through various analyses of variance and t-test statistical models. In many cases the data analyzed by these tests were indices developed from raw data in one of two ways. Either the indices were appropriately weighted summaries of compound items that clustered in factor analyses, or they were unweighted summaries (means) of responses that were selected to correspond to the conceptual definition of the index.

Footnotes:

1. The research design used obviously calls for a repeated measures statistical model to account for individual differences over the three experimental sessions. However, unlike the laboratory experiment where subject attendance is fairly easily controlled, a longitudinal field experiment using intact groups where attrition and replacement must be expected, poses statistical model problems. Observations in this study are a combination of three repeated measures (conferees who attended all three sessions), two repeated measures (conferees who attended two successive sessions) and independent measures (subjects who attended only one session). No known statistical model will handle all three types of data and had all data, except that provided by conferees who attended all three sessions, been eliminated, the data base would have been too small for statistical test. Since subjects were randomly assigned to treatment groups, the inclusion of the variability attributable to individuals in the error term of the factorial model is unlikely to produce a significant bias.

2. A total of 47 conference sessions were analysed. (One session had to be cancelled for reasons unrelated to the experimental procedures.) Despite the attempts to maintain 6 person conference sessions, only 36 of the 47 sessions had only a total of 5 people and 7 sessions had only 4 people (2 at each node). In the "incomplete" sessions scores for all indices were mathematically adjusted for the number of people present at the session.

3. In face-to-face conferences the "other side of the conference table" corresponds to the "mediated node" in the video and audio conferences.

4. Unfortunately, measures on individuals' comprehension of each other person in the conference was inadvertently omitted from the measuring instrument.

CHAPTER III
PARTICIPANTS' JUDGEMENTS OF THE CONFERENCE DISCUSSIONS

This chapter presents the measures and analyses of the block of questions dealing with participants' judgements of the conference sessions. Regardless of any other 'objective' measures of the behaviors and outcomes associated with teleconferencing, conferees' perceptions of the conference will be a major determinant of the voluntary usage of teleconferencing systems. The judgements may or may not be rational and/or accurate but they do represent the user's attitudes and, as such, must be considered as an important factor influencing his predisposition to make use of the system and his actual behaviors in TC situations.

Measures of Discussion Attitudes

Fourteen 5-point polar adjective scales were selected to represent Osgood, Suci and Tannenbaum's (1957) dimensions of meaning.[1] The scales selected as representative of the traditional Evaluative dimension were good-bad, useful-useless, and boring-interesting; for the Activity dimension, 'lively-dragging', 'static-dynamic', and 'varied-repetitive'; and, for the Potency dimension, 'tense-relaxed' and 'warm-cold'. Six additional scales were presented that seemed most relevant to the concept "conference discussion". They were 'aimless-directed','satisfying-dissatisfying', 'productive-counterproductive', 'chaotic-organized', 'probing-superficial' and 'competitive-cooperative'. Scales were presented in random dimension

order with scale endings randomly reversed. Participants were asked
to use the 14 scales to indicate their overall feelings about the conference
session.

Hypotheses

The two general hypotheses developed in Chapter I can be
translated into specific hypotheses about the expected relationships
between conference mode, time and attitudes towards conference
discussions:

> H1 (a) Face-to-face and video conference discussions
> will be judged more positively than audio
> conferencing on evaluative, activity, and potency
> dimensions.

The rationale for this hypothesis is somewhat supported by
Champness (1972) who found that the face-to-face and video system used
were rated more positively on the evaluative dimension than was the audio
system.[2] He found no evaluative difference between the face-to-face
and video system for 2-person communications using British civil servants
as subjects, each of whom judged each of the three systems. Despite the
scale and methodological differences between the two studies, Champness'
evidence, the only documented evidence available, is the best predictor
of discussion ratings in the present study. Any substantial differences
between the two sets of findings would present rather serious interpretive
problems.

It should also be noted that Champness found no significant
differences between the three modes on the potency and activity dimensions.

He does not, however, discuss or interpret this finding and there is no obvious explanation for the lack of difference. Lacking an explanation, this study continues to hypothesize differences between the audio mode and the others on the dimensions of potency and activity.

> H2 (a) Over time, judgements on evaluative, potency and activity dimensions of the discussion will become increasingly similar in face-to-face, video, and audio conferencing modes.

H2 (a) predicts a mode/time interaction on discussion judgements.

Semantic Structures of Conference Discussions

Scales with weeks and modes collapsed were factor analyzed by both the orthogonal and oblique rotation methods. Iterations were set to yield three factor solutions with minimum eigenvalues set at 1.00 Varimax rotations was employed in the orthogonal method and Kaiser normalization with delta set at 0 in the oblique method.

Orthogonal Rotation

The factor structure of the orthogonal solution (Table 1) is clearly interpretable as the three Osgood factors of evaluation, activity and potency. Eight of the fourteen scales have their primary loadings on the evaluation first factor which accounts for most of the variability in the matrix. In descending order of factor loadings, "good", "useful", "directed", "interesting", "satisfying", "productive", "organized" and "probing" are all associated with the evaluative judgement of the conference session. Five of the six scales, added to the traditional

list,because they were particularly relevant to conferences, loaded on the evaluative factor.

Scales associated with the activity dimension of the conference discussions (factor 2) with "lively-dragging", "static-dynamic" and "varied-repetitive". "Tense-relaxed" and "warm-cold" loaded on the potency dimension (factor 3). The only scale that did not load on any of the factors was "competitive-cooperative". In retrospect this is not altogether surprising: in group discussions, there is unlikely to be concensus as to which of the adjectives, "competitive" or "cooperative" constitutes the "positive" pole. The "positive" pole is less ambiguous with the other thirteen adjective pairs.

Oblique Rotation

When the assumption of independence of factors is released, the interpretable number of factors is reduced to two. However, the principle loadings of the scales for the two remaining factors evaluation and potency, are considerably higher than the loadings achieved in the orthogonal solution. (Table 2).

The structure of the most important factor, the evaluation factor, is very similar in the two rotational methods. All of the scales loading on this factor in the orthogonal solution remain in the oblique solution and one scale is added. "Lively-dragging" now loads positively on the evaluation dimension. The other two scales, "static-synamic" and "varied-repetitive", from the activity factor do not load on any factor in the oblique solution. The potency factor remains as it

TABLE 1	ORTHOGONAL FACTOR STRUCTURE OF DIMENSIONS OF CONFERENCE JUDGEMENTS

	ORTHOGONAL FACTOR STRUCTURE		
	1 EVALUTATION	2 ACTIVITY	3 POTENCY
bad-GOOD	.755	.500	.097
useless-USEFUL	.717	.398	.039
aimless-DIRECTED	.667	.363	.061
boring-INTERESTING	.645	.479	.120
dissatisfying-SATISFYING	.640	.406	.326
counterproductive-PRODUCTIVE	.630	.424	.112
chaotic-ORGANIZED	.633	.198	.176
superficial-PROBING	.559	.296	.180
dragging-LIVELY	.456	.684	.128
static-DYNAMIC	.379	.646	.227
repetitive-VARIED	.253	.518	.004
tense-RELAXED	.032	.058	.597
cold-WARM	.156	.450	.492
competitive-COOPERATIVE	.333	-.030	.323
% of variance explained	85.7%	8.6%	5.7% -- 100%

was in the orthogonal rotation except that the principle loadings of the
scales associated with the factor are now somewhat higher. Again, the
"competitive-cooperative" scale does not load on either of the factors in the
oblique solution.

Construction of Factor Indices

A test of the two hypotheses requires first, that the more
satisfactory factor solution be selected, and secondly that composite
scale indices be derived for each of the factors.

A comparison of the orthogonal and oblique solutions indicates
clearly that the latter is conceptually preferable. The greatly increased
purity of scale loadings in the oblique solution makes the assumption of
independence of factors untenable. For this reason, all subsequent analyses
are based upon indices developed for the dimensions of evaluation and
potency obtained from the oblique solution.

Two common methods of developing indices or factor scores
are traditionally used in the social sciences. The incomplete-
estimation method employs only those scales that load substantially on a
given factor. This is a commonly used method that has the shortcoming
of not controlling the influence of variables not included and is
somewhat suspect when the indices are built from an orthogonal solution.
The complete-estimation method has the advantage of using all scales
in the matrix, appropriately weighted.[3] Because of its mathematical and

TABLE 2   OBLIQUE FACTOR STRUCTURE OF DIMENSIONS OF CONFERENCE
            JUDGEMENTS

	OBLIQUE FACTOR STRUCTURE		
	1 EVALUATION	2 POTENCY	3
bad-GOOD	.903	-.058	-.018
useless-USEFUL	.865	-.117	.000
aimless-DIRECTED	.797	-.084	.012
boring-INTERESTING	.780	.007	-.094
counterproductive-PRODUCTIVE	.755	-.007	-.054
dissatisfying-SATISFYING	.712	.211	.006
chaotic-ORGANIZED	.692	.020	.159
superficial-PROBING	.636	.064	.039
dragging-LIVELY	.605	.117	-.370
tense-RELAXED	-.094	.628	.069
cold-WARM	.141	.553	-.242
static-DYNAMIC	.483	.238	-.355
repetitive-VARIED	.376	.021	-.343
competitive-COOPERATIVE	.290	.226	.284
% of variance explained	85.7%	8.6%	5.7% -- 100%

theoretic superiority, the factor indices derived from the complete-estimation method are reported in the subsequent analyses and tests. It should be noted, however, that analyses performed on the partial-estimation indices, although not reported, produced similar results throughout.

The Influence of Communication Mode on Discussion Judgements

Of the two semantic factors for judging the conference discussion, evaluation and potency, modal differences on the evaluation dimension must be considered the most critical. Traditionally this factor accounts for the bulk of the variability in what people mean by a concept or event, it is the least ambiguous of the factors, and has been demonstrated by prior research to be quantitatively different for communication modes (Champness, 1972). In addition, the scale selection for the study was such that only the evaluative dimension was adequately represented. In retrospect, those scales that were added to the traditional list because they seemed relevant to the way people would make judgements about conference discussions, were all intuitively evaluative and it is not surprising that they loaded principally on this factor.

Hypothesis 1 (a) predicted that both the face-to-face and video discussions would be evaluated more favourably than would the audio discussion. While both comparisons were in the predicted direction, the differences reach acceptable levels of statistical significance only when the video and audio systems are compared ($p < .02$). In addition,

though not statistically significant, the evaluation rating for the video

conference was more favourable than the rating for the face-to-face

conference (Table 3). In general, the pattern of results was consistent

with the hypothesis, although the statistical support was only partial.

The hypothesized relationships between conference modes and

discussion ratings on the potency dimension was not supported. Recalling

that the dimension measures were developed from the oblique factor

analytic solution and that activity did not emerge as a factor, differences

in this dimension obviously could not be obtained. However, inspection

of the factor scores for the activity dimension calculated from the

orthogonal solution clearly indicated that there was no possibility of

significant differences between modes on the dimension.

The Influence of Time on Discussion Judgements

In Chapter I it was argued that audio conferencing would be

characterized by a negative novelty effect and a high degree of uncertainty.

This was expected to be manifest in less favourable evaluations of the

conference sessions in the audio conferences, particularly in the first

session where participants had no prior familiarity with audio conferencing.

In subsequent sessions, as the novelty effects begin to wear off and

conferees begin to make adjustments for the technological constraints

and their sociopsychological consequences, it was predicted that the

evaluations of the conference discussions on the three interactive modes

TABLE 3   SUMMARY ANALYSES OF THE EVALUATIVE AND POTENCY DIMENSIONS OF CONFERENCE DISCUSSIONS

EVALUATIVE

Week (W)	$\bar{X}$ Index Average *			$\bar{X}$ Mode (M)	p		t-test (Scheffé) Paired Mode Comparisons		
	Audio	Video	Face				A/V	A/F	V/F
1	.40	.40	.37	.39	M	n.s.			
2	.12	.29	.13	.18	W	<.002			
3	.04	.36	.30	.22	MxW	n.s.			
$\bar{X}$	.21	.36	.28	.29			<.02	n.s.	n.s.

POTENCY

1	.14	.15	.19	.16	M	n.s.			
2	.19	.18	.16	.18	W	n.s.			
3	.18	.27	.19	.21	MxW	n.s.			
$\bar{X}$	.17	.19	.18	.18			n.s.	n.s.	n.s.

*Indices can take values from -1 to +1

FIGURE 4   MEAN INDEX RATINGS OF EVALUATIVE AND POTENCY BY WEEK AND MORE
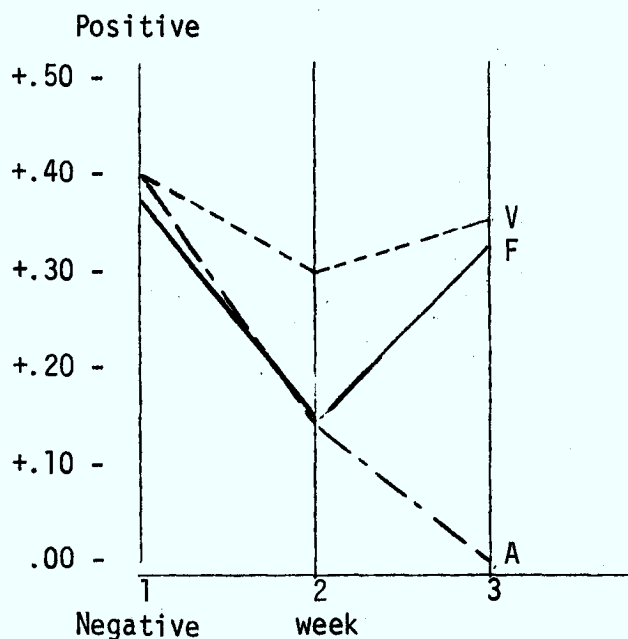
EVALUATIVE   POTENCY
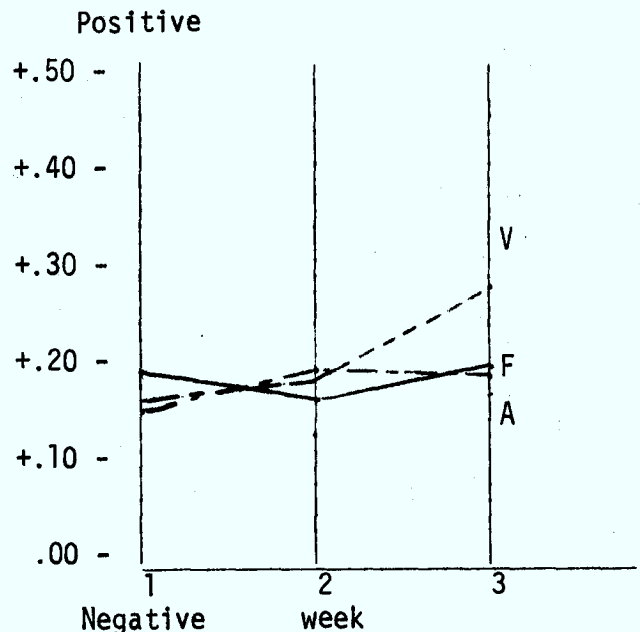
would become more similar. This predicted time and mode interaction effect on conference discussion was based on the intuitive assumption that people are able to make the necessary adjustments and that they will do so.

The hypothesis was not supported for either the evaluative or potency dimensions of the conference discussion. For neither dimension was the time by mode interaction significant (Table 3). Moreover, the pattern of conference evaluations that seems, from an inspection of the means, to be emerging is directly opposite to the hypothesized relationship. After the first session the evaluations of the discussion is highly similar for the three modes but by the third week the audio conferences are evaluated considerably less favourably than are the conferences held on the other two modes (Figure 4). In fact, the large differences in the final week contribute most to the overall mode main effect reported in the previous section. Had the study been designed as one session rather than repeated sessions, no differences in discussion evaluations across modes would have been detected at all.

To complete the analysis of the mode and time effects on the dimensions of conference discussion, it is necessary to refer briefly to the observed significant "time" main effect for the evaluative dimension (Table 3). When evaluative ratings are collapsed across modes, the overall conference ratings changed from week-to-week ($p < .002$). This can be attributed to the relatively negative evaluations that

characterized discussion in all modes in the second week. This trend of

a second week "slump" in the dynamics of group interaction has been

previously documented by Heinicke and Bales (1953):

> .....it appears that on the average these groups
> started in session 1 with a heavier emphasis on task-
> oriented types of interaction, with inhibition of the
> more effective types of reaction and with low rates
> of overt negative reactions. In session 2, however,
> overt negative reactions show a sharp rise, task-
> oriented activities begin to decline, and positive
> reactions, while maintaining their level, show a
> shift toward greater affect. It appears that
> session 2 is, on the average, the session of greatest
> conflict. In sessions 3 and 4....the negative reactions
> drop and the positive reactions rise.. It appears that
> the groups have gone through some sort of "crisis".[4]

To the extent that the groups in the present study conform to the

developmental trends observed by Heinicke and Bales, it is reasonable to

assume that a decrease in task-orientation and an increase in overt

negative reactions would be reflected by less favourable evaluations of

the conference sessions in the second week. Since this occured in all

of the modes, there is no reason to believe that conference mode had

any differential influence on the generally lower evaluation in the

second week.

Individual Scale Ratings of Conference Discussion

To this point the analysis has been concerned with the composite

dimensions or indices built from all of the polar adjective pairs.

This procedure is desirable for attempting to determine the underlying

structure of the judgements people make about conference sessions.
However, since the composite indices often tended to produce patterns
that did not reach acceptable levels of statistical significance,
and because many of the individual scale differences are of interest
in their own right, it is instructive, particularly in an
exploratory study, to inspect these individual scales more closely.

All possible paired comparisons of mode differences for each
scale were made for the overall discussion ratings. Of the 24 possible
comparisons of differences between scales loading on the evaluation
factor, 11 were statistically significant. None of these were inconsistent
with the hypothesized relationship between communication mode and
discussion ratings. None of the individual comparisons for scales
associated with either the potency or activity dimensions were statistically
significant (Table 4). Comparing the evaluations subjects made of the
discussions in each mode,it is possible to determine the salient features
that characterize each mode. Pairwise comparisons between the modes
identify the particularities of each mode in terms of statistical
significance. In the following comparisons these are capitalized for
easy identification; where the differences did not yield an acceptable
level of statistical significance, lower case was used.
Video versus Audio The video discussion is rated generally BETTER,
more USEFUL, SATISFYING, PRODUCTIVE, PROBING, directed,interesting,
lively, dynamic, varied and warmer than is the audio discussion. It is

also seen as more COMPETITIVE and less relaxed than audio but neither of these scales is associated with the evaluation dimension.

Face-to-face versus Audio The face-to-face conference is judged generally better, more USEFUL, PRODUCTIVE, ORGANIZED, directed, probing, lively, dynamic, varied, cooperative and warmer than is the audio conference. On the other hand, the audio discussion is seen as more interesting and relaxed.

Video versus Face-to-face Video is rated generally better, more USEFUL, INTERESTING, SATISFYING, directed, probing, lively and varied than is face-to-face but face-to-face is judged more productive, organized, dynamic, relaxed, cooperative and warmer.

As can be seen, the analysis of individual scales provides little information in addition to that already obtained by the analysis of the compound indices. The patterns reported for the indices are, not surprisingly, repeated in the individual scales. However, while the mode comparisons for the indices for the video versus face-to-face and the face-to-face versus audio were not significant on the overall evaluation dimension, a number of individual scales loading on this dimension produced differences that were significant (Figure 5).

The mode/time interaction hypothesis that predicted that ratings of the audio discussion would become increasingly similar to the ratings on the other two modes was, by the analysis of individual scales, not

TABLE 5   SUMMARY ANALYSIS OF SCALE RATINGS OF CONFERENCE DISCUSSIONS BY MODE AND WEEK--POTENCY AND ACTIVITY SCALES

| Scale | Week | $\overline{X}$ Scale Average[*] | | | t-test Pair Multiple Comparisons | | |
		Audio A	Video V	Face F	A/V	A/F	V/F
dragging-LIVELY	1	2.79	2.62	2.40			
	2	1.90	1.75	1.37			
	3	1.97	2.47	2.50			
	Avg.	2.22	2.27	2.10	n.s.	n.s.	n.s.
static-DYNAMIC	1	2.23	2.24	2.49			
	2	1.90	1.93	1.72			
	3	2.20	2.36	2.54			
	Avg.	2.10	2.18	2.26	n.s.	n.s.	n.s.
repetitive-VARIED	1	2.72	2.62	2.31			
	2	1.76	2.15	1.54			
	3	1.62	1.86	2.47			
	Avg.	2.04	2.20	2.11	n.s.	n.s.	n.s.
tense-RELAXED	1	2.68	2.54	2.75			
	2	3.00	2.86	2.83			
	3	3.31	3.29	3.40			
	Avg.	2.99	2.90	2.98	n.s.	n.s.	n.s.
cold-WARM	1	2.43	2.39	2.64			
	2	2.56	2.43	2.43			
	3	2.66	2.97	2.97			
	Avg.	2.54	2.60	2.69	n.s.	n.s.	n.s.
competitive-COOPERATIVE [**]	1	1.36	1.27	1.20			
	2	1.32	1.11	1.71			
	3	1.54	1.50	1.97			
	Avg.	1.40	1.30	1.60	n.s.	n.s.	$<.02$

  [*] Scales can take values from 1 (maximum negative) through 5 (maximum positive)
[**] Did not load on any factors

supported. Only one of fourteen interactions was significant and the nature of the interaction did not support the hypothesis.[5] Also, the patterns of scale interaction that were suggested were diametrically opposed to the hypothesis. The audio system was generally rated about the same or slightly lower than video or face-to-face in the first session but by the end of the third week the differences had increased sharply. While participants in all modes appeared to experience some kind of "crisis" in the second session, as described by Heinicke and Bales, in the video and face-to-face they appeared to overcome this in the third week with correspondingly more favourable ratings. This typical U-shaped pattern in the two communication modes was not observed in the audio discussions. In the audio discussions the ratings generally either continued to decline or remain unchanged for the third session. The discussion ratings for the modes over the three sessions is presented graphically in Figure 6 for all scales for which statistically significant differences were found between any of the modes.

Summary and Discussion

As hypothesized, the discussions on the audio system were evaluated significantly less favourably than those conducted on the other two systems. These differences did not, however, occur for the potency and activity dimensions of discussion judgements. This supports

TABLE 4   SUMMARY ANALYSIS OF SCALE RATINGS OF CONFERENCE DISCUSSIONS
          BY MODE AND WEEK --EVALUATIVE SCALES

Scale	Week	$\bar{X}$ Scale Average*			t-test Pair Multiple Comparisons		
		Audio A	Video V	Face F	A/V	A/F	V/F
bad-GOOD	1	4.18	4.15	4.15			
	2	3.55	3.79	3.62			
	3	3.38	4.14	3.70			
	Avg.	3.71	4.02	3.84	<.02	n.s.	n.s.
useless-USEFUL	1	4.03	4.34	4.00			
	2	3.13	3.75	3.59			
	3	3.08	4.11	3.62			
	Avg.	3.42	4.06	3.74	<.001	<.03	<.02
aimless-DIRECTED	1	3.79	3.46	3.88			
	2	3.03	3.11	2.70			
	3	2.92	3.46	3.24			
	Avg.	3.25	3.34	3.30	n.s.	n.s.	n.s.
boring-INTERESTING	1	4.48	4.35	4.09			
	2	3.34	3.43	3.03			
	3	3.46	4.14	3.70			
	Avg.	3.76	3.96	3.64	n.s.	n.s.	<.01
dissatisfying-SATISFYING	1	3.61	3.84	3.70			
	2	3.00	3.37	2.97			
	3	3.12	3.71	3.33			
	Avg.	3.24	3.64	3.35	<.01	n.s.	<.03
counter-productive-PRODUCTIVE	1	2.68	2.89	2.89			
	2	2.35	2.65	2.45			
	3	2.39	2.65	2.90			
	Avg.	2.47	2.72	2.76	<.05	<.04	n.s.
chaotic-ORGANIZED	1	3.54	3.38	3.91			
	2	2.97	3.18	3.32			
	3	3.12	3.50	3.17			
	Avg.	3.20	3.35	3.50	n.s.	<.03	n.s.
superficial-PROBING	1	2.35	2.39	2.38			
	2	2.11	2.25	2.23			
	3	1.93	2.65	2.40			
	Avg.	2.13	2.43	2.34	<.05	n.s.	n.s.

FIGURE 5 PATTERNS OF CONFERENCE DISCUSSION JUDGEMENTS IN VIDEO, AUDIO AND FACE-TO-FACE MODES

Direction of Judgements					
V >A	V >F	F >A	F> V	A >F	A >V
(1) Evaluative Scales					
GOOD*	good	good			
USEFUL***	USEFUL*	USEFUL*			
interesting	INTERESTING**	interesting			
SATISFYING**	SATISFYING*	satisfying			
PRODUCTIVE*		PRODUCTIVE*	productive		
PROBING*	probing	probing			
organized		ORGANIZED*	organized		
directed	directed	directed			
lively	lively			lively	
(2) Potency Scales					
			relaxed	relaxed	relaxed
warm		warm	warm		
(3) Other Scales					
dynamic		dynamic	dynamic		
varied	varied	varied			
		cooperative	COOPERATIVE*		cooperative

UPPERCASE - difference statistically significant - ***p < .001, ** p < .01, *p < .05

lowercase - difference not statistically significant

Champness' earlier findings. While the communication mode effects on discussion ratings were generally the same for the two studies, there are two notable differences in the two sets of data. First, in the Champness study, the face-to-face system tended to be evaluated somewhat more favourably than the video system. The pattern was reversed in the present study. Secondly, the differences reported in the Champness study were statistically significant for an overwhelming number of comparisons, while acceptable levels of significance in this study occured less often. Since the Champness study of conference attitudes is the only available empirical evidence that comes close to forming a basis of comparison with any portion of the data generated by this study, it is important to attempt to reconcile these inconsistencies.

Why, in this study, was the pattern reversed and the video discussion evaluated more favourably than the face-to-face conference? This may be a trivial question since only the direction was reversed and neither study found the differences to be statistically significant. However, the opposing patterns occured on scale after scale.

There are many other factors that could be suggested as possibly accounting for the reversal. Among the possibilities are untapped differences between the student population in Ottawa and the civil servant population in Britain, differences in the video and/or face-to-face configruations in the two studies, scale differences, and a host of methodological differences. While any combination of these

FIGURE 6   MEAN CONFERENCE RATINGS IN AUDIO, VIDEO, AND FACE-TO-FACE
          CONFERENCES OVER THREE CONSECUTIVE WEEKLY SESSIONS--SELECTED SCALES
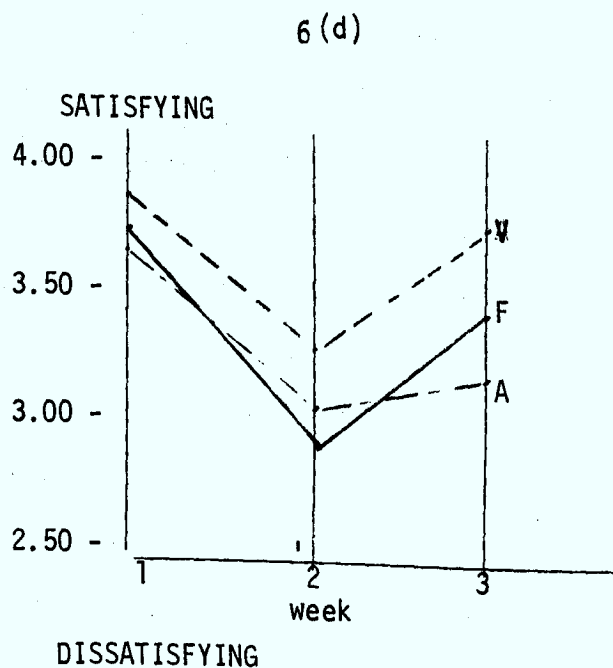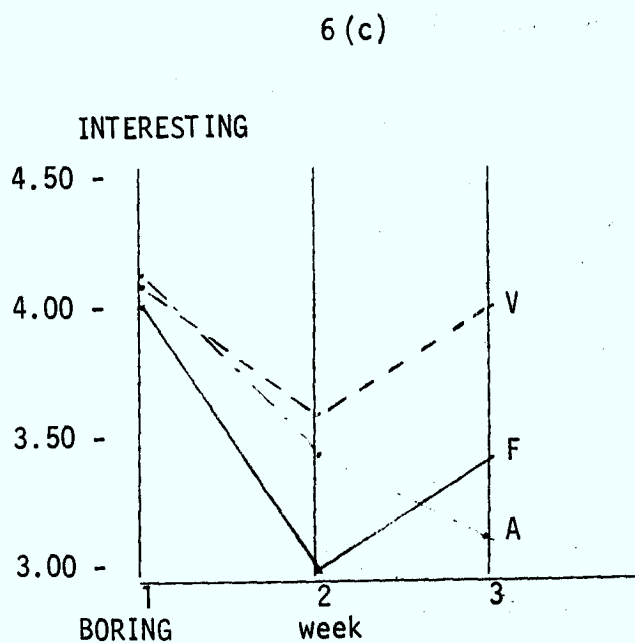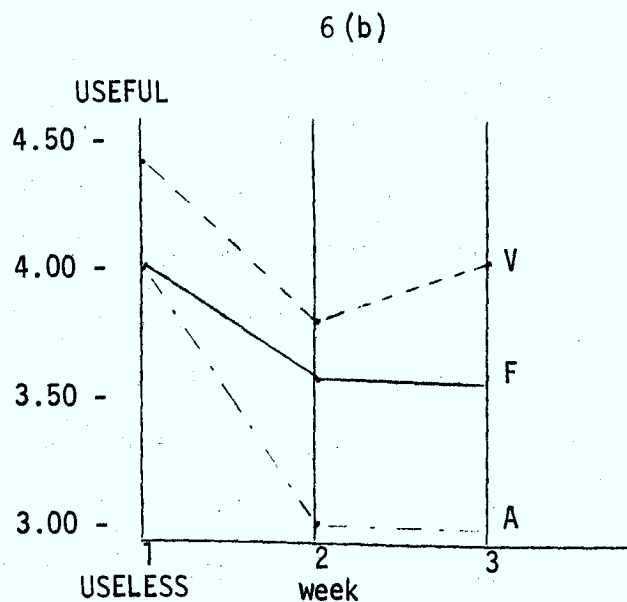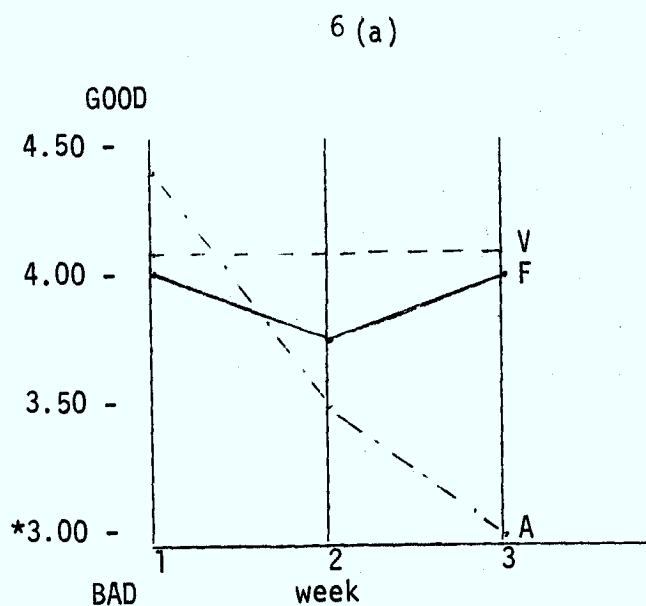
FIGURE 6   MEAN CONFERENCE RATINGS IN AUDIO, VIDEO, AND FACE-TO-FACE
(cont.)   CONFERENCES OVER THREE CONSECUTIVE WEEKLY SESSIONS--SELECTED SCALES
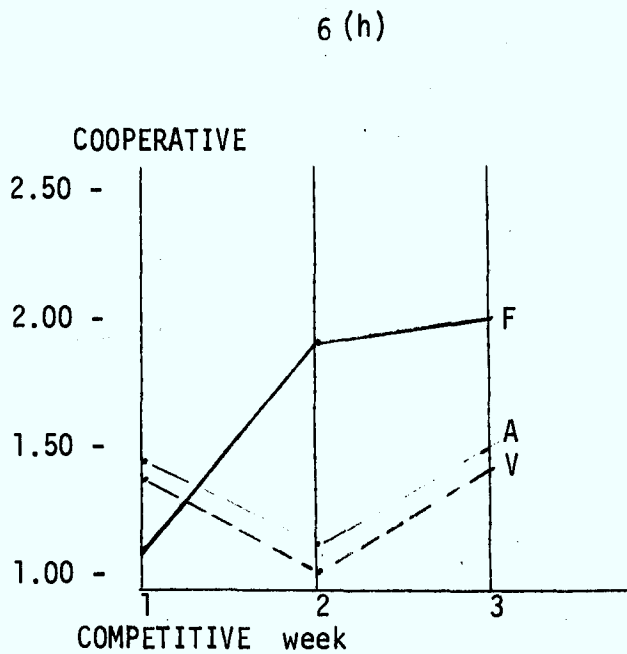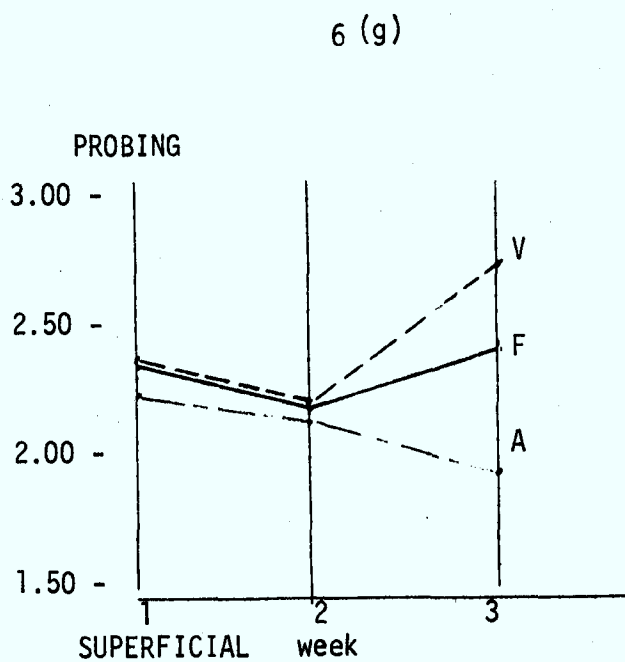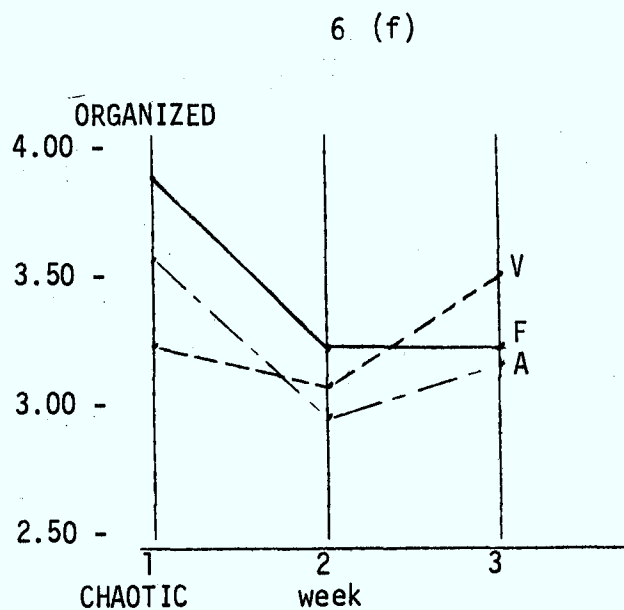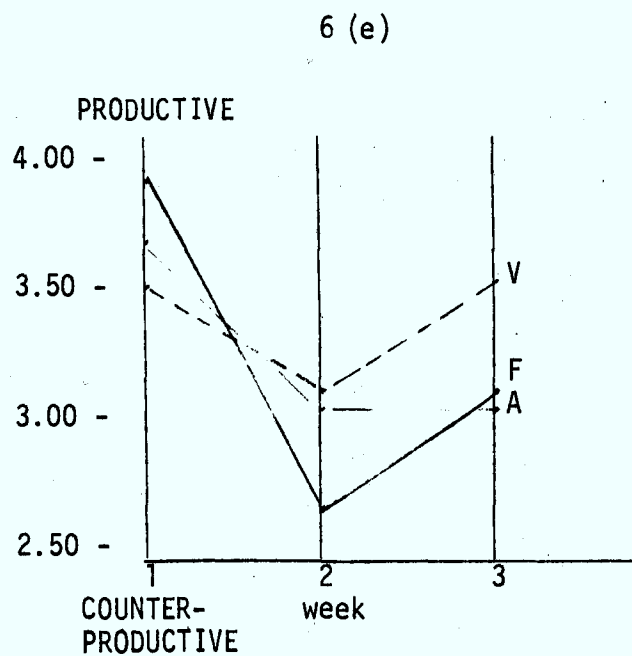
are possible, the precise nature of the differences and the reasons why they might be expected to produce conflicting trends is obscure.

It is also possible to interpret the more positive evaluations of the video discussion as the positive novelty effect of video more than compensating for any loss in channel capacity. (It will be recalled from Chapter I that lack of information about the relative strength of these two opposing vectors presented the prediction of differences between video and face-to-face evaluations). While "novelty" might account for the findings in this study, it does not reconcile the incompatability with the Champness study. One would expect that such a channel capacity/novelty relationship would have operated in that study as well.

A more plausable interpretation of the more favourable video evaluations in this study concerns the very different communication situations that existed in the video modes in the two studies. Because Champness dealt with pairs of individuals interacting over the video mode, the system was purely a two-person video communication system, and stretches the definition of "conference" to its lower limit. What is termed a video system in the Canadian study is, in fact, a video/face-to-face conference system that requires that both mediated and non-mediated types of interaction occur simultaneously. The possibility exists that the ratings of 6-person video conference discussions is some sort of complex cognitive addition of the more desireable aspects of both video and face-to-face interaction. Given the exploratory nature of this study and

the relatively low power of the measuring instruments, further investigation
will be required to determine the conditions under which video systems
may be significantly superior to face-to-face meetings.

The other inconsistency in the two sets of data, differences in
attained levels of statistical significance, can be interpreted in a more
straightforward fashion. The Champness study obtained acceptable levels
of significance more frequently and, generally, the random sampling
interpretation of his differences was less probable. This can be accounted
for by two major methodological differences in the studies. First, the
evaluations in the Champness study are related while in the present
study they are independent--in the former each person was exposed to every
system and evaluated all three, while in the latter situation, each
person evaluated only one system. Rating all three systems results in the
phenomenon of "self-anchoring" of responses which has a tendency
to exaggerate differences between scores.[6] Counterbalancing for order of
experience with each medium, the research design employed by Champness
to control for other factors, does not, however, control for the effects of
self-anchoring.

Secondly, the British study asked participants to rate the
communication medium, not the discussion that took place via the medium.
Since communication medium is only one factor that is likely to influence
a person's evaluation of a discussion, asking that only the medium be judged,

requires respondents to make a conscious effort to suppress all other
factors. So far as people are able to separate the medium from
the discussion, the evaluations are relatively pure evaluation of the
medium. On the other hand, asking people to evaluate a discussion, when
only the medium is manipulated and all other influences are permitted
to contribute to random error across communication modes, increases the
error term and decreases the mathematical value of the statistical test.
Though not wishing to be seen as critical of Champness' decision, it
can be argued that it is the conferees' evaluations of the conference, not
the medium, that is of ultimate concern.

Unlike the predicted effects of communication mode, the
hypotheses concerning the effects of time on conference judgements were
not supported. The evaluations of the discussions held on the audio mode
became increasingly negative while the discussion evaluations in the video
and face-to-face situations recovered from the significantly lower second week
discussion ratings observed in all groups. Apparently these negative
reactions carried over to the following audio conference session. This
suggests that when negative experiences take place in group discussions,
it will be more difficult and will take longer for audio conferences to
recover from the experience, than on the other communication modes.

Rather than speculating, at this point, on further interpretations
of the data, and their possible implications, it is preferable to wait to

consider these findings in conjunction with the results of the

remaining analyses. This will provide a more complete, and perhaps

clearer view of the factors contributing to modal (and temporal)

differences in attitudes towards the conference discussions.

Footnotes:

1. Osgood, et. al., The Measurement of Meaning, 1967.

2. Champness, 1972.

3. For a more detailed comparison of the complete-estimation and partial-estimation methods of obtaining factor scores, see Statistical Package for the Social Sciences by Nie, Bent and Hull (1970) or Modern Factor Analysis by Harman (1967).

4. Heinicke and Bales, (1953), p. 16.

5. For the scale repetitive-varied, one would expect that, as a group continued to discuss the same problem over three consecutive weeks, the discussion would be seen as increasingly repetitive. This was the case with the audio and video discussions; however, in the face-to-face conference the third session was, on the average, the most varied for that mode. There is no obvious explanation for this and the pattern was observed for only this one of the fourteen semantic differential scales.

6. This should not be construed as a criticism of Champness' design since precision is increased by having each subject evaluate each system. The design will, however, produce greater differences between the modes than will an independent measures design which prevents a useful comparison of the size of the differences. The problem of making such comparisons is compound by the more restricted range of ratings in the present study. The scales presented here are 5-point in comparison to the 7-point scales used in the British study.

CHAPTER IV
UNCERTAINTY AND ADAPTATION IN AUDIO AND VIDEO TELECONFERENCING

This chapter examines the questions of potential uncertainties that, by unsystematic observations, seemed to be occuring in conferences that require technology to permit people to share a communication space. Specifically the research concern is with:

(1) articulating the sources and objects of uncertainty
(2) determining the extent to which these uncertainties differ in audio and video conference systems, and
(3) comparing peoples' ability to adapt to any uncertainties engendered by or accentuated by audio and video systems.

The exploration of uncertainty as a central research decision in this study was largely the result of observing people in teleconferences and talking with them about their experience. Quite often people expressed concerns about feeling unsure about such things as "who was supposed to respond?", "to whom was the statement or question addressed?", "what were they driving at?", "should we have tried to get them off that subject?" and a variety of similar questions. This suggested to the researchers that distinct types of uncertainty might be accentuated by conferencing technology. Moreover, these uncertainties appeared to be quite different when associated with attitudes or behaviors associated with one's own node, the mediated node, and the transactions between the two.

Reationale

The development of a framework to investigate uncertainty in teleconferencing situations was initially guided by the empirical and

theoretical work of Seeman (1961) and Allardt (1965).

Allardt develops a typology of four separate sources of uncertainty that can contribute to forms of alienation and frustration and the disintegration of the structure of social groupings. Briefly stated, they are uncertainties with regard to:

(A) Values--not knowing the hierarchy of values, what is "right" in a particular social situation and what is "wrong"

(B) Norms--not knowing what actions are generally acceptable and what are not, even if one does understand the values.

(C) Role Expectations--not knowing specifically what one should do or how to do it.

(D) Definition of the Situation-- not knowing what is happening.

Israel (1971) has incorporated Allardt's typologies to more precisely define some of Seeman's earlier categories of alienation. He assumes a hierarchial relationship between values, norms, role-expectations and definitions of the situation that can be considered in a conceptually cumulative alientation model.[1]

FIGURE 7   ISRAEL'S CUMULATIVE ALIENATION MODEL

Uncertainty with regard to:

Type of Alienation	Values	Norms	Role-Expectations	Definition of the Situation
Meaninglessness	+	+	+	+
Normlessness	-	+	+	+
Role-or self-Estrangement	-	-	+	+
Accidental Alienation	-	-	-	+
No alienation	-	-	-	-

The preceding catagories of uncertainty are assumed to operate
in any social situation and were used as a basis for deliniating the
concept of uncertainty in the special situation of teleconferencing.
It should be mentioned that the research concern is not one of
contributing to theories of uncertainty in general, but rather one of using
existing formulations of the concept to more precisely model and operationalize
uncertainty in teleconferencing.

Extending the discussion of uncertainty in general to the
particular situation of teleconferencing requires a consideration of
the peculiarities of mediated group interaction. Unlike traditional
face-to-face conferences, in teleconferences, groups of people are spacially
removed from each other and any communication event that occurs is simultaneously
mediated for some and face-to-face for others. It is reasonable to assume that the
mediated event will be viewed systematically differently than the face-to-face
event, (over and above the commonplace observation that any event is viewed
differently by different people). Additionally, the fact of being in the
same locality with others suggests at least the potential for these people
forming a self-contained group. This manifests itself by people who are
physically together at a conference node refering to themselves as "we"
and by refering to people at a distant node as "they". For these reasons
it seems necessary to take into account the social context in which the
various sources of uncertainty could be imbedded.

Three social contexts of uncertainty are considered. People who are physically together at a conference node are, throughout this report, refered to as the "immediate group"; people who are physically removed are refered to as the "mediated group"; and, the interdependencies between the two, achieved through mediation, is refered to as the "between groups" social context.

It is now possible to array the twelve source/context possibilities for uncertainty that could occur in teleconferencing.[2] For each of the four basic sources of uncertainty there are three concurrent social contexts available. For example, an individual may be fairly certain about the values of the immediate group but be confused about the values of the mediated group. Similarly, he may be fairly certain about both immediate and mediated group values but, to the extent that they differ, he may be confused about the way they interact to produce the values of the total conference.

A series of statements reflecting each source of uncertainty in each of the social context was formulated. These are presented in Figure 8. At this point it should be clear why the uncertainty formulations were appropriate only to teleconferencing and do not apply to the face-to-face conferences: while the sources of uncertainty apply in face-to-face situations, the social contexts of teleconferencing do not apply to face-to-face conferences i.e., there is no mediated group. Since each uncertainty source has been placed in a social context appropriate to teleconferencing, the uncertainty statements would be quite meaningless to people in face-to-face conferences.[3]

Figure 8   SOURCE AND SOCIAL CONTEXT MEASURES OF UNCERTAINTY IN AUDIO AND VIDEO TELECONFERENCING

	Source of Uncertainty				
	(A) Values	(B) Norms	(C) Roles	(D) Situation	
I Immediate Group	21. I wasn't at all confused about the positions that were taken at my end.	24. I wasn't always sure just what the people at my end expected of me.	18. Sometimes I was uncertain as to who was supposed to respond to comments from the other end.	7. ...we sometimes talked things over... before we said anything to others	Immediate Group Uncertainty Index (Row I)
II Mediated Group	26. I clearly understood the positions taken by the people at the other end.	15. I had quite a bit of trouble knowing how the people at the other end were reacting to the things I said.	20. It was clear to me that those at the other end were well organized and knew what they were doing.	22. It was sometimes hard to react to things said at the other end because it was hard to interpret what was meant.	Mediated Group Uncertainty Index (Row II)
III Between Groups (I&II) Uncertainty	1. I think we were confused about what we were supposed to be doing in the meeting.	2. We had trouble organizing ourselves to get as much out of the meeting as possible.	23. It was clear to me what the two ends should have been doing to have a better discussion.	25. I felt that the two ends talked past each other quite a bit because all of us were confused about what was going on at each other's end.	Between Groups Uncertainty Index (Column + Row Measures)
Overall Uncertainty Index (Column + Row) Measures	Values Uncertainty Index (Column A)	Norms Uncertainty Index (Column B)	Roles Uncertainty Index (Column C)	Situation Uncertainty Index (Column D)	Overall Uncertainty Index

Social Context of Uncertainty

Hypotheses

By incorporating these formulations into the general rationale concerning channel capacity and novelty effects, the following relationships between uncertainty and audio and video conferencing are predicted:

H1 (b) Uncertainty with regards to values, norms, role expectations and situational definition will be greater in audio than in video conferencing, regardless of the social contexts in which these uncertainties are imbedded.

H1 (c) Uncertainty about the values, norms, roles, and situational definition concerning the mediated group will be greater in audio than in video conferencing.

H1 (d) Uncertainty about values, norms, roles and situational definition concerning the transactions between the mediated and immediate group will be greater in audio than in video conferencing.

It is difficult to predict differences in uncertainty between the audio and video modes when the social context of the uncertainty is the immediate group. For both modes, the immediate group is a face-to-face group and for this reason, it could be argued that there will be no difference in uncertainty about the values, norms, roles and situation. Arguments could be made, however, that would predict differences between the modes even for the immediate group. For instance, it is possible that the presence of interactive television monitors in the video mode will focus the attention on the mediated mode in a way that reduces the attention participants pay to immediate group members. This could have the effect

of increasing their uncertainty about the immediate group. Since this

focusing effect would be absent from audio conferencing, it is possible that

uncertainty about the immediate group could be greater in video conferencing.

On the other hand, attending more to the immediate group in audio

conferencing because there is no one else to look at, might result in an

information overload about the immediate group and uncertainty about

them may then be higher than in video conferencing.

Although these and other arguments could form the basis for

predicting differences, both are well beyond the level of control in the

study and the theoretic rationale that has been developed.

Since uncertainty has generally been predicted to be greater in

audio than in video conferencing, it is assumed that greater adjustments will

have to be made by participants in audio conferencing. It is predicted

that increasingly these adjustments will be made and that this will result

in a decrease in the differences in uncertainty between video and audio

conferencing over time. This is formalized in the following set of hypotheses:

> H2 (b) Over time, the degree of uncertainty in audio
> conferencing regarding values, norms, roles and
> the definition of the situation will be reduced,
> and will more closely resemble the degree of
> uncertainty in video conferencing.

> H2 (c) Over time, the degree of uncertainty in audio
> conferences about the mediated group's values,
> norms, roles, and definition of the situation
> will decrease, and will more closely resemble the
> degree of uncertainty in video conferencing.

H2 (d) Over time, the degree of uncertainty about
values, norms, roles and definition of the
situation concerning the transaction between the
mediated and immediate groups in audio conferencing
will decrease, and will more closely resemble the
degree of uncertainty in video conferencing.

Uncertainty Measures

Eight compound indices of uncertainty were developed--one for each of the

four sources of uncertainty, one for each of the three social contexts in

which each of the four sources could be imbedded, and one general index

of uncertainty that collapses uncertainty items across both sources and

contexts. The following description of the construction of these

indices will be clearer by refering to the matrix provided in Figure 8.

Conferees indicated their agreement with each of the questions in Figure 8

on a five-point scale that varied from 'strongly disagree'to 'strongly agree'.

Scale ends were appropriately reflected and the relevant scales for each

index were averaged to produce indices that could take values from 1

(low uncertainty) through 5 (high uncertainty). The 'source' indices

were based upon the three statements in the matrix column for each source,

the social context indices were based upon the four statements in the

matrix row for each context, and the general uncertainty index was

based on all twelve statements. In the questionnaire, the twelve statements

were randomly dispersed through fifteen other statements about the

teleconference.

Results

The Influence of the Communication Mode

The general expectation that all uncertainty from all sources would

be greater in audio than in video was supported. Only the difference in

uncertainty about role expectations in the two conference modes failed
to reach an acceptable level of statistical significance (Table 6).
The overall level of uncertainty in audio was greater than in video
$(p < .003)$.

Also as predicted, uncertainty about the mediated group was
greater in audio conferences than in video conferences (Table 7; $p < .001$).
Uncertainty related to the interaction between the mediated and immediate group,
while in the predicted direction, was not statistically significant. This
is somewhat surprising since, although not hypothesized, uncertainty about the
immediate group was greater in audio than in video conferences $(p < .03)$.
If in audio conferences the uncertainty about both the immediate and the
mediated group was greater than in video, it is conceptually unclear
why the uncertainty for the transactions between the mediated and immediate
groups would not also be significantly greater in audio.[4] The direction
of the difference between the two modes was as predicted.

The Influence of Time on Uncertainty

As conferees become more familiar with the audio system, it
was hypothesized that uncertainty would decrease, both for the sources
of uncertainty and the conference contexts. Uncertainty in audio would
increasingly approach the relatively low levels of uncertainty predicted in
the video system. As shown in Tables 6 and 7 and graphically represented in
figures 9 and 10, the hypothesis was not supported. None of the mode/time
interactions were significant for either the sources or contexts of

uncertainty. The numerical trends were generally even directly opposite to those predicted. Uncertainty trends to generally increase or remain stable over the three sessions in audio, while uncertainty in the video mode,despite the fact that uncertainty was initially lower in video than in audio, generally declined from the first to the third week.

While it would be incautious to state that uncertainty increased over time in the audio system on the basis of trends, there is clearly no evidence that the level of uncertainty decreased over time in the audio system.

Additional Measures of Adaptation

The rationale that was developed suggested that many of the questions that could be raised about differences between audio and video conferencing can be subsumed under a variety of types of uncertainties arising in the different social contexts that characterize teleconferencing. There remain, however, many questions about audio and video conferencing that do not obviously relate to uncertainty. Questions concerning the utility of the graphics monitors, the extent to which the spacial constraints inhibit favourable outcomes of a conference, the notion of privacy, pragmatic considerations of speaker identification, particularly in audio systems, and similar questions do not fit conveniently into the category system of uncertainties developed in the previous section.

A total of fifteen such questions were presented in the questionnaire because they seemed important to the development of an understanding of teleconferencing phenomena. A summary analysis of the

TABLE 6   SUMMARY ANALYSIS OF SOURCE INDICES OF UNCERTAINTY IN AUDIO
AND VIDEO CONFERENCING BY MODE AND WEEK

Index*	Week (W)	$\bar{X}$ Mode (M) Audio	$\bar{X}$ Mode (M) Video	$\bar{X}$ (A+V)	Uncer-tainty	p (1-tail)	
Source A: Values Uncertainty	1 2 3	2.44 2.46 2.61	2.29 2.25 2.12	2.36 2.36 2.37	A> V	M W MxW	< .03 n.s. n.s.
	$\bar{X}$	2.49	2.24	2.36			
Source B: Norms Uncertainty	1 2 3	2.85 3.22 3.05	2.53 3.14 2.92	2.69 2.78 2.61	A> V	M W MxW	< .003 n.s. n.s.
	$\bar{X}$	2.88	2.51	2.69			
Source C: Roles Uncertainty	1 2 3	3.04 3.22 3.05	3.05 3.14 2.92	3.05 3.18 2.98	A> V	M W MxW	n.s. n.s. n.s.
	$\bar{X}$	3.10	3.05	3.07			
Source D: Definition of Situation Uncertainty	1 2 3	2.54 2.67 2.70	2.24 2.21 2.09	2.38 2.45 2.41	A> V	M W MxW	< .001 n.s. n.s.
	$\bar{X}$	2.69	2.19	2.44			

TABLE 7   SUMMARY ANALYSIS OF CONTEXT INDICES OF UNCERTAINTY IN AUDIO
AND VIDEO CONFERENCING BY MODE AND WEEK

Index	Week	Audio	Video	(A+V)	Uncertainty	p	
Context I: Immediate Group Uncertainty	1 2 3	2.55 2.61 2.66	2.46 2.44 2.13	2.51 2.53 2.41	A> V	M W MxW	< .03 n.s. n.s.
	$\bar{X}$	2.60	2.37	2.48			
Context II: Mediated Group Uncertainty	1 2 3	2.97 3.08 3.01	2.61 2.64 2.38	2.79 2.87 2.71	A> V	M W MxW	< .001 n.s. n.s.
	$\bar{X}$	3.02	2.57	2.79			
Context III: Between Groups Uncertainty	1 2 3	2.62 2.81 2.71	2.50 2.56 2.63	2.56 2.68 2.67	A> V	M W MxW	n.s. n.s. n.s.
	$\bar{X}$	2.71	2.55	2.63			
Generalized Uncertainty	1 2 3	2.72 2.83 2.79	2.52 2.55 2.38	2.62 2.70 2.59	A> V	M W MxW	< .003 n.s. n.s.
	$\bar{X}$	2.78	2.50	2.64			

* Indices can take values from 1.00 (maximum certainty) through 5.00 (maximum uncertainty

FIGURE 9   SOURCES OF UNCERTAINTY--MEANS BY MODE AND WEEK
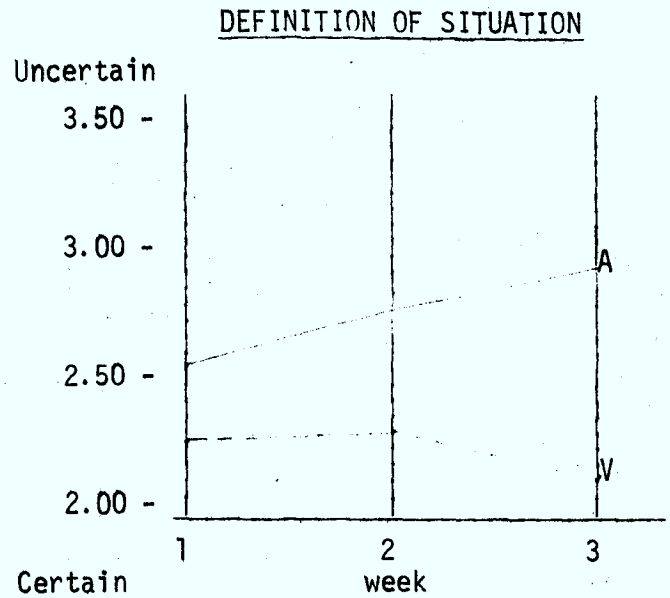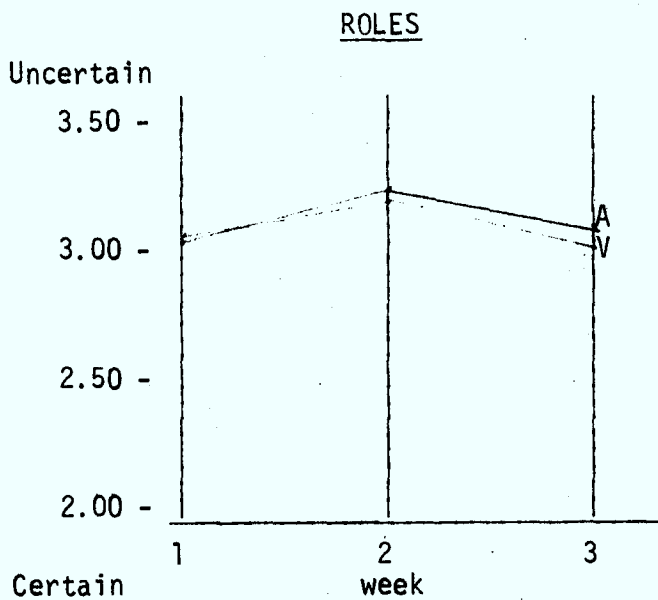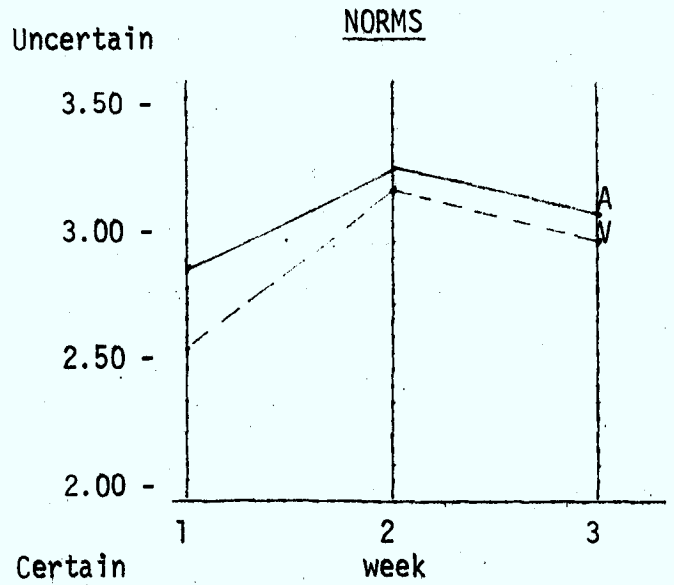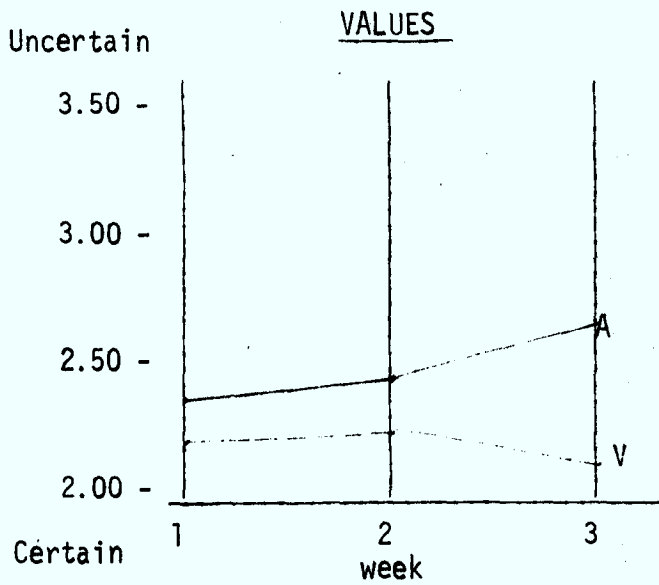
FIGURE 10 CONTEXT OF UNCERTAINTY--MEANS BY MODE AND WEEK
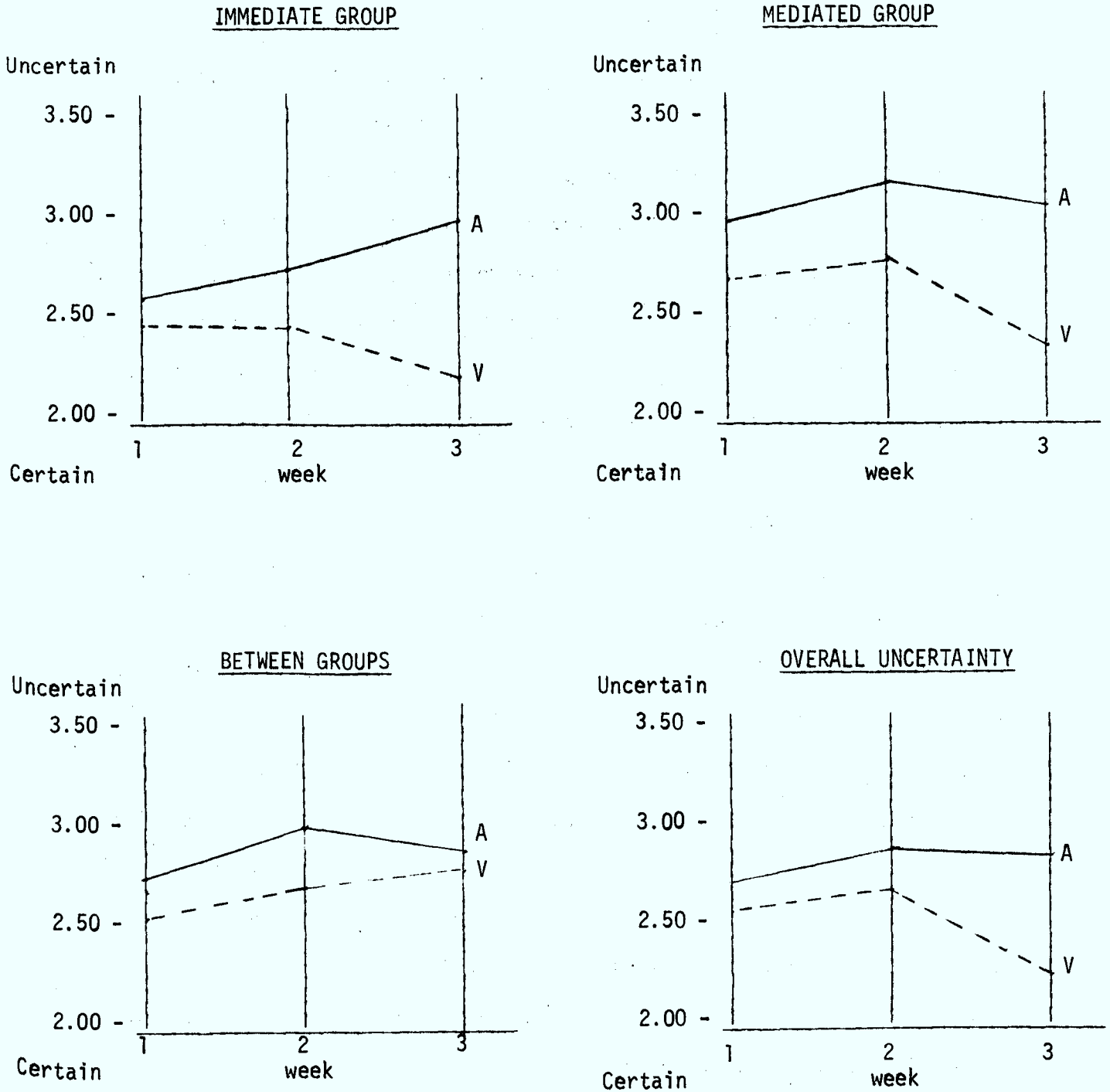
responses to all individual questions is provided in Table 8. Since

many of the individual questions did not yield statistically significant

results, as can be seen in this table, a discussion of individual

items and trends would become cumbersome and would have relatively low

information value. For this reason these items, together with the twelve

uncertainty items, were factor-analysed to determine their interrelationships

and any underlying structure. Both orthogonal and oblique methods of

rotation were used (tables 9-11 & 12-14 respectively). The specifications

for both methods were the same as described in Chapter II for the

semantic differential scales. The two analyses provided highly similar

results except that the oblique solution accounted for more items and

tended to have somewhat purer factor loadings. For this reason the following

discussion refers specifically to the oblique solution (tables 9-11).

     Three identifiable factors emerged from the analyses and these have

tentatively been labeled (1) Social Adaptation, (2) Spacial Adaptation, and

(3) Psychological Adaptation. This new clustering of items derived

from the factor analysis is an alternative conceptualization to the typology

of uncertainties in terms of context and source presented in the

preceding section. Whereas the latter expresses the researchers'

rational paradigm, the former reflects the subjects' definition of areas

of adaptation. The two models together afford a more complex appreciation of

the same problem from two perspectives.

TABLE 8 INDIVIDUAL UNCERTAINTY ITEMS--AUDIO AND VIDEO MODES WEEK/MODES MEANS
AND PROBABILITIES (1-tailed)

Item*	Week (W)	$\bar{X}$ Mode (M) Audio	$\bar{X}$ Mode (M) Video	$\bar{X}$ (A+V)	Adap- tation	p (1-tail)	
1. I think we were confused about what we were supposed to be doing in the meeting.	1	2.39	2.14	2.27	A<V	M	< .05
	2	2.27	1.96	2.13	A<V	W	n.s.
	3	2.59	2.15	2.38	A<V	MxW	n.s.
	$\bar{X}$	2.41	2.08	2.22	A<V		
2. We had trouble organizing our- selves to get as much out of the meeting as possible.	1	2.75	2.70	2.73	A<V	M	n.s.
	2	3.34	3.25	3.03	A<V	W	< .02
	3	3.00	3.00	3.00	.	MxW	n.s.
	$\bar{X}$	3.02	2.96	2.99	A<V		
3. I felt uneasy because I wasn't sure how much responsibility I should be taking...	1	2.27	2.21	2.24	A<V	M	n.s.
	2	2.21	2.19	2.20	A<V	W	n.s.
	3	2.14	1.95	2.05	A<V	MxW	n.s.
	$\bar{X}$	2.21	2.13	2.18	A<V		
4. I felt that people talked past each other quite a bit.	1	2.44	2.32	2.38	A<V	M	< .04
	2	2.59	2.33	2.46	A<V	W	n.s.
	3	2.91	2.15	2.55	A<V	MxW	n.s.
	$\bar{X}$	2.61	2.28	2.45	A<V		
4b. Sometimes when the others were talking I had difficulty concentrating...	1	3.00	1.88	2.31	A<V	M	< .001
	2	3.10	2.26	2.70	A<V	W	n.s.
	3	2.50	1.95	2.24	A<V	MxW	n.s.
	$\bar{X}$	2.86	2.09	2.42	A<V		
5. I found it disturbing not being in the same room with the other people.	1	2.53	2.97	2.76		M	n.s.
	2	2.07	2.26	2.16	..	W	< .01
	3	2.14	1.75	2.24		MxW	n.s.
	$\bar{X}$	2.27	2.43	2.35			
6. I quite often felt that my own comments were not directed to any specific person, and this bothered me.	1	2.00	2.35	2.18	V<A	M	n.s.
	2	2.24	2.11	2.18	A<V	W	n.s.
	3	2.00	1.70	1.86	A<V	MxW	n.s.
	$\bar{X}$	2.08	2.11	2.10	V<A		

*The greater the mean, the greater the agreement with the item.
range from 1 to 5 (total agreement)

TABLE 8 INDIVIDUAL UNCERTAINTY ITEMS FOR AUDIO AND VIDEO MODES WEEK/MODE MEANS AND PROBABILITIES

Item*	Week (W)	X̄ Mode (M) Audio	X̄ Mode (M) Video	X̄ (A+V)	Adaptation	p (1-tail)
7. At our end we sometimes talked things over among ourselves before we said anything to the others.	1	2.24	2.39	2.32	V<A	M < .10
	2	2.86	2.37	2.61	A<V	W n.s.
	3	2.91	2.30	2.62	A<V	MxW n.s.
	X̄	2.63	2.36	2.50	A<V	
9. It was hard to know who was talking at the other end.	1	2.56	1.76	2.15	A<V	M < .001
	2	2.18	1.63	1.91	A<V	W n.s.
	3	2.05	1.65	1.86	A<V	MxW n.s.
	X̄	2.29	1.69	1.99	A<V	
10. Getting used to this system is quite a chore.	1	2.06	2.32	2.19	V<A	M n.s.
	2	2.21	2.07	2.14	A<V	W n.s.
	3	2.24	1.84	2.05	A<V	MxW n.s.
	X̄	2.16	2.13	2.14	A<V	
11. I was sometimes uncertain whether the people at the other end were listening.	1	2.67	2.35	2.51	A<V	M < .01
	2	2.93	2.48	2.71	A<V	W n.s.
	3	2.82	1.80	2.33	A<V	MxW n.s.
	X̄	2.80	2.26	2.53	A<V	
12. When someone at the other end spoke, it was always clear to whom he was speaking.	1	2.79	2.94	2.86	A<V	M < .10
	2	2.66	2.93	2.78	A<V	W n.s.
	3	3.00	3.40	3.19	A<V	MxW n.s.
	X̄	2.80	3.05	2.92	A<V	
13. This type of system makes me feel that I am constantly being observed by those at the other end.	1	2.16	2.94	2.56	A<V	M < .001
	2	1.93	2.59	2.25	A<V	W n.s.
	3	2.05	2.50	2.26	A<V	MxW n.s.
	X̄	2.05	2.72	2.38	A<V	
14. I think if we had all been together in the same room the discussion would have been more productive.	1	2.82	2.79	2.81	A<V	M
	2	2.76	2.82	2.79	V<A	W n.s.
	3	3.14	2.70	2.93	A<V	MxW n.s.
	X̄	2.88	2.78	2.83	A<V	

TABLE 8 INDIVIDUAL UNCERTAINTY ITEMS FOR AUDIO AND VIDEO MODES WEEK/MODE
MEANS AND PROBABILITIES

Item*	Week (W)	$\bar{X}$ Mode (M) Audio	$\bar{X}$ Mode (M) Video	$\bar{X}$ A+V	Adaptation	p (1-tail)	
15. I had quite a bit of trouble knowing how the people at the other end were reacting to the things I said.	1	3.18	2.47	2.82	A<V	M	<.001
	2	3.00	2.33	2.68	A<V	W	n.s.
	3	2.96	2.00	2.50	A<V	MxW	n.s.
	$\bar{X}$	3.06	2.31	2.69	A V		
16. The graphics monitors were useful.	1	2.88	2.79	2.83		M	n.s.
	2	2.93	2.93	2.93		W	n.s.
	3	2.81	2.95	2.88		MxW	n.s.
	$\bar{X}$	2.88	2.88	2.88			
17. When those at the other end were speaking, I never got the feeling they were speaking directly to me.	1	2.93	2.50	2.72	A<V	M	<.001
	2	3.21	2.35	2.80	A<V	W	n.s.
	3	2.73	2.05	2.41	A<V	MxW	n.s.
	$\bar{X}$	2.98	2.33	2.66	A<V		
18. Sometimes I was uncertain as to who was supposed to respond to comments from the other end.	1	2.70	2.61	2.65	A<V	M	<.10
	2	2.83	2.63	2.73	A<V	W	n.s.
	3	2.73	2.05	2.42	A<V	MxW	n.s.
	$\bar{X}$	2.75	2.48	2.62	A<V		
19. I think if we had all been together in the same room I would have felt more comfortable.	1	2.88	3.15	3.02	V>A	M	n.s.
	2	2.79	2.96	2.87	V>A	W	n.s.
	3	2.64	2.85	2.74	V>A	MxW	n.s.
	$\bar{X}$	2.78	3.01	2.90	V>A		
20. It was clear to me that those at the other end were well organized and knew what they were doing.	1	2.52	2.50	2.48	V<A	M	n.s.
	2	2.21	2.19	2.54	V<A	W	n.s.
	3	2.32	2.65	2.33	A<V	MxW	n.s.
	$\bar{X}$	2.36	2.43	2.39	A<V		
21. I wasn't at all confused about the positions that were taken at my end.	1	3.55	3.50	3.49	V<A	M	n.s.
	2	3.52	3.51	3.80	V<A	W	n.s.
	3	3.50	3.85	3.52	A<V	MxW	n.s.
	$\bar{X}$	3.52	3.56	3.54	A<V		

TABLE 8 INDIVIDUAL UNCERTAINTY ITEMS FOR AUDIO AND VIDEO MODES WEEK/MODES
MEANS AND PROBABILITIES

Item*	Week (W)	X̄ Mode (M)		X̄ (A+V)	Adap- tation	p (1-tail)	
		Audio	Video				
22. ...hard to react to things said at the other end because it was hard to interpret what was meant.	1	2.76	2.24	2.49	A<V	M	<.001
	2	2.86	2.26	2.56	A<V	W	n.s.
	3	2.68	2.12	2.42	A<V	MxW	n.s.
	X̄	2.77	2.21	2.50	A<V		
23. It was clear to me what the two ends should have been doing to have a better discussion.	1	3.06	3.00	2.97	V>A	M	n.s.
	2	2.97	3.04	3.00	A>V	W	n.s.
	3	3.27	2.70	3.00	V>A	MxW	n.s.
	X̄	3.08	2.93	3.01	V>A		
24. I wasn't always sure just what the people at my end expected of me.	1	2.64	2.41	2.52	A<V	M	<.05
	2	2.54	2.19	2.36	A<V	W	n.s.
	3	2.50	2.15	2.33	A<V	MxW	n.s.
	X̄	2.57	2.27	2.42	A<V		
25. ...two ends talked past each other...confused about what was going on at each other's end.	1	2.39	2.15	2.27	A<V	M	<.01
	2	2.59	2.04	2.32	A<v	W	n.s.
	3	2.50	2.05	2.29	A<V	MxW	n.s.
	X̄	2.49	2.09	2.29	A<V		
26. I clearly understood the positions taken by the people at the other end.	1	3.55	3.77	3.66	A<V	M	<.01
	2	3.36	3.82	3.59	A<V	W	n.s.
	3	3.27	3.95	3.60	A<V	MxW	n.s.
	X̄	3.41	3.83	3.62	A<V		

Social Adaptation - This factor is closely related to uncertainty since eight of the eleven items making up the dimension came from the uncertainty matrix. However, since the term "uncertainty" has previously been precisely defined, and because of the above conceptual differences, it would be confusing to term this factor social uncertainty.

The adaptation factor lacks the precision and the nuances that were posited in the uncertainty dimensions. It would be incorrect, however, to conclude that this is an indication of 'over-theoritizing'; had the instrument been more detailed and had it included a large number of questions for the uncertainty dimensions as defined in the previous section, it can be assumed that a similar factor structure to that of the subjects' preoccupations would have emerged.

This methodological constraint was, however, not active for those questions for which the factor analyses did yield new parameters. The contribution lies particularly in the factors of 'Spacial' and 'Psychological' adaptation, parameters that have not previously been taken into consideration.

Spacial Adaptation - This dimension reflects a concern for the most obvious defining characteristic of teleconferencing systems. It is associated with the fact that some of the people in the conference are not physically present and with the feeling that discussions would have been less disturbing and more productive had they been. The problems associated with getting used to the system are a function of this physical separation rather than any

TABLE 9   FACTOR 1   SOCIAL ADAPTATION

Item	Oblique Factor Structure		
	1	2	3
22. It was sometimes hard to react to things said at the other end because it was hard to interpret what was meant.	.670	.036	.029
4. I felt that people talked past each other quite a bit.	.631	.077	.126
25. ...two ends talked past each other.... confused about what was going on at each other's end.	.616	.124	-.079
2. We had trouble organizing ourselves to get as much out of the meeting as possible.	.587	.107	.028
4b. Sometimes when the others were talking I had difficulty concentrating on what was being said.	.553	-.103	-.335
20. It was clear to me that those at the other end were well organized and knew what they were doing.	-.471	.090	.080
26. I clearly understood the positions taken by the people at the other end.	-.455	.060	.232
7. At our end we sometimes talked things over among ourselves before we said anything to the others.	.419	-.023	.003
1. I think we were confused about what we were supposed to be doing in the meeting.	.401	-.008	-.096
11. I was sometimes uncertain whether the people at the other end were listening.	-.382	.042	.214
21. I wasn't at all confused about the positions that were taken at my end.	.382	.024	.255

% of variance explained - 73.7

TABLE 10 FACTOR 2   SPACIAL ADAPTATION

Item	Oblique Factor Structure		
	1	2	3
5. I found it distrubing not being in the same room with the other people.	.184	.739	-.032
19. I think if we had all been together in the same room I would have felt more comfortable.	.164	.716	-.100
10. Getting used to this system is quite a chore.	.231	.621	-.016
14. I think if we had all been together in the same room the discussion would have been more productive	.202	.552	-.059

% of variance explained - 17.9

TABLE 11 FACTOR 3   PSYCHOLOGICAL ADAPTATION

Item	Oblique Factor Structure		
	1	2	3
18. Sometimes I was uncertain as to who was supposed to respond to comments from the other end.	-.064	.136	.818
24. I wasn't always sure just what the people at my end expected of me.	.124	-.173	.523
17. When those at the other end were speaking, I never got the feeling they were speaking directly to me.	.164	-.035	.512
15. I had quite a bit of trouble knowing how the people at the other end were reacting to the things I said.	.220	.158	.472
3. I felt uneasy because I wasn't sure how much responsibility I should be taking...	.109	.277	.421

% of variance explained - 8.3

TABLE 12 FACTOR 1 SOCIAL ADAPTATION

Item	Orthogonal Factor Structure		
	1	2	3
22. It was sometimes hard to react to things said at the other end because it was hard to interpret what was meant.	.632	.142	.136
4b. Sometimes when the others were talking I had difficulty concentrating on what was being said.	.628	-.077	-.436
25. ...two ends talked past each other ...confused about what was going on at each other's end.	.613	.248	.226
4. I felt that people talked past each other quite a bit.	.566	.151	.039
2. We had trouble organizing ourselves to get as much out of the meeting as possible.	.554	.199	.120
26. I clearly understood the positions taken by the people at the other end.	-.504	-.077	-.320
20. It was clear to me that those at the other end were well organized and knew what they were doing.	-.474	-.010	-.183
21. I wasn't at all confused about the positions that were taken at my end.	-.441	-.106	-.325
11. I was sometimes uncertain whether the people at the other end were listening.	.429	.162	.290
1. I think we were confused about what we were supposed to be doing in the meeting.	.412	.085	.185
7. At our end we sometimes talked things over among ourselves before we said anything to the others.	.399	.047	.097

% of variance explained - 73.7

TABLE 13 FACTOR 2   SPACIAL ADAPTATION

Item	Orthogonal Factor Structure		
	1	2	3
5. I found it distrubing not being in the same room with the other people.	.188	.777	.108
19. I think if we had all been together in the same room I would have felt more comfortable.	.190	.769	.166
10. Getting used to this system is quite a chore.	.228	.669	.100
14. I think if we had all been together in the same room the discussion would have been more productive.	.212	.610	.129

% of variance explained - 17.9

TABLE 14 FACTOR 3   PSYCHOLOGICAL ADAPTATION

Item	Orthogonal Factor Structure		
	1	2	3
18. Sometimes I was uncertain as to who was supposed to respond to comments from the other end.	.183	.335	.743
17. When those at the other end were speaking, I never got the feeling they were speaking directly to me.	.309	.124	.166
24. I wasn't always sure just what the people at my end expected of me.	.273	-.017	.502

% of variance explained - 8.3

technological idiosyncrasies of a particular system. The dimension seems
to reflect a feeling that teleconferencing in any form is undesirable in
that it somehow upsets the traditional medium of face-to-face group
discussion. None of the items from the uncertainty matrix loaded on the
dimension of spacial adaptation which, in itself, suggests that people
do not have feelings of uncertainty about the effects of spacial relationships
in teleconferencing but rather that they have achieved closure and
have either accepted or rejected the constraint of spacial separation.
Psychological Adaptation - This dimension refers to the individual's
psychological inability to cope with certain aspects of teleconferencing. The
individual himself is uncertain about when he should speak, what is
expected of him, and about how the people at the mediated mode react to
him. This could also be called egocentric undertainty, since three of the
five items with high loadings on the factor are from the original uncertainty
matrix. The distinction between psychological and social adaptation can
be clearly seen by comparing the two sets of relevant items in terms of
the focus of the problem: for the psychological dimension the object
of the individual's problem is himself while in the social dimension the
object is the group and subgroup.

A number of other interesting observations emerge from this
analysis. First, 11 of the 12 items that were used to operationalize the source/
context uncertainty typologies loaded on either the social or psychological
adaptations factors. This suggests an internal consistency in the

selection of measures of the uncertainty matrix. Also, respondents clearly distinguished adaptation problem areas in teleconferencing as personal on the one hand and group related on the other.

Secondly, several of the items that were not constructed to operationalize the source/context uncertainty matrix are clearly associated with uncertainty. This tends to support the notion that exploring the uncertainties in teleconferencing situations is a useful approach to understanding the communication effects of mediated group interaction and that further more elaborate investigations are indeed warranted.

Thirdly, the emergence of what has been termed the "spacial adaptation" factor is evidence that people have clear and varied feelings about conducting group meetings when a sub-group is physically separated. Whether these feelings are dependent upon their personal experiences in teleconferencing itself or upon predispositions towards teleconference technology requires further investigation.

Analysis of the Adaptation Dimensions of Teleconferencing

Indices for the Social, Spacial and Psychological dimensions of adaptation were developed from the complete-estimation method of constructing factor scores described in the previous chapter. The indices can take values from 0 (m minimum adaptation) through +1 (maximum adaptation).

Influence of the Communication Mode

Differences between the degree of adaptation in audio and video conferencing are presented in Table 15. Social and psychological adaptation was greater in video than in audio but this in itself provides no new information ($p < .001$ and $p < .01$). Since both of these dimensions are made up largely of uncertainty items, and the difference between uncertainty in video and audio systems has been demonstrated in the previous section, these results are by and large merely a mathematical manipulation of the same data.

Perhaps the most interesting findings in this analysis was the lack of significant difference between people in the video and audio modes in Spacial Adaptation (Table 12). The results of the factor analysis indicate clearly that people very considerably in their feelings about being spacially separated from some members of the conference. However, the teleconference mode alone apparently does not account for the difference. Being upset or disoriented by spacial aspects of the teleconferencing situation are reported about equally in both video and audio systems. There are at least two very different but plausible interpretations of this phenomenon that warrant further considerations.

It is possible that certain people are basically opposed to the whole concept of mediated conferencing, or for that matter, communication technology in general, and that they will opt for the traditional face-to-face conference in all situations without reference to the capabilities

Table 15 SUMMARY ANALYSES OF SOCIAL, SPACIAL AND PSYCHOLOGICAL ADAPTATION
TO AUDIO AND VIDEO TELECONFERENCING--BY MODE AND WEEK

Index*	Week (W)	Mode (M) Audio	Video	Mode ($\bar{X}$)	A+V p		Adaptation
Social Adaptation	1	.572	.623	.596			
	2	.521	.615	.565	MxW	n.s.	
	3	.548	.657	.601	W	n.s.	
	$\bar{X}$	.548	.629	.587	M	<.001	V > A
Spacial Adaptation	1	.567	.512	.538			
	2	.602	.564	.582	MxW	n.s.	
	3	.589	.596	.591	W	n.s.	
	$\bar{X}$	.585	.550	.566	M	n.s.	
Psychological Adaptation	1	.564	.592	.577			
	2	.542	.606	.573	MxW	n.s.	
	3	.575	.674	.623	W	n.s.	
	$\bar{X}$	.559	.617	.587	M	<.01	V > A
General Adaptation	1	.570	.601	.584			
	2	.538	.604	.570	MxW		
	3	.556	.647	.600	W	n.s.	
	$\bar{X}$	.555	.614	.583	M	<.01	V > A

*Indices can take values from 0 (minimum adaptation) to +1.000
(maximum adaptation)

of any specific system. To explore this interpretation would require considerable personal data about the individual respondents. Since this data is not available in the present study, the extent to which "technology phobia" might be a contribution factor cannot be demonstrated.

It is also possible that communication mode interacts with some other factor in the conference situation to differentially effect participants' desire to be "all together in the same room". A consideration of the evidence already presented adds some credence to this position. Considering the fact that those in audio conferencing evluated the sessions as less useful, less satisfying, less productive and more superficial than did those in the video situation (Chapter III), it is reasonable to assume that they would be more interested, than would the video conferees, in removing themselves from the teleconferencing situation in favour of the traditional face-to-face situation. Generally speaking, this was not the case.

There are at least two opposing situational reasons why people might not feel any advantage to meeting face-to-face. Either the teleconference went so well that no particular advantage would be seen as likely to accrue, or else the conference went so poorly that even being all together might not be seen as being capable of improving the situation. In either case, the person is likely to disagree with such statements as "I think if we had all been together in the same room the discussion would have been more productive", although the reasons for disagreement are completely opposite. Should similar responses in one

teleconference type be for positive reasons, and in the other for

negative reasons the "spacial adaptation" measure would thereby be

contaminated by participants' evaluations of the various conference

discussions. This would tend to reduce the average numerical difference

between the two modes on "spacial adaptation", even if there was

an actual difference.

To control for the possible contaminating effects of

conference evaluation on spacial adaptations required that these evaluations

be equalized for each conference type. Therefore, the data on spacial

adaptation was reanalysed by covarying out the effects of the

evaluation dimension of the conference discussions. As a result, the above

position was supported as spacial adaptation in the video conference was

now greater than in audio (p $<$ .05; table 15b).

Table 15b SUMMARY COVARIANCE ANALYSIS OF SPACIAL ADAPTATION--
BY MODE AND WEEK WITH DISCUSSION EVALUATIONS EQUALIZED

	Week (W)	Mode (M)		Mode ($\bar{X}$)	AOV p	Adaptation
		Audio	Video			
Spacial Adaptation	1	.636	.586	.610		
	2	.506	.568	.536	MxW n.s.	
	3	.447	.646	.545	W $<$ .05	
	$\bar{X}$	.532	.602	.565	M $<$ .05	V $>$ A

The Influence of Time on Adaptation

It was predicted that as conferees in audio became increasingly familiar with the system, their responses to the adaptation measures would increasingly approximate those in video conferencing. The hypothesis was not supported for any of the adaptation indices. Since the indices of social and psychological adaptation are mathematically similar to the uncertainty indices, the results are, of course, similar and need not be discussed again.

The hypothesis that spacial adaptation would, over time, increase in audio to more closely approximate the adaptation in video was not supported (Table 15b). Although the time/mode interaction is not significant, the trends in spacial adaptation in the two modes is clearly opposed to the hypothesis (Figure 11). With the effects of conference discussion evaluations removed from the measure of spacial adaptation, conferees reported greater inability to adapt to the spacial constraints of the conference in each succesive session. The opposite tendency was exhibited in the video conferences.

When the three indices were combined into a general index of system adaptation, the greater adaptation occuring in video was stable over the three sessions (Table 15 and Figure 11). The hypothesized time/mode interaction was not supported.

Summary and Discussion

This chapter investigated the basis of uncertainty in teleconferencing systems and conferee adaptation to the two systems.

Uncertainty was defined in terms of Israel's formulation of

Figure 11   ADAPTATION INDEX AVERAGES--BY MODE AND WEEK.
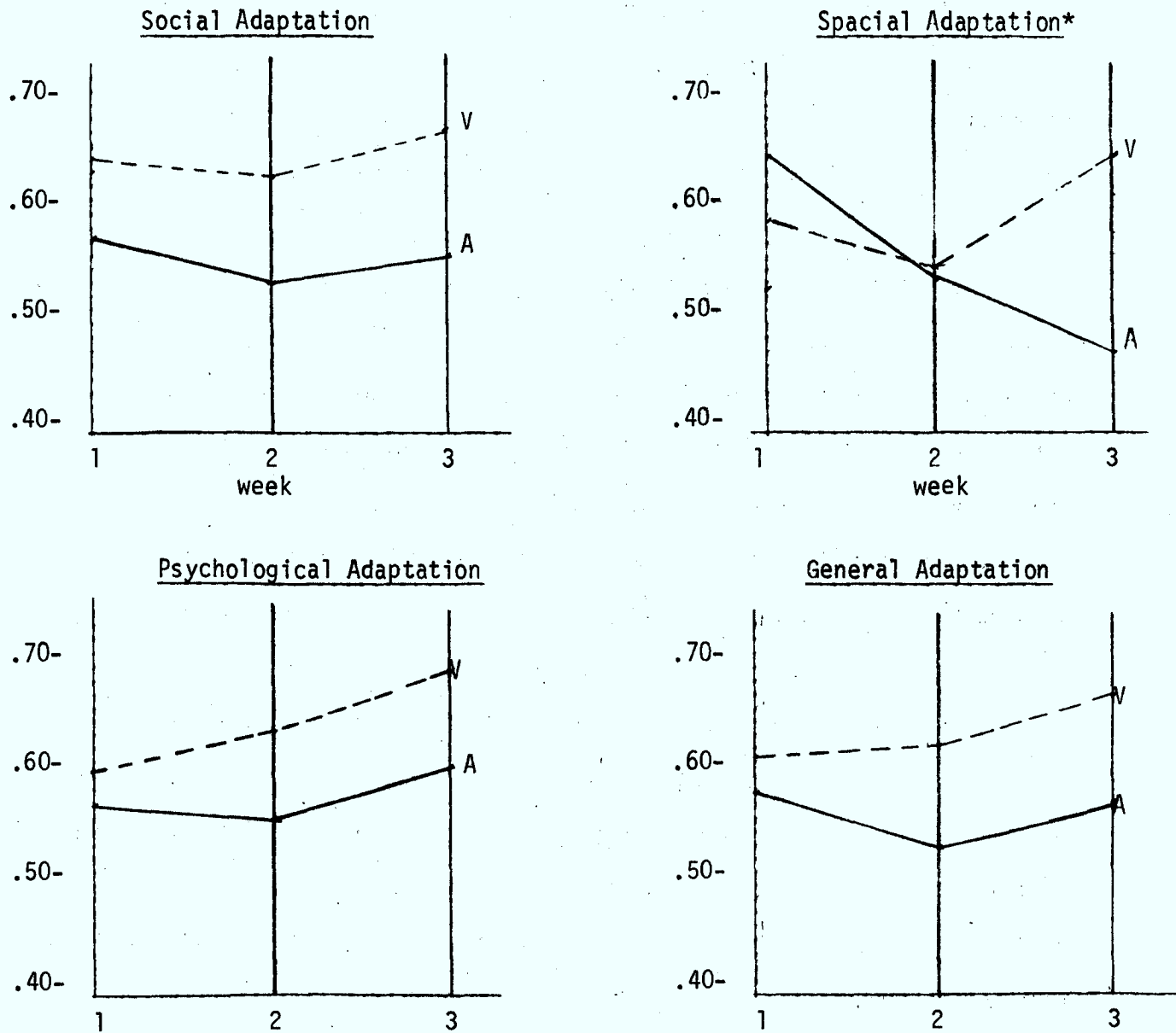
*Discussion evaluations equalized.

Allardt's four social sources of uncertainty--uncertainty resulting from values, norms, role expectations, and definition of the social situation. The model was extended to incorporate the teleconference contexts of the immediate group, the mediated group and the relationships between the two groups.

Uncertainty about the mediated group from all sources with the exception of role expectations, was greater in audio than in video and again this was relatively stable over the three weeks. Although increasing familiarity with the audio system did not significantly change any of the uncertainty measures, the trends in the data over time were inconsistent with the hypothesis that uncertainty in audio conferencing would decrease and more closely approximate the level of uncertainty in video conferencing.

The uncertainty formulations represented a rational paradigm based upon existing theories concerning uncertainty in social situations. When measures of uncertainty were analysed along with a number of other measures of conference perceptions, a somewhat different pattern resulted. Items clustered, in terms of the social and egocentric concerns of the conferees. Despite the differences in the underlying emphasis that characterize the theoretic and perceptual dimensions, they derive from very similar data. For this reason both the mode and time effects for social and egocentric (psychological) adaptation and necessarily similar to those reported for the

uncertainty indices.

The factor analysis that produced the social and psychological dimensions of adaptation, also clustered a number of items that were clearly identifiable as representing a concern with the spacial constraints of teleconferencing. "Getting used to the system" meant coming to terms with the separated group situation. The dimension was characterized by the feeling that being disturbed, uncomfortable and generally unproductive, either was or was not related to the physical separation of the two groups.

That there was no overall difference between conference modes on this dimension, suggested that either a personal "technology phobia" factor was operating that was independent of the actual teleconferencing system, or that people were giving the same response to the items for opposite reasons, or that both factors were operating. Since the data collected did not include a personality inventory of participants, the potential influence of any "technology phobia" could not be determined.

However, the feelings that, "all being together in the same room", would be "unnecessary" on the one hand, and "would not improve the situation" on the other, could be determined by removing the effects of discussion evaluations from the spacial adaptation scores. This analysis of covariance supported the contention that spacial adaptation is easier in video than in audio conferencing. There was no indication in the data that the adaptive problems in audio are quickly overcome.

In general, the data clearly suggests that uncertainty and adaptation problems in audio conferencing are relatively greater than in video conferencing.

Footnotes:

(1) Israel, 1971, p. 229

(2) This does not imply that there are twelve and could be only
     twelve source/contexts of uncertainty in teleconferencing but
     only that the model developed incorporates twelve catagories for
     empirical tests in the study.

(3) The researchers originally attempted to write items that could be
     used for all three communication modes; however, to write most of
     the items so that they made sense for face-to-face conferences
     changed the meaning so drastically that the item was, at best,
     ambiguous in the teleconference situation. The number of items that
     could be used for all modes was too small to permit a meaningful
     comparative analysis.

(4) The similarity between the modes in "between group" uncertainty may
     be a function of the particular task and population. Unlike the
     most likely practical uses for TC systems, values, norms, and
     roles are highly similar in each conference node. This would tend
     to reduce "between group" uncertainty, regardless of TC system.
     One further explanation is the possibility that the between group
     statements were less precise than those selected to represent uncertainty
     in either the immediate or mediated group contexts.

(5) The descriptions of the three types of adaptation are worded in
     terms of those who tended to have low adaptation. For those with
     high adaptation the description if, of course, reversed.

CHAPTER V
INTERPERSONAL PERCEPTIONS AND CONFERENCE ATMOSPHERE

In preceding chapters analysis of individual judgements were presented of the conference as a whole, or the immediate or mediated node as a whole. In this chapter, the locus of individual judgements is each of the other people in the conference. By analysing perceptions at the individual level, it is hopefully possible to attain a more powerful explanation of the differences that have been observed between conference modes at the group and subgroup levels of analysis.

By investigating the perceptions and reactions of an individual to each of the other members of the conference, it is possible to determine the interpersonal environment or atmosphere of a session. It would be difficult to specify all of the factors that could conceivably contribute to the atmosphere of a conference; however, the extent to which people feel that their contributions are comprehended and accepted and they in turn generally comprehend and accept the contributions of others would seem to be critical determinants of a positive interpersonal environment for any conference, provided, of course, that the argument is not extended to its theoretical extreme, i.e., one would not wish to suggest that either perfect interpersonal agreement or perfect interpersonal comprehension represents the most favorable conference atmosphere. If either of these conditions could be attained the conference would lose its purpose. For purposes of this report, then, conference atmospheres are treated as

continua along the following dimensions:

    -<u>acceptance</u> of the contributions of others

    -perception of others' <u>acceptance</u> of one's own contributions

    -<u>comprehension</u> of others' contributions[1]

    -perception of others <u>comprehension</u> of one's own contributions

Conference atmpsphere as defined here is similar to the notions of morale or cohesion in groups, both of which have received considerable attention in the literature on group processes.[2] While a review of the literature on the relationship between atmosphere and social, psychological and task environment factors is unwarranted in this report, it is important to note that a wide variety of factors ranging from interpersonal and task attractiveness through success in attaining objectives have been demonstrated to have an effect on atmosphere. Also, there is considerable empirical evidence to support the position that both formal and informal coalition or clique formations differentially effect perceptions of the atmosphere in task oriented groups. Again many factors have been demonstrated to effect the manner in which coalitions form in groups such as those in this study. However, all such factors in this study have been either randomized across conference modes or held constant. The only factor under consideration is the conference mode and any patterning influences this may have on interpersonal judgements from which measures of conference atmosphere can be abstracted.

The defining characteristic of teleconferencing, the fact that groups of people are spacially removed from each other, itself suggests an organizing principle for exploring conference atmosphere. It is possible to conceive of three separate but related 'atmospheres' coexisting in one conference--the atmosphere in the immediate node, the atmosphere in the mediated node, and the overall conference atmosphere. A common observation in teleconferencing situations is the distinction conferees make between "us" and "them", refering to members of the immediate and mediated nodes. If this is merely shorthand identification denotation without cognitive or behavioral implications, the labels are inconsequential. However, if the 'we/they' labels are symptomatic of conferees systematically preceiving members of the mediated group differently from members of the immediate group, and behaving towards individuals on the basis of their physical proximity, the implications are obvious and, perhaps, under some situations, undesirable. If the conference mode itself is a determinant of patterns of acceptance and comprehension, this factor would have to be taken into account when selecting particular teleconferencing systems to match specific types of tasks and in evaluating decisions arrived at through teleconferencing.

Based upon the earlier rationale of differences in channel capacity, novelty effects, and uncertainty in audio, video and face-to-face conferencing, the following relationships are predicted:

H1 (e) Conference atmosphere in the face-to-face and video modes will be more positive than in audio because in these groups people will accept more, feel more comprehended and accepted by those at the mediated node than the people in audio.[3]

H1 (e) predicts that the overall conference atmosphere will be differentially evaluated in the three communication modes because of differences in perceptions and evaluations of members of the mediated node. No differences between the three modes are predicted for evaluations of immediate group members since all are face-to-face communication situations.

H2 (e) Over time, conference atmosphere in the three communication modes will become increasingly similar, as those in the audio mode adjust to the technological constraints and are better able to accept and feel comprehended and accepted by those at the mediated node.

Measures of Conference Atmospheres

Indices of Acceptedness (feeling accepted)

Each person rated each other person in the conference by responding to the statement:

Indicate, as well as you can, whether or not each of the other people seemed to agree with the things you said.

Because those in the audio conferences had a visual disadvantage, they received the following written instructions to permit person identification at the mediated node:

As you couldn't see the people at the other end, you probably don't know how they were sitting. However, you probably could tell the difference between their voices. Whatever scheme you have for telling the people apart, think of one of them as ⓐ another as ⓑ and the other as ⓒ and fill in the boxes that way. Just forget about the "true" seating arrangement.

Research assistants who were present while participants filled out
the post session questionnaires, indicated that those in the audio mode
experienced no particular difficulty in following these instructions and
completing this section of the questionnaire. This may have been
helped by the fact that in almost all audio conferences, people made use
of the graphics monitor to "set" the seating arrangement early in the
session. (This also occured, but to a lesser extent, in the video
conferences.)

The response matrix is provided in Appendix A and the four response
catagories were (1) "Seemed usually to disagree", (2) "I have no idea",
(3) "Agreed with some things, but not others", (4) "Seemed usually to
agree". Immediate Group Acceptedness was calculated by averaging each person's
average evaluation of the other two people at the immediate node. Mediated
Group Acceptedness was calculated by averaging each person's average
evaluation of the three people at the mediated node, and Overall Conference
Acceptedness by averaging each person's average evaluation of the other
five at the conference, regardless of node. All indices could take
values between 1 (general disagreement) through 4 (general aggrement).

Indices of Acceptance

The three Indices of Acceptance of others' contributions were
calculated in the same manner as above, except the responses were to the
statement:

> Indicate whether or not you tended to agree with
> what each of the other people said.

Indices of Comprehension

The three indices measuring the extent to which an individual felt that he had been comprehended were also calculated in the manner described above. Possible responses "I don't think the person understood", "I have no idea" and "The person seemed to understand" were made to the statement:

> Indicate as well as you can whether or not each of the people seemed to understand the implications of the things you said, regardless of whether or not they seemed to agree.

These indices could take values from 1 (a general feeling of not being understood) through 3 (a general feeling of being understood).

Results

Acceptance of Others' Contributions

Influence of the Communication Mode - The extent to which people were willing to accept the contributions of all the other members in the conferences, was significantly greater in the face-to-face and video conference than in the audio conference ($p < .005$ overall). As indicated in Table 16, when the various modes were compared, the overall acceptance of others was greater in both face-to-face and video than in audio ($p < .001$ and $p < .005$). The audio conference mode alone appears to exert significant influence on people's inability to accept others' contributions. Since there are no differences in immediate group acceptance at all, and given that there are no differences between

Table 16 SUMMARY ANALYSIS OF ACCEPTANCE INDICES* OF CONFERENCE ATMOSPHERE--
BY MODE AND WEEK

Conference Atmosphere Index**	Week (W)	X̄ Mode (M)			AⱸV p	p t-test (Scheffé) Paired Comparisons			Direction of Positive Atmosphere Differences
		Audio	Video	Face		A/V	A/F	V/F	
Acceptance of Mediated Group*** Members	1	2.64	2.92	3.10	MxW n.s. W <.005				
	2	2.76	3.07	3.11					
	3	2.87	3.38	3.60					
	X̄	2.74	3.08	3.18	M <.001	<.001	<.001	n.s.	V>A, F>A
Acceptance of Immediate Group Members	1	2.88	3.03	3.16	MxW n.s. W n.s.				
	2	3.14	3.15	3.03					
	3	3.21	3.25	3.59					
	X̄	3.05	3.12	3.19	M n.s.	n.s.	n.s.	n.s.	
Acceptance of All Group Members	1	2.72	2.96	3.12	MxW n.s. W <.001				
	2	2.89	3.11	3.08					
	3	3.01	3.35	3.60					
	X̄	2.86	3.10	3.18	M <.01	<.005	<.001	n.s.	V>A, F>A

*   Compound indices based on responses to: "Indicate whether or
not you tended to agree with what each of the other people
said."

**   Indices can take values from 1.00 (no agreement) to 4.00
(perfect agreement with others' statements)

***   In face-to-face conferences, the three people on the other side of
the table from each respondent correspond to the "mediated"
group in the technological modes.

face-to-face groups and video groups on the dimension of mediated

group acceptance, the only substantive problem occurs in acceptance of

mediated group members in audio conferencing. The crux of the problem

then appears to be the lack of the visual cues. The extent to which audio

augmentation such as slow-scan video might overcome this problem needs to be

empirically demonstrated.

As hypothesized, the overall mode difference in atmosphere of

acceptance is attributable to mode differences in willingness to accept

mediated group member's contributions: the acceptance of mediated group

members was not significantly different for face-to-face and video conferencing,

acceptance for both video and face-to-face however was greater than in the

audio conference mode (p<.001 for both comparisons). While there was a

tendancy for immediate group acceptance to be generally higher in

face-to-face than in video and generally higher in video than in audio,

these differences were not statistically significant.

Influence of Time on Acceptance of Others' Contributions - The

results of this analysis are also presented in Table 16 and are graphically

displayed in Figure 12. It was hypothesized (H2e) that acceptance of

mediated group members in audio conferencing would, over time, increasingly

approximate acceptance of mediated members in the other modes.

This prediction was not supported. While the acceptance of those in the

mediated group (across the table in the face-to-face group) increased

significantly from the first to the third session (p<.005) when the

FIGURE 12 MEAN PERCEIVED ACCEPTANCE OF ONE'S OWN CONTRIBUTIONS BY IMMEDIATE AND MEDIATED GROUP MEMBERS--BY MODE AND WEEK
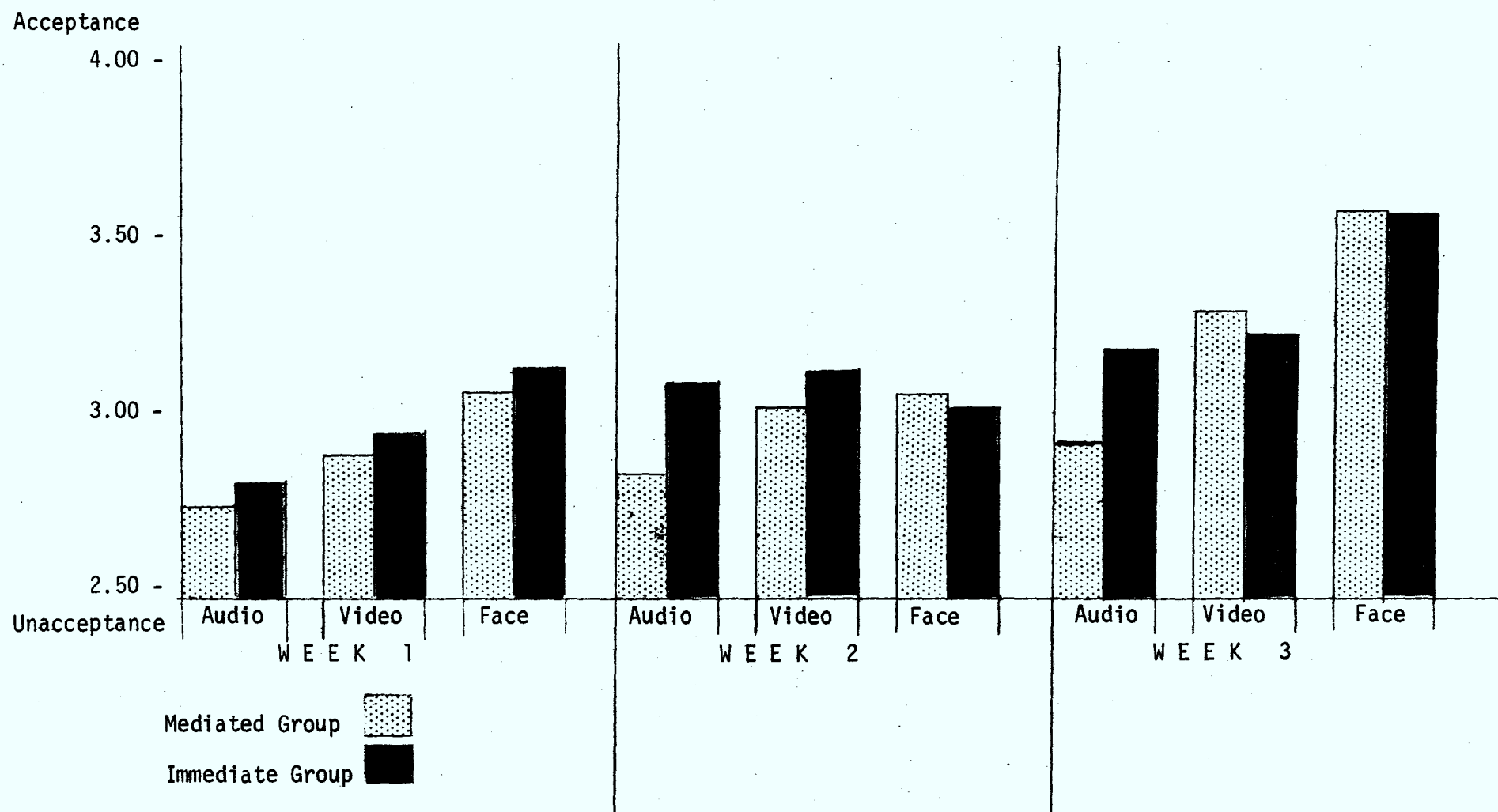
data was collapsed over modes, acceptance of the mediated group in audio increased more slowly, and the level of acceptance was always low, relative to the other two modes. As one would intuitively expect, in face-to-face, whether a person sat across the table or on the same side of the table, did not generally effect the extent to which his contributions were accepted. Similarly, acceptance in the video conferences does not appear to be significantly influenced by node considerations. This observation was consistent over the three experimental sessions.

Perceived Acceptance of One's Contributions by Others (Acceptedness)

Influence of the Conference Mode - It was hypothesized that the degree to which a person felt his contributions were being accepted would be influenced by the conference mode. This was based upon a consideration of the degraded channel capacity in the audio mode, i.e., the loss of the visual cues would result in the people in the audio mode feeling less accepted by the members of the mediated group than in the other two conference situations. The hypothesis was supported. Paired comparisons of the three conference modes indicate that those in both the face-to-face and video situation perceived themselves as being more accepted by members of the mediated group than those in audio (Table 17 $p < .01$ and $p < .001$).

It should also be noted that perceived acceptance by immediate group members, those with whom the individual was communicating face-to-face

Table 17 SUMMARY ANALYSIS OF PERCEIVED ACCEPTANCE INDICES* OF CONFERENCE ATMOSPHERE--BY MODE AND WEEK

Conference Atmosphere Index**	Week (W)	$\bar{X}$ Mode (M)			AoV p	p t-test (Scheffé) Paired Comparisons			Direction of Positive Atmosphere Differences
		Audio	Video	Face		A/V	A/F	V/F	
Perceived Acceptance by Mediated Group Members***	1	2.71	2.99	3.09	MxW n.s.				
	2	2.84	3.24	3.05					
	3	2.92	3.39	3.33	W n.s.				
	$\bar{X}$	2.81	3.17	3.12	M <.01	<.001	<.01	n.s.	V>A, F>A
Perceived Acceptance by Immediate Group Members	1	3.18	3.03	3.00	MxW n.s.				
	2	3.06	3.22	2.80					
	3	3.13	3.33	3.19	W n.s.				
	$\bar{X}$	3.13	3.17	2.97	M n.s.	n.s.	n.s.	n.s.	
Perceived Acceptance by All Group Members	1	2.88	3.01	3.06	MxW n.s.				
	2	2.93	3.24	2.95					
	3	3.00	3.38	3.27	W n.s.				
	$\bar{X}$	2.93	3.18	3.06	M <.05	<.01	n.s.	n.s.	V>A

*   Compound indices based on responses to: "Indicate, as well as you can, whether or not each of the other people seemed to agree with the things you said."

**   Indices can take values from 1.00 (perceived zero agreement) to 4.00 (perceived perfect agreement)

***   In face-to-face conferences, the three people on the other side of the table from each respondent correspond to the "mediated" group in the technological modes.

was about the same in all conference modes. However, a comparison of the immediate and mediated group evaluations in each mode yields some interesting indications. First, in the audio mode perceived acceptance is greater for immediate than mediated group members. Secondly, the opposite is the case for face-to-face conferences. Thirdly, in the video situation, node had no effect on a person's perception of acceptedness. The situation in the audio mode does not need further elaboration as similar patterns have been consistently observed for other criteria. However, the results in video and face-to-face need further elaboration as similar patterns have been consistently observed for other criteria. However, the results in video and face-to-face need further interpretation as they are in contradiction with the fundamental assumption of this study. Channel capacity is predicted to have differential effects on behavioral and attitudinal parameters with increasing degradation of informational variety available. Therefore, one would have expected that perceived acceptance by others be greater for immediate group members in the video situation, and that there would not be any major difference between these two sets of evaluations in face-to-face as the difference between immediate group and mediated group would seem to be quite meaningless for this mode. These expected patterns were reversed for the two modes.

The following are some speculative interpretations of these serendipitous findings: Clearly, channel capacity is a parameter which offers adequate interpretation of the results in the audio mode but cannot

be extended to video. Therefore, the tentative explanations have to

originate from a vantage point that starts at the other end of the

continuum, namely the face-to-face results. Indeed, there is evidence

in the scientific literature that accounts for the pattern, namely the

importance of the seating arrangement in face-to-face groups for socio-

metric structure. It is generally known from this body of data that people

tend to focus their attention and sociometric choices much more on others

opposite themselves than those beside them.[4] The difference in evaluations

of the 'immediate' and 'mediated group in the face-to-face mode is

absolutely consistent with this literature. Again, however, this paradigm

cannot be extended to the video mode because, due to the focussing effect

of the incoming television monitor, it would suggest the prediction that in the

video mode a similar, if not even more accentuated pattern should appear,

but does not. Some other explanatory factor has to be included, since

neither channel capacity nor seating arrangement accounts for the entire

set of results. Indeed, both of these parameters have to this point

operationalized the patterns of interaction rather than their quality.

The greater possibility of involvement and participation possible in the

face-to-face mode seems to bring about a transparency of the boundaries

between the two subgroups and allows for changes of membership,

modification of solidarity etc. Whereas in the face-to-face mode

the physical separation of the table can be overcome and patterns of

affiliation and liking can be established across and beyond it, such relationships cannot be attained in the video situation, notwithstanding the level of interpersonal understanding and agreement. This may possibly account for the patterns of acceptedness in face-to-face and video. To the extent that this interpretation is valid, it suggests, that for conferences where group solidarity, integration, and participation are particularly desirable, video conferencing would seem to be advantageous. Considerable research efforts will have to be made to ascertain to what extent these results are generalizable and to check the validity of the tentative interpretations set forth in the preceding paragraph.

The results of the pairwise comparisons of perceived acceptedness by all group members appear then to be influenced by a number of factors. As predicted, perceived acceptedness was greater in video than in the audio mode ($p < .01$). The absence of differences between the video and the face-to-face modes is consistent with earlier analyses and needs no further explanation at this time. Although the numerical values for perceived acceptedness by all group members were higher in face-to-face than in audio, the difference was not statistically significant. This is most probably due to the relatively low level of perceived acceptedness by the immediate group in the face-to-face mode which was discussed above.

Influence of Time on Perceived Acceptedness - Contrary to the
hypothesis, people in the audio mode did not feel more accepted by
the mediated group over the three sessions. Neither the time
main effects nor any of the time/mode interactions for any of the
indices were statistically significant (Table 17). In fact, the
difference of measures for acceptedness in audio as compared to
those in the other two modes increased rather than decreased. No
differences were hypothesized for the influence of time on measures of
perceived acceptedness by members in the immediate group. No such
differences were found on an acceptable level of statistical significance
but some interesting trends emerged. The characteristic slump in the
second week which has effected measures on all variables discussed to
this point appeared in the audio and face-to-face modes. The trend in the
video mode, however, was one of steady increase in acceptedness. This would
suggest that problems in the second week in this conference situation are not
associated with feelings of rejection.

Also, though not statistically significant, perception of
acceptance by those in both the mediated and immediate group tended to be
higher in video teleconferencing than in the face-to-face conferencing.
(Table 17) The trends were reversed for people's acceptance of others,
where face-to-face was somewhat higher than video. (Table 16) No
obvious explanation for these opposing trends is immediately available.

FIGURE 13   MEAN PERCEIVED ACCEPTANCE OF ONE'S OWN CONTRIBUTIONS BY IMMEDIATE AND MEDIATED GROUP MEMBERS--BY MODE AND WEEK

-113-
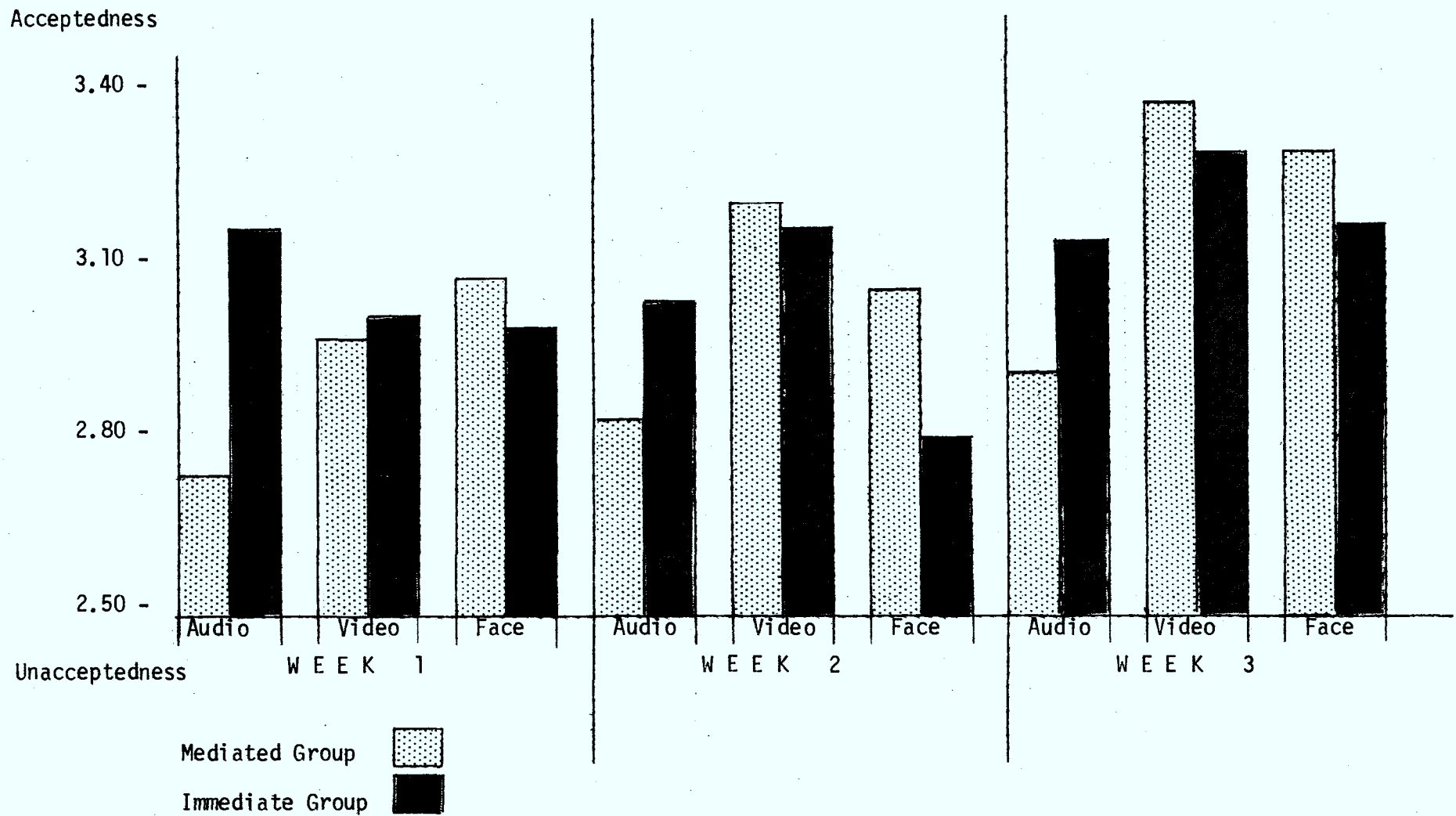
However, the dynamics of conferences will be clarified by the analyses
of the transcripts and will hopefully offer an explanation of the
differences between the sociometric processes in the immediate and mediated
groups in the three modes.

Perceived Comprehension of One's Contributions by Others

Influence of the Conference Mode - As was the case with the previous
atmosphere indices, the hypothesis concerning differences in the degree to
which a person felt that others understood him in the three conference
modes was supported. Those in the audio mode felt significantly less
understood by the mediated group than did those in video or face-to-face
(Table 18; p <.05 and p <.01). Again there were no differences between the
modes in perceived comprehension by those in the immediate mode and the
overall differences between modes in perceived comprehension by all
conference members must be attributable to mediated node differences
in perceived understanding. It should be noted that all comprehension indices
for the audio mode are consistently lower than in the other teleconferencing
groups. This was to be expected for the mediated group but an explanation
of why this occurs in the immediate group also is less apparent. Possibly,
the problems in the interaction with the mediated group are so strong that they
impinge on the dynamics of the immediate group. In fact, not only has the
audio mode been consistently the least positive on practically all measures
presented in this report but there is also indication that no forms of
adaptation are sufficient so as to at least overcome difficulties in either
of the two nodes or their transactions. This would be an indication that

Table 18 SUMMARY ANALYSIS OF PERCEIVED COMPREHENSION INDICIES* OF CONFERENCE ATMOSPHERE--BY MODE AND WEEK

Conference Atmosphere Indices**	Week (W)	$\bar{X}$ Mode (M) Audio	Video	Face	AoV p	p t-test (Scheffé) Paired Comparisons A/V	A/F	V/F	Direction of Positive Atmosphere Differences
Comprehended by Mediated Group*** Members	1	2.51	2.53	2.75					
	2	2.57	2.78	2.69	MxW n.s.				
	3	2.56	2.81	2.69	W n.s.				
	$\bar{X}$	2.54	2.68	2.72	M <.05	<.05	<.01	n.s.	F>A, V >A
Comprehended by Immediate Group Members	1	2.56	2.53	2.78					
	2	2.59	2.87	2.67	MxW n.s.				
	3	2.68	2.65	2.69	W n.s.				
	$\bar{X}$	2.60	2.67	2.73	M n.s.	n.s.	<.05	n.s.	F> A
Comprehended by All Group Members	1	2.52	2.53	2.76					
	2	2.58	2.82	2.68	MxW n.s.				
	3	2.61	2.74	2.68	W n.s.				
	$\bar{X}$	2.56	2.68	2.72	M <.05	<.01	<.005	n.s.	F>A, V>A

*   Compound Indices based on responses to: "Indicate, as well as you can, whether or not people seemed to understand the implications of the things you said, regardless of whether or not they seemed to agree."

**   Indices can take values from 1.00 to 3.00 (perfectly comprehended)

***   In face-to-face conferences, the three people on the other side of the table from each respondent corresponds to the "mediated" group in the technological modes.

much attention will have to be given to selecting those types of tasks which can be efficiently dealt with over the audio system and in the execution and solution of which the negative characteristics of the system have a relatively limited influence. Complexity, both in terms of the task and the interactions needed for it, appears to be an important consideration. With increasing complexity one can expect that the problems of using the audio mode will become ever more accentuated.

Influence of Time - The observed differences reported above did not change over the three sessions. Neither the time main effects or time/node interactions were significant for any of the analyses. There is no evidence to support the hypothesis that, over time, comprehension of the contributions of members of the mediated group in audio conferencing will approach that of either video or face-to-face comprehension. The mean comprehension scores by week and by mode are presented graphically in Figure 14. It is rather interesting to note that the slump of the second week, which has characterized most variables in the study so far, was not observed for perceived comprehension of either immediate or mediated group. The trends which are seen in these data would underline the fact that, whatever the problems of the second week, comprehension is not an important factor.

FIGURE 14   MEAN PERCEIVED COMPREHENSION OF ONE'S CONTRIBUTIONS BY IMMEDIATE AND MEDIATED
            GROUP MEMBERS--BY MODE AND WEEK
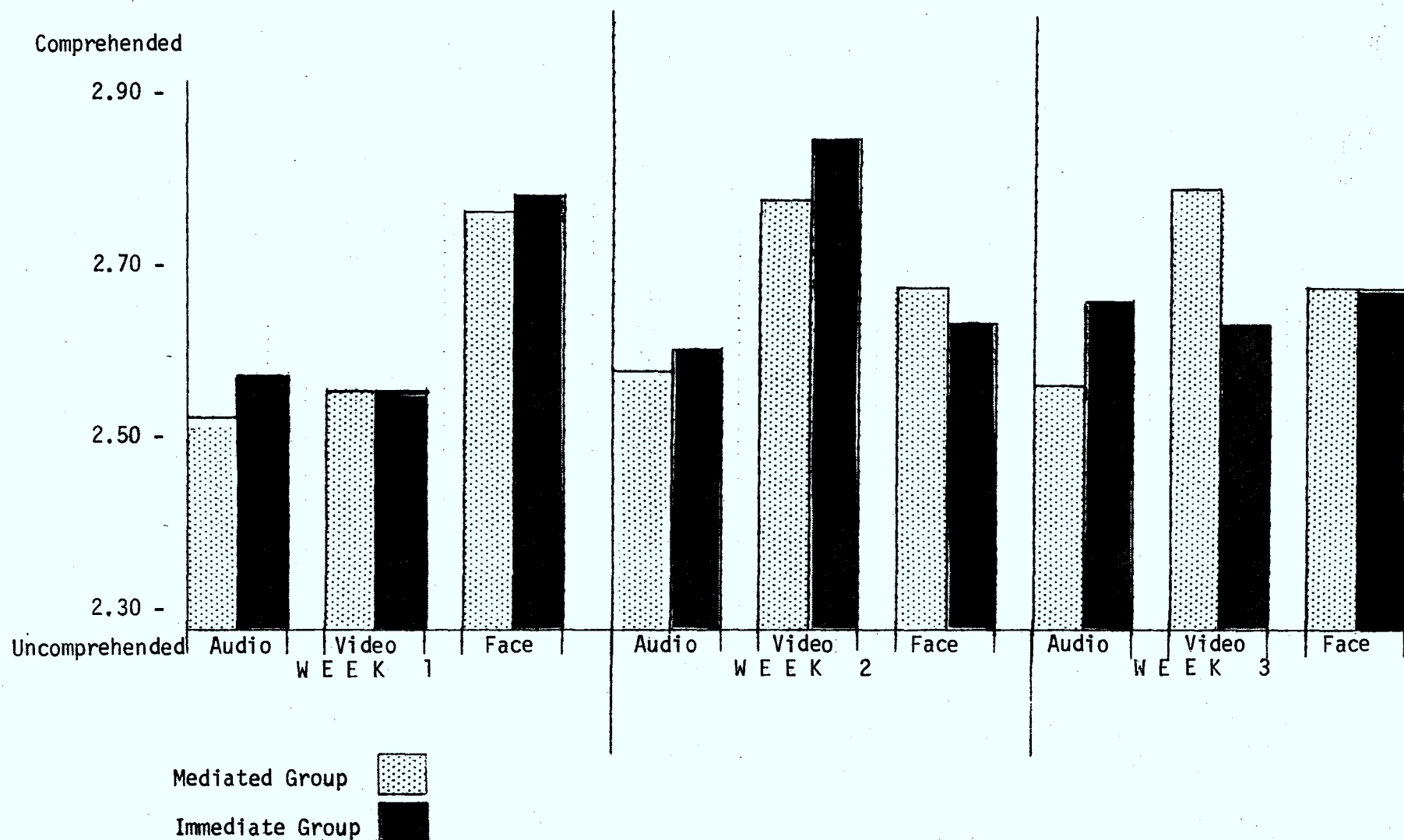
Summary and Discussion

Several facets of conference atmosphere were explored by having each conferee judge each other conferee on the dimensions of (1) his agreement with the person, (2) the degree to which he felt the person agreed with him, and (3) the degree to which he felt the person understood his contributions. Judgements were partitioned into (1) mediated group judgements, (2) immediate group judgements, and (3) total conference judgements, for the purpose of investigating group and subgroup atmospheres in the different conference situations.

For all three dimensions of conference atmosphere, the judgements in audio concerning mediated group members were significantly less favourable than those in video and face-to-face conferencing. No differences between video and face-to-face modes concerning the mediated group were significant. This situation was observed in all three sessions and did not change over the experimental period.

The above modal differences did not generally occur when the interpersonal judgements were made of members of the immediate group. Although there was a slight tendency for those in audio to also evaluate immediate group members less favourably on the dimensions than depth in either face-to-face or video, in one of nine individual comparisons did this reach statistical significance. However, the tendency does suggest the possibility that judgements of immediate group members along these dimensions may be affected by evaluations of the mediated group, or at least that the two group judgements are not entirely independent. Again,

the patterns were stable over the three experimental sessions. Beyond these statistical results, some further interpretations of the findings are warranted. These have to do with the sociometric atmospheres in the conferencing sessions and extrapolations from the data to characteristics of the different modes and their possible future uses. First, it has been shown that the audio system produced constraints on all dimensions of conference atmosphere relative to the other systems. This, together with the results from the preceding chapters, points to limitations inherent in the system for maximizing the quality and complexity of interactions. The data indicate that the problems are not only attitudinal and related to behaviors of the individual participants but also effect the structure and dynamics of the interacting groups. Very serious thought will, therefore, have to be given to which particular types of tasks can be effectively and satisfactorily dealt with via this system.

Second, while the face-to-face situations was primarily included in the analysis for comparative reasons, the data suggest subtle problems in this mode. They have already been pointed out numerous times in the literature and are of interest for this report only insofar as they are overcome in the video conference mode. In fact, problems related to seating arrangements and concomitant influences on group integration and solidarity were not replicated in the video mode though basically the same theoretical parameters should have acted in the latter mode.

Third, and somewhat surprisingly, there is some evidence to suggest that video has neither the obvious disadvantages of audio nor the subtle and less important shortcomings of the traditional face-to-face conference. Though this may seem to be a rather strong statement, there is mounting evidence from all the major blocks of data that tend to support this contention. The detailed sociometric analyses of this chapter begin to explain the more abstract results of the preceding sections. The interrelation between the groups' dynamics and their structural properties on the one hand and the individuals' position in and evaluations of the conferences now becomes clearer.

Footnotes:

1. As previously noted, the measure of a persons comprehension
    of the contributions of each other person was inadvertently
    omitted from the questionnaire.

2. c.f. McGrath and Altman, 1966

3. The idea of a mediated group in face-to-face conferences is,
    of course, contradictory. However, because of the similarity
    in seating arrangements, those on the "other side of the table"
    were analyzed as the mediated group to provide a common analytic base.

4. c.f. Strodtbeck, and Hook, 1961, Stein or, 1950, Sommer, 1961,
    or Strodtbeck, Ames and Hawkins, 1957.

CHAPTER VI
SUMMARY OF RESULTS AND DISCUSSION

This experimental study was a comparative analysis of attitudes and perceptions in real-time audio-visual and graphic-augmented-audio teleconferencing and the traditional face-to-face method of conducting conferences or meetings. On three consecutive weeks, conferees participated in 6-person meeting held on one of the communication modes.

The purpose of the meetings was one of making detailed recommendations for changes in a program in which the participants had all been engaged for a period of five months.

A variety of indices were developed from questionnaire data to determine the nature of any differences between communication modes and any changes that occured over the three sessions on parameters related to three central concerns:

● Questions concerning users' evaluations of the conference discussions.

● Questions considering the nature of uncertainties and adaptation in teleconference systems.

● Questions concerning the potential for and nature of human interactions in teleconference systems.

Hypotheses, based largely upon considerations of differences in channel capacity, novelty effects and uncertainties in the communication situations were tested. These hypotheses and the results of the analyses are summarized:

● H1 (a) Face-to-face and video conference discussions
          will be judged more positively than audio
          conferencing on evaluative, activity, and
          potency dimensions.

The hypothesis was generally supported for the evaluative dimension but

only the video/audio difference was statistically significant. The

hypothesis was not supported for either the activity or potency dimensions

which supports Champness' earlier data from British civil servants. In

addition, video tended to be evaluated more favourably than face-to-face

although the difference was not statistically significant.

● H2 (a) Over time, judgements on evaluative, potency and
          activity dimensions of the discussion will
          become increasingly similar in face-to-face, video,
          and audio conferencing modes.

The hypothesis was not supported. The tends in the data were generally

directly opposite to the hypothesis.

● H1 (b) Uncertainty with regards to values, norms, role
          expectations and situational definition will be
          greater in audio than in video conferencing,
          regardless of the social contexts in which
          these uncertainties are imbedded.

The hypothesis was supported. Only in the area of role expectations

did the difference not reach an acceptable level of statistical significance.

Also, further analysis of the uncertainty measures in conjunction with

other teleconferencing items that yield dimensions of social, spacial,

and psychological adaptation resulted in similar findings. For all

three adaptation dimensions, adjustment was significantly more difficult

in the audio conferences than in the video.

- H2 (b) Over time, the degree of uncertainty in audio
conferencing regarding values, norms, roles and
the definition of the situation will be reduced,
and will more closely resemble the degree of
uncertainty in video conferencing.

The hypothesis was not supported. Over time, the trend appeared to be
that uncertainty in audio increased slightly while declining
slightly in video. Neither did the additional analysis of the social,
spacial and psychological adaptation measures indicate that increased
adaptation to the audio system occured with increasing familiarity with
the system. In audio it appeared that the people found it increasingly
difficult to come to terms with the spacial constraints while the opposite
was apparent in video.

- H1 (c) Uncertainty about the values, norms, roles, and
situational definition concerning the mediated
group will be greater in audio than in video
conferencing.

This hypothesis was supported. Although no difference in uncertainty about
the immediate group was hypothesized, since for both communication systems
the immediate group interaction is face-to-face, uncertainty was also
significantly higher in audio than in video .

- H2 (c) Over time, the degree of uncertainty in audio
conferences about the mediated group's
values, norms, roles, and definition of the
situation will decrease, and will more closely resemble
the degree of uncertainty in video conferencing.

The hypothesis was not supported. The tendency was for uncertainty about
the mediated group to remain about the same in audio and to decrease
over time in video.

● H1 (d) Uncertainty about values, norms, roles and
situational definition concerning the
transactions between the mediated and immediate
group will be greater in audio than in video
conferencing.

Although the difference was in the predicted direction, it was not

statistically significant. The hypothesis was not supported. This is

difficult to interpret in light of the significantly higher uncertainty

in audio surrounding both the immediate and mediated nodes. ·That this did

not create greater uncertainty for between node transactions was

tentatively interpreted as resulting from imprecision in the between group

uncertainty measures.

● H2 (d) Over time, the degree of uncertainty about values,
norms, roles and definition of the situation
concerning the transaction between the mediated
and immediate groups in audio conferencing will
decrease, and will more closely resemble the
degree of uncertainty in video conferencing.

This hypothesis was predicated on the assumption that between group uncertainty

would be generally higher in audio than in video (H2d). Since that

hypothesis was not supported, the hypothesis (H2e) was no longer tenable.

● H1 (e) Conference atmosphere in the face-to-face
and video modes will be more positive than
in audio because in these groups people will
accept more, feel more comprehended and accepted
by those at the mediated node than the people in
audio.

This hypothesis was supported for all three dimensions of conference

atmosphere. There was no statistical difference between video and face-

to-face modes on any of the three dimensions.

● H2 (e) Over time, conference atmosphere in the three
communication modes will become increasingly
similar, as those in the audio mode adjust
to the technological constraints and are better
able to accept and feel comprehended and accepted
by those at the mediated node.

The hypothesis was not supported. The conference atmosphere contributed

by perceptions of the mediated group, as measured by the three dimensions,

tended generally to become more positive over time in each of the

modes; however, the rate of increase tended to be least in audio.

● H1 On an array of attitudinal and behavioral dimensions
face-to-face conferencing and video conferencing
will be evaluated more favourably than audio
teleconferencing.

● H2 Over time, attitudinal and behavioral evaluations
in different teleconferencing configurations will
become increasingly similar, and these will
increasingly approximate attitudinal and
behavioral evaluations in non-mediated conferencing.

To conclude the summary of results, general hypothesis H1 was, by

and large, supported and H2, not only received no support, but the

fairly consistent trend was the reversal of the expected effects of

increased familiarity with the audio facility.

Discussion

When considering the implications of the major findings in the

study, it is perhaps useful to recall the salient characteristics of the

subjects and the conference task and objectives. These characteristics

define, in varying degrees, the generalizable limits of the results:[1]

● The conferences were six person conferences. Increasing
  or decreasing conference size might well effect certain
  of the results.

● Conferees at each node in the conference, while they knew
  each other did not, except by chance, know any of the
  people at the mediated node. This lack of familiarity with
  the people about whom they received no visual
  information throughout the sessions,quite likely
  contributed to the problems in the audio conferences.

● Responsibility for reaching the conference objectives
  was symetrical. Each node and each person within each
  node was equally responsible. In some conferences and
  meetings, one group of people, who are physically together, are
  responsible for making decisions and those at the mediated
  node or nodes function largely as sources of information
  for the decision makers. The lack of visual contact in these
  situations might not represent the problems it seems to have
  done in this study.

● In the conferences there was no official chairman. No
  person had any legitimate authority over any other person
  and no sanctions could be imposed. In formal organizations
  the levels of authority will usually be represented to some
  extent, in a conference and this could be reflected in
  somewhat different results in some of the dimensions measured
  in this study. As an example, the attitudes toward
  teleconferencing and other conferees that senior personnel
  conveyed could possibly affect more junior members, either
  consciously or out of their awareness.

● The conference objective "to discuss and make recommendations
  for changes in an existing program" represents only one
  general type of conference. A more specific conference task,
  perhaps one that required explicit "go/no go" decisions,
  might have produced different results.

These notwithstanding, the consistently lower "performance" of

audio group interaction cannot be dismissed. That people are oriented visually

to group interaction and are adversely effected when visual cues are unavailable

was apparent in the results. While this does not negate the potential

usefulness of audio conferencing, particularly when the alternatives are
either infrequent or no communication at all between groups who need
to interact, the findings of this study, though certainly neither
conclusive nor comprehensive, do suggest some factors worth considering
both in systems design and system use. Though the considerations are not
necessarily novel, they do, since they are implied by the present data,
warrant discussion:

- In audio conferencing, internodal personal familiarity
  is desirable. When people at either end do not know each other,
  this adds a further dimension of uncertainty and complexity
  to the situation. Time spent familiarizing people with one
  another, either prior to or at the beginning of the meeting,
  appears to be essential for maximizing the potential for
  an effective meeting.[2]

- The number of active participants at any node in the audio
  system should probably be kept to a minimum as
  uncertainty is likely to increase with the number of participants.

- Audio systems should not be thought of as alternatives to
  face-to-face meetings but should only supplement such meetings.
  The importance of this consideration is probably directly
  related to the lack of familiarity conferees have with
  one another, and the need for complex information processing.

- Audio systems are likely to accentuate internodal
  differences. If possible, conflict or competitive situations
  should be avoided, particularly when the conflict or competition
  is between the two mediated groups. In the present study,
  internodal patterns of disagreement emerged in audio that can
  only be explained in terms of the demand characteristics of
  the system itself. Audio systems probably have the potential
  for creating rivalries in addition to simply increasing them.

- The partial loss of visual cues in the audio conference
  clearly suggests that the total situation be kept as
  uncomplex as possible. Interpersonal familiarity has already
  been noted. The task itself should probably be presented
  as simply as possible. Lengthy intricate presentations or
  analyses that can produce confusion are questionable in audio
  conferencing and alternatives should be used.

● A chairman functioning as an uncertainty absorber is likely to produce a more satisfying conference than could be expected in a more laissez-faire situation. While this arrangement may not always be desirable for any meeting in any communication medium, from the standpoint of uncertainty reduction alone, it appears to be desirable in audio conferences.

● Audio meetings should probably be planned to be relatively short. Even if this is not planned, shorter meetings are likely to take place in any case. The data suggests that people have difficulty concentrating when people at the mediated node are speaking and this will likely shorten the meeting, perhaps prematurely. The common observation that "we got the meeting over in half the usual time" cannot be uncritically accepted as desirable--especially when the objectives require relatively complex considerations and decisions.

● The relative difficulty in overcoming "slumps" in the discussions in audio systems probably should be explained to conferees or at least to the chairman of the meeting.

● The previous considerations are based upon the assumptions of a need and/or desire for active participations of the conferees. In any situation where this is not a consideration, or less of a consideration, the effectiveness of the audio systems is likely to increase. Such things as essentially one-way transmission of information, or asymmetrical internode responsibility for decisions are examples of such situations. However, to the extent that such situations are the major uses of the system, the system should not be thought of as a conferencing system.

The above considerations are obviously neither mutually exclusive nor exhaustive. They represent only some of the factors that should be considered and they are all related to the basic notion of complexity and uncertainty of the conference situation.

While it is probably premature to begin to make any precise statements concerning audio system design on the basis of the evidence

presented, it is possible to suggest one major line of investigation toward

design ends that appears to be fruitful; should the installation of

widespread audio conferencing facilities be seriously considered:

> - Some method, such as slow-scan video, to compensate for
> the loss of real-time visual cues warrants considerable
> research and should probably be of fairly high priority.
> In the present study, the identification of the speaker
> and "getting the floor" did not seem to be as critical
> as the high loss of reaction cues from the mediated node.
> The extent to which slow-scan would reduce this problem
> is an empirical question.

Finally, it is necessary to remark briefly on video conferencing.

That the audio/video system was superior to audio system , on all

the major conferencing parameters considered, is hardly surprising and

probably not debatable. Whether the extremely high economic cost of

attaining this superiority is warranted is certainly debatable, but if

this is a research question at all, behavioral research is only one

research consideration related to the debate, if it is even debated.

Some of the comparisons between the video system and the face-to-

face conference were, however, somewhat surprising. The fact that the

video conference tended to be somewhat superior to face-to-face

on some of the parameters suggests, that we begin to seriously

think of video systems for group interaction as possibly something more than

close approximation to the ideal face-to-face conference. Of particular

interest was the video monitor's apparent capacity for focusing attention

of people on those at the mediated node.[3] If the focusing phenomenon is valid,

video conferencing might prove to be more desirable than even face-to-face

in situations like bargaining and negotiation where internodal agreement

and solidarity are essential, and where the initial positions taken
at the two ends are disparate; or in situations where different areas of
expertise are represented at the two nodes and special concentration and
comprehension of people at the other node is necessary for desirable outcomes.

In conclusion, the evidence reported has ranged from that
of approaching certainty to the merely suggestive, and from the descriptive
to modest levels of explanation. Hopefully, the analyses of the conference
transcripts and video tapes will increase the explanatory power of the total study
and that additional research will explore some of the possible relationships
suggested in these data.

Footnotes:

1. While it is necessary to show caution when making generalizations about any study, it is equally important to appreciate areas where the results are likely to be comparable for other situations and populations.

   There is a popular belief among some that all data collected from a student population has little or no relevance for other populations--usually called "real people". Much of this criticism is often warranted but the appropriatness of such criticism must be examined for each individual study, and not studies in general.

   There are a number of reasons why the researchers feel that the choice of subjects in the present study provided data that would be comparable to that provided by other populations. (1) The study made no attempt to explore dimensions of conferencing that would be sensitive to organizational structures. The whole area of superior/subordinate relationships, for example, was not investigated and the concepts measured were limited to considerations that would apply to any conference. (2) While some would argue that students might take the conference task less seriously than those whose careers were involved, this is not an important consideration unless there is reason to expect that "seriouslessness" would operate in one conference mode and not in another. If not, any effect this could have would be a constant across all treatment groups and, therefore, could not in any way account for observed differences in the communication modes. (3) The choice of subjects was further justified by the high degree of comparability between the results of this study and those of Champness' study of British civil servants, in areas where data comparisons were possible. (4) Additionally, reliable person-to-person or sociometric evaluations are often difficult to obtain within the context of formal organizational structures, regardless of whatever measures are taken to insure the anonymity of the evaluator. Candidness is less of a problem when students evaluate their peers. (5) Students, for a variety of reasons, are likely to express their emotions sooner and more observably than people whose careers are involved. This is probably even truer of such feelings as anger, frustration, boredom and overt interpersonal hostility. In short, students are less likely to suffer in silence than people attending meetings in their professional roles. A consideration of the available and feasible measurement instruments makes the last two justifications for research subjects particularly important.

The above justifications notwithstanding, a comprehensive appreciation and evaluation of various teleconferencing facilities as communication devices will require careful investigation of their effectiveness for potential actual users.

2. The data in this study supported many of the observations reported by Stahmer and Havron in Planning Research in Teleconference Systems (1973). In particular, their observation of the importance of interpersonal familiarity (raster) is consistent with the position taken here.

3. In private conversation, Donald George, Carleton University, concurred with this observation which he terms "The Focusing Effect" of the video monitor in interpersonal communication.

APPENDIX A

INITIAL QUESTIONNAIRE

(All subjects - one week prior to Post Conference Session)

NAME _____ MAJOR _____ AGE _____

Please take a few moments to answer the following;

Indicate briefly those elements or aspects of the course about which you
personally have definite feelings.

ASPECTS (write in)	EVALUATION (check ( ) one)			
	VERY SATISFIED	SATISFIED	DIS- SATISFIED	VERY DIS- SATISFIED

How often have you been in discussions with other people about the orientation
or organization of the course?

___often ___occasionally ___rarely ___never

If you have been in conversations about the course orientation and organization,
what areas or topics were under discussion and what seemed to be the general feelings?

AREA DISCUSSED	GENERAL FEELING

PRE SESSION INSTRUCTIONS

Week 1

About this meeting....

For the next 45 minutes you are asked to discuss the Human
Communication course with a number of other students. The group is
asked to determine the aspects of the course that you feel could
benefit by being changed in some way and to come up with concrete
recommendations for achieving these changes.

This is the first of three consecutive Wednesday meetings
that you will have with the same people, to discuss the course and
to make recommendations.

Right after the meeting, you will be asked to take a few
minutes to jot down the recommendations that were made, as well as
some of your observations about the meeting. But don't worry about
that now as further information will be provided then.

Some of the meetings are being taped on a random basis.
The meeting you will be in is one of those being taped. Our intentions
are honourable--to create a forum where students can make their
feelings, expectations and recommendations known, for the purpose
of improving the quality of this course--so, please, don't let the
equipment inhibit your frank and open discussion.

Your willingness to participate in this endeavour is appreciated,
and hopefully you will also find the exchange interesting and informative.

PRE SESSION INSTRUCTIONS

Week 2

This is the second of the three meetings to discuss and make recommended changes for the course in Human Communication. Please continue with the discussions that began last week.

At the end of today's meeting, you will again be asked to jot down any additional recommendations arising out of this meeting, as well as any elaborations or modifications of your earlier recommendations. You will also be asked for some of your observations of the meeting.

****

Note: After it has been compiled, a summary of all of the information coming out of these meetings will be made available to every one who participated.

****

PRE SESSION INSTRUCTIONS

Week 3

PLEASE READ THIS BEFORE THE SESSION:

This is the third and final week of these meetings. The faculty and TA's have now spent considerable time reading the recommendations the various groups have made and last Saturday morning all of us viewed and discussed many of the thirty tapes we now have of your evaluations and discussions of the course. These have already been revealing and when we have read and where possible viewed and further discussed all of your recommendations, observations and comments, we have every reason to believe that this will lead to a better Human Communication course in the future.

We feel, and hope you do too, that this is an extremely ambitious attempt to find out what students think about and would like to see in such a programme. Therefore, we hope you will understand that it will take some weeks before we can provide you with a complete rundown of what we found out from what you told us of your meetings. We are making every effort to do this as quickly as possible and beg your indulgence.

FOR THIS WEEK:

For the past two weeks much of the discussion in the

groups has centered around first, why you have certain concerns, and

second, your recommendations about what should be done. This week

we ask you to take the one or two recommendations that you feel

most strongly about and to discuss as fully as possible, not

what should be done, but how it should be done. In other words,

try to put yourselves in the position of having to put

the recommendation into effect. For example, what would you do if

you were trying to plan this course and were advised to "Make

the lectures more relevant", "Integrate the lectures and groups

better", etc. Probably we all agree with such suggestions, but

how exactly would you try to accomplish them?

(While viewing the tapes and reading the comments, we noted that some people felt that they were in some kind of "experiment". In a sense this feeling is justified. We are killing two birds with one stone. Our major concern is with your discussion and recommendations for making this a better course, and at the same time getting your feelings and reactions, after the sessions, to a communication situation. Some of the situations were unfamiliar, but are already beginning to be used--and may be much more prevalent in the future. Beyond that, however, there is no "experiment" going on.)

POST SESSIONS QUESTIONNAIRE

<u>Face-to-Face Conferences</u>

NAME _____

Please state briefly what you felt were the recommendations for
the course that came out of today's meeting. Put only one recommendation
in each box and use as many boxes as necessary.

After each recommendation, scales are provided for you to indicate
(a) the extent to which you personally agree with the recommendation
(b) how important you think the recommendation is for the course.

RECOMMENDATION:	strongly agree ____	very important ____
	agree ____	quite important ____
	undecided ____	not very important ____
	disagree ____	not at all important[1] ____
	strongly disagree ____	

RECOMMENDATION:	strongly agree ____	very important ____
	agree ____	quite important ____
	undecided ____	not very important ____
	disagree ____	not at all important[1] ____
	strongly disagree ____	

RECOMMENDATION:	strongly agree ____	very important ____
	agree ____	quite important ____
	undecided ____	not very important ____
	disagree ____	not at all important[1] ____
	strongly disagree ____	

RECOMMENDATION:	strongly agree ____	very important ____
	agree ____	quite important ____
	undecided ____	not very important ____
	disagree ____	not at all important[1] ____
	strongly disagree ____	

RECOMMENDATION:	strongly agree ____	very important ____
	agree ____	quite important ____
	undecided ____	not very important ____
	disagree ____	not at all important[1] ____
	strongly disagree ____	

Please indicate your overall feelings about today's discussion using the scales provided. Please mark each scale once.

	extremely	somewhat	neutral	somewhat	extremely	
boring	___	___	___	___	___	interesting
chaotic	___	___	___	___	___	organized
probing	___	___	___	___	___	superficial
relaxed	___	___	___	___	___	tense
dissatisfying	___	___	___	___	___	satisfying
warm	___	___	___	___	___	cold
dynamic	___	___	___	___	___	static
competitive	___	___	___	___	___	cooperative
useless	___	___	___	___	___	useful
varied	___	___	___	___	___	repetitive
productive	___	___	___	___	___	counterproductive
lively	___	___	___	___	___	dragging
aimless	___	___	___	___	___	directed
bad	___	___	___	___	___	good

Please indicate the extent of your agreement or disagreement with each of the following statements.

5 - strongly agree
4 - agree
3 - don't know
2 - disagree
1 - strongly disagree

CIRCLE ONE

1. I think we were confused about what we were supposed to be doing in the meeting.   5 4 3 2 1

2. We had trouble organizing ourselves to get as much out of the meeting as possible.   5 4 3 2 1

3. I felt uneasy because I wasn't sure how much responsibility I should be taking for getting something done.   5 4 3 2 1

4. I felt that people talked past each other quite a bit.   5 4 3 2 1

At the right hand side of the page is a representation
of the seating arrangement of your meeting.

(1)   In one of the two rows numbered (1) indicate
      the seat you were sitting in by putting an X
      through that circled letter.

(2)   In the two rows numbered (2) indicate as well
      as you can whether or not each of the other
      people seemed to agree with the things you
      said, by marking:

              A - seemed usually to agree
              D - seemed usually to disagree
              M - agreed with some things, but not
                  others
              ? - I have no idea

(3)   In the two rows numbered (3) indicate whether
      or not you tended to agree with what each of
      the other people said:

              A - I tended to agree with what the
                  person said
              D - I tended to disagree
              M - I agreed with some things but
                  not others
              ? - I have no idea

(4)   In the two rows numbered (4) indicate as well
      as you can whether or not each of the other
      people seemed to understand the implications
      of the thing you said, regardless of whether
      or not they seemed to agree.

              U - the person seemed to understand
              N - I do not think the person under-
                  stood
              ? - I have no idea

(4)

(3)

(2)

(1)   ⓐ   ⓑ   ⓒ

SEATING
ARRANGEMENT

(1)   ⓓ   ⓔ   ⓕ

(2)

(3)

(4)

Any additional comments? _____

_____

_____

_____

POST SESSIONS QUESTIONNAIRE

Video Teleconferences

NAME _____

Please state <u>briefly</u> what you felt were the recommendations for the course that came out of today's meeting. Put only one recommendation in each box and use as many boxes as necessary.

After each recommendation, scales are provided for you to indicate
(a) the extent to which you personally agree with the recommendation
(b) how important you think the recommendation is for the course.

RECOMMENDATION:		
	strongly agree ———	very important ———
	agree ———	quite important ———
	undecided——	not very important ———
	disagree ———	not at all important ———
	strongly disagree ———	

RECOMMENDATION:		
	strongly agree ———	very important ———
	agree ———	quite important ———
	undecided——	not very important ———
	disagree ———	not at all important ———
	strongly disagree——	

RECOMMENDATION:		
	strongly agree ———	very important ———
	agree ———	quite important ———
	undecided——	not very important ———
	disagree ———	not at all important ———
	strongly disagree——	

RECOMMENDATION:		
	strongly agree ———	very important ———
	agree ———	quite important ———
	undecided——	not very important ———
	disagree ———	not at all important ———
	strongly disagree——	

RECOMMENDATION:		
	strongly agree ———	very important ———
	agree ———	quite important ———
	undecided——	not very important ———
	disagree ———	not at all important ———
	strongly disagree——	

Please indicate your overall feelings about today's discussion using the scales provided. Please mark each scale once.

	extremely	somewhat	neutral	somewhat	extremely	
boring	___	___	___	___	___	interesting
chaotic	___	___	___	___	___	organized
probing	___	___	___	___	___	superficial
relaxed	___	___	___	___	___	tense
dissatisfying	___	___	___	___	___	satisfying
warm	___	___	___	___	___	cold
dynamic	___	___	___	___	___	static
competitive	___	___	___	___	___	cooperative
useless	___	___	___	___	___	useful
varied	___	___	___	___	___	repetitive
productive	___	___	___	___	___	counterproductive
lively	___	___	___	___	___	dragging
aimless	___	___	___	___	___	directed
bad	___	___	___	___	___	good

Please indicate the extent of your agreement or disagreement with each of the following statements.

5 - strongly agree
4 - agree
3 - don't know
2 - disagree
1 - strongly disagree

CIRCLE ONE

1. I think we were confused about what we were supposed to be doing in the meeting.   5 4 3 2 1

2. We had trouble organizing ourselves to get as much out of the meeting as possible.   5 4 3 2 1

3. I felt uneasy because I wasn't sure how much responsibility I should be taking for getting something done   5 4 3 2 1

4. I felt that people talked past each other quite a bit.   5 4 3 2 1

| | 5 - strongly agree | | 2 - disagree |
| 4 - agree | | 3 - don't know | 1 - strongly disagree |

CIRCLE ONE

5.	I found it disturbing not being in the same room with the other people.	5 4 3 2 1
6.	I quite often felt that my own comments were not directed to any specific person, and this bothered me.	5 4 3 2 1
7.	At our end we sometimes talked things over among ourselves before we said anything to the others	5 4 3 2 1
8.	... and (if you did) I felt uneasy about this.	5 4 3 2 1
9.	It was hard to know who was talking at the other end.	5 4 3 2 1
10.	Getting used to this system is quite a chore.	5 4 3 2 1
11.	I was sometimes uncertain whether the people at the other end were listening.	5 4 3 2 1
12.	When someone at the other end spoke, it was always clear to whom he was speaking.	5 4 3 2 1
13.	This type of system makes me feel that I am constantly being observed by those at the other end.	5 4 3 2 1
14.	I think if we had all been together in the same room the discussion would have been more productive.	5 4 3 2 1
15.	I had quite a bit of trouble knowing how the people at the other end were reacting to the things I said.	5 4 3 2 1
16.	The graphics monitors were useful.	5 4 3 2 1
17.	When those at the other end were speaking, I never got the feeling they were speaking directly to me.	5 4 3 2 1
18.	Sometimes I was uncertain as to who was supposed to respond to comments from the other end.	5 4 3 2 1
19.	I think if we had all been together in the same room I would have felt more comfortable.	5 4 3 2 1
20.	It was clear to me that those at the other end were well organized and knew what they were doing.	5 4 3 2 1
21.	I wasn't at all confused about the positions that were taken at my end.	5 4 3 2 1
22.	It was sometimes hard to react to things said at the other end because it was hard to interpret what was meant.	5 4 3 2 1
23.	It was clear to me what the two ends should have been doing to have a better discussion.	5 4 3 2 1
24.	I wasn't always sure just what the people at my end expected of me.	5 4 3 2 1
25.	I felt that the two ends talked past each other quite a bit because all of us were confused about what was going on at each other's end.	5 4 3 2 1
26.	I clearly understood the positions taken by the people at the other end.	5 4 3 2 1

At the right hand side of the page is a representation of the seating arrangement of your meeting.

(1) In one of the two rows numbered (1) indicate the seat you were sitting in by putting an X through that circled letter.

(2) In the two rows numbered (2) indicate as well as you can whether or not <u>each of the other people seemed to agree with the things you said</u>, by marking:

> A - seemed usually to agree
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> M - agreed with some things, but not others
> ? - I have no idea

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> A - I tended to agree with what the person said
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> M - I agreed with some things but not others
> ? - I have no idea

(4) In the two rows numbered (4) indicate as well as you can whether or not <u>each of the other people seemed to understand the implications of the thing you said, regardless of whether or not they seemed to agree</u>.

> U - the person seemed to understand
> N - I do not think the person understood
> ? - I have no idea

(4) □ □ □

(3) □ □ □

(2) □ □ □

(1) ⓐ ⓑ ⓒ

THE OTHER END

YOUR END

(1) ⓓ ⓔ ⓕ

(2) □ □ □

(3) □ □ □

(4) □ □ □

Any additional comments? _____

_____

_____

_____

POST SESSIONS QUESTIONNAIRE

Audio Teleconferences

NAME _____

   Please state <u>briefly</u> what you felt were the recommendations for
the course that came out of today's meeting. Put only one recommendation
in each box and use as many boxes as necessary.

   After each recommendation, scales are provided for you to indicate
(a) the extent to which you personally agree with the recommendation
(b) how important you think the recommendation is for the course.

RECOMMENDATION:	strongly agree ———	very important ———
	agree ———	quite important ———
	undecided——	not very important ——
	disagree ____	not at all important [1] ———
	strongly disagree ———	

RECOMMENDATION:	strongly agree ———	very important ———
	agree ———	quite important ———
	undecided——	not very important ——
	disagree ____	not at all important [1] ———
	strongly disagree——	

RECOMMENDATION:	strongly agree ———	very important ———
	agree ———	quite important ———
	undecided——	not very important ————
	disagree ____	not at all important [1] ———
	strongly disagree——	

RECOMMENDATION:	strongly agree ———	very important ———
	agree ———	quite important ———
	undecided——	not very important ———
	disagree ____	not at all important [1] ———
	strongly disagree——	

RECOMMENDATION:	strongly agree ———	very important ———
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dissatisfying	___	___	___	___	___	satisfying
warm	___	___	___	___	___	cold
dynamic	___	___	___	___	___	static
competitive	___	___	___	___	___	cooperative
useless	___	___	___	___	___	useful
varied	___	___	___	___	___	repetitive
productive	___	___	___	___	___	counterproductive
lively	___	___	___	___	___	dragging
aimless	___	___	___	___	___	directed
bad	___	___	___	___	___	good

Please indicate the extent of your agreement or disagreement with each of the following statements.

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CIRCLE ONE

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CIRCLE ONE

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(4)

(1) In one of the two rows numbered (1) indicate the seat you were sitting in by putting an X through that circled letter.

(3)

(2) In the two rows numbered (2) indicate as well as you can whether or not <u>each of the other people seemed to agree with the things you</u> said, by marking:

(2)

        A – seemed usually to agree
        D – seemed usually to disagree
        M – agreed with some things, but not others
        ? – I have no idea

(1)   ⓐ   ⓑ   ⓒ

THE OTHER END

(3) In the two rows numbered (3) indicate whether or not <u>you tended to agree with what each of the other people</u> said:

YOUR END

        A – I tended to agree with what the person said
        D – I tended to disagree
        M – I agreed with some things but not others
        ? – I have no idea

(1)   ⓓ   ⓔ   ⓕ

(4) In the two rows numbered (4) indicate as well as you can whether or not <u>each of the other people seemed to understand the implications of the thing you said, regardless of whether or not they seemed to agree.</u>

(2)

(3)

        U – the person seemed to understand
        N – I do not think the person understood
        ? – I have no idea

(4)

Any additional comments? _____

_____

_____

_____

(Concerning rows (2) (3) and (4)

As you couldn't see the people at the other end, you probably don't know how they were sitting. However, you probably could tell the difference between their voices. Whatever scheme you have for telling the people apart, think of one of them as ⓐ, another as ⓑ, and the other as ⓒ, and fill in the boxes that way. Just forget about the "true" seating arrangement.

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WESTON, J.R.
  Teleconferencing: a comparison
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