David Crocker

Working Paper

ISI / WP- 4

September 1976

A Teleconference on TELECONFERENCING

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ABSTRACT

This document serves the dual purpose of reporting the results of extensive discussion which took place during a seminar on "Human Communication in Teleconferencing" and of illustrating the process of computer-based teleconferencing. In this seminar, students, faculty and researchers from several universities and research institutes participated in occasional group meetings and extensive online interaction using a modified version of the FORUM 5 system. The transcript from the computer conference has been reorganized in this document into two parts: "Toward a Taxonomy of Teleconferencing" and "Toward Improved Computer Teleconferencing." The first part is subdivided into a number of topics on the definition and classification of teleconferencing situations and systems and the second part is subdivided into a number of topics on the user interface and desirable capabilities for teleconferencing systems. The seminar and this document are unique in that they use the medium of teleconferencing to discuss the problems with and possibilities for its use.

TABLE OF CONTENTS

INTRODUCTION
by Jim Carlisle

This report covers a conference on Teleconferencing, extending from February until late July 1975. While the conference met face-to-face every two weeks at USC/Information Sciences Institute, the majority of the interaction occured through a teleconferencing medium, called NCONFER (a modified version of FORUM5).

In this report, we have organized and edited the entries of this teleconferencing interaction. The text that originally occurred in the teleconference is printed with a smaller and lighter font, as shown by the following entry:

[2] Carlisle(Chrmn) WED 19-FEB-75 5:27PM

SEMINAR ON "HUMAN COMMUNICATION IN TELECONFERENCING"

Organizer:

Jim Carlisle

Sponsors:

USC Annenberg School of Communications and
USC Information Sciences Institute

Meetings:

Held every other Wednesday, from 3-5 pm in the ISI 11th floor conference room

Assignments:

In consideration of the fact that most of us are working full-time in addition to participating in this seminar, assignments will be kept to a minimum. A course bibliography was distributed at the first meeting. Each of you is requested to select one or two readings per topic. One week after each class meeting, you are asked to report on what you found of interest in the readings. To facilitate group interaction, without tying up the valuable face-to-face meeting time, we will use the conference medium for these literature reviews. This permits others in the seminar to browse through the reports and decide whether additional reading is worthwhile.

Guest Speakers:

Several are under consideration. One idea is to invite them to participate in the class discussions, which can be structured as problem solving sessions with one or more specific objectives per meeting. Rudy Bretz spoke at the second meeting -- and subsequently joined the seminar as an active participant.

Topics:

The following six topics were selected at the first meeting:

1) How is Teleconferencing currently being used and by whom?

2) What research is underway?

3) What problems do people have with current and proposed systems?

4) What are the behavioral functions involved in teleconferencing and what protocol mechanisms are needed for various systems?

5) What current and emerging technologies can be used for teleconferencing and how should they be matched to applications?

6) What research and development is needed?

. . .

Deletions from the original entries are indicated by three dots, as shown in the above entry. The header line for each entry (listing an entry number, the name of the author of the entry, and the date and time of creation) was automatically generated by the NCONFER system.

We decided to correct gross misspellings to improve readability, but the transcript entries are, for the most part, reproduced here exactly as they were entered.

This teleconference differs from many that have used FORUM and CONFER in the past in that almost all of the interaction took place in "nonrealtime" (i.e. asynchronously) On the occasions when two or more participants were typing at the same time, some realtime interaction was attempted but this rarely resulted in anything very substantial. It is possible that the need for realtime exchange was largely fulfilled in our bi-weekly face-to-face meetings. The nonrealtime nature of this conference may also have been due to the fact that considerable reflection was generally needed before participation. Another result is that the entries are considerably longer than in most teleconferences.

Restructuring and Editing the Transcript

Entries from the original transcript have been substantially reorganized from the chronological order (and categories) in which NCONFER maintained them. The following discussion, with examples from the transcript, describes the reasons for and the process used in restructuring the conference transcript.

Heavy interaction in the online conference lasted for about three months and resulted in nearly 400 entries by nineteen participants. After about two months, we began a discussion (within the conference) on what to do with the burgeoning transcript. Dave Crocker was bringing nicely printed transcripts to the group meetings. Any new participant or one who had been offline for more than a few weeks would simply be overwhelmed by the volume of new entries to review when he rejoined the conference. By that time, we also found we had deviated from the originally agreed upon structure of the seminar. After the first meeting the following agenda/schedule had been used to structure discussion within the conference:

TITLE:

HUMAN COMMUNICATION IN TELECONFERENCING

TOPIC 1:

Applications and Proposed Taxonomies
(prior to February 26)

TOPIC 2:

Past and Current Research
(prior to March 12)

TOPIC 3:

Problems With Current and Proposed Systems
(prior to March 26)

TOPIC 4:

Behavioral Issues Involved in Teleconferencing
(prior to April 9)

TOPIC 5:

Current and Emerging Technology
(prior to April 23)

TOPIC 6:

Research and Development Needed for Teleconferencing
(prior to May 7)

Interest in the taxonomy exercise continued at a high level beyond the first month of the seminar. Furthermore, participants began to put all entries into TOPIC 1 in order to ease the burden of searching manually through each of the six topic activities for new entries each time one logged into the conference. By the end of the third month there was considerable interest in restructuring the transcript -- both for convenience of retrieving entries and for sharing the discussion with our colleagues.

There was some discussion as to who the audience was for a report such as this and we debated the relative merits of options ranging from an un-edited copy of the transcript to the preparation of one or more completely new papers integrating the ideas found in the transcript. There are relatively few entries in the transcript on these questions since a good deal of the discussion as well as organizing the sub-group which edited this report took place during our face-to-face meetings. (See the section in this report on Shortype.)

Early in the conference, the possibility of some form of publication was raised. Carlisle, while reviewing a paper, suggested that it might serve as a stylistic model for our report.

[24] Carlisle(Chrmn) SAT 1-MAR-75 5:05PM

Notes on Russell Ackoff and James Emery's "Third Version of an Idealized Design of a Scientific Communication and Technology Transfer System", October 1974:

. . .

The style of this paper is similar to that of a NCONFER transcript, with 61 numbered, short paragraphs. From the title, it is obvious that this is the third iteration of this set of statements. We might consider editing one of our topic discussions for this sort of iterative publication and discussion.

The question of what to do with the transcript was raised again by Press, and briefly discussed in the following exchange. Though not explicitly stated, there seemed to be a consensus in favor of editing the transcript and publishing a document.

[59] Press TUE 15-APR-75 5:50PM

WHAT SHOULD BE DONE WITH CONFERENCE TRANSCRIPTS??

PUBLISH THEM? MILDLY EDIT AND PUBLISH? RADICALLY EDIT AND PUBLISH? REVIEW THEM IN COMPUTING REVIEWS, RELEVANT JOURNALS AND/OR SIG PUBLICATIONS? DISTRIBUTE THEM ON TAPE? DISTRIBUTE THEM AS TECH MEMOS? SCRATCH THEM?

IF THEY ARE SOMEHOW DISTRIBUTED PEOPLE CAN CLAIM "CREDIT" FOR PARTICIPATION. (AUTHORS COULD BE LISTED IN ORDER OF NUMBER OF BITS CONTRIBUTED).

[Larry Press made his entries via an old teletype machine installed at his home which was capable of generating only upper case letters.]

[60] Farber TUE 15-APR-75 8:45PM

<Re: [59]>
radically edit them and distribute via tech memo.

[61] Carlstedt WED 16-APR-75 12:41PM

I think it would be interesting to try to carry out the task of editing a transcript for publication as part of the conference itself. This would force a lot more response and interaction. There would have to be some facility for keeping track of updates and versions, however--not something that NCONFER is very conducive to.

[64] Carlisle(Chrmn) MON 28-APR-75 10:12PM

<RE Press's and Farber's comments [59,60]>
What to do with the conference transcripts was a key consideration in setting up the seminar and the on-line conference. Its main functions are to maintain a record of our evolving ideas and debate, to facilitate communication among participants between the meetings, to substitute for the traditional seminar assignments of papers and reports, and to experience a form of teleconferencing. It became clear by the second meeting that the taxonomy assignment was of long-term interest to many of us. Thus it is the focus of much of the activity in this conference.

[65] Carlisle(Chrmn) MON 28-APR-75 10:20PM

I agree with Dave that we must radically edit the transcript before any publication. Ackoff and Emery's paper is an example of what an edited conference transcript might look like. CF [24] above. We must preserve the integrity of individual points of view and respect the informality with which entries have been made in many cases. The task of editing this transcript into a focussed and coherent whole will be substantial. My suggestion is that we use it as a reference until the end of the seminar. Then, edit out the mistakes and allow anyone to withdraw any entries he has made and regrets or wishes to retain for personal use. We can then set up an editorial policy and clean up the transcript for more formal reference. cont'd.

[66] Carlisle(Chrmn) MON 28-APR-75 10:29PM

As far as publication goes, I think that there are some good ideas and much hard work and thought in the current transcript. I suggest that we set up a new conference in a few weeks within which a coherent paper can be developed. Entries from the current conference can be PUT into a file, edited and revised, and resubmitted to the new confrence in more polished form. I'm open for suggestions of topics and volunteers for the various editor roles.

Note that in this exchange, Carlstedt [61] mentions the possibility of editing a report during the conference. This possibility is explored further under the topic of "Collaboration support".

Six weeks later, Press suggested a report outline. Some discussion of how to proceed followed, however, as noted above, a good deal of this was done during the next face-to-face meeting.

[219] Press FRI 30-MAY-75 12:23PM

<RE WHAT TO DO WITH OUR TRANSCRIPT:>
I WOULD LIKE TO BEGIN A CONCRETE DISCUSSION OF WHAT SORT OF REPORTS AND OTHER OUTPUTS MIGHT RESULT FROM OUR EFFORTS IN THIS CONFERENCE. I PERSONALLY FEEL THAT ENOUGH ENERGY HAS GONE INTO THE CONFERENCE AND ENOUGH INTERESTING THINGS HAVE BEEN SAID TO JUSTIFY PUTTING OUT AN EDITED MEMO. I WOULD BE WILLING TO WORK ON IT AND WILL SUGGEST A FIRST ALTERNATIVE OUTLINE IN THE FOLLOWING ENTRY.

[220] Press FRI 30-MAY-75 12:30PM

PROPOSED MEMO OUTLINE.

I. INTRODUCTION

WHO WAS IN THE CONFERENCE? WHAT WAS THE PURPOSE OF THE CONFERENCE? WHAT SORT OF SYSTEM WAS USED?

II. CONTENT SECTIONS.

EACH OF THESE SECTIONS WOULD CONSIST OF EDITED TRANSCRIPT MATERIAL, ORGANISED AROUND VARIOUS TOPICS OR "THREADS". THERE WOULD BE SOME OVERLAP AMONG THEM AND EACH CONTENT SECTION WOULD BE INTRODUCED WITH A PARAGRAPH OR SO. THE FOLLOWING ARE SUGGESTED CONTENT SECTIONS:

UNIDIMENSIONAL CLASSIFICATION SCHEMES.
MULTIDIMENSIONAL CLASSIFICATION SCHEMES (ANDERSON-SUTHERLAND, CARLSTEDT, AND BRETZ).
TELECONFERENCING SITUATIONS.
CONFER COMPLAINTS AND SUGGESTIONS. THESE WOULD ONLY BE INCLUDED IF THEY WERE OF GENERIC INTEREST RATHER THAN CONFER-SPECIFIC. I AM THINKING HERE OF THE ROUGH DISTINCTION RAISED IN ACTIVITY 3 BETWEEN SUGGESTED FEATURES AND NITS.
TERMINOLOGY. DISCUSSIONS OF THE DEFINITIONS OF TERMS SUCH "TELECONFERENCE", "SYSTEM", AND "SITUATION".
BEHAVIORAL ISSUES. COSTS AND BENEFITS OF PARTICIPATION, FEEDBACK, INSTRUMENTATION.
DATA ORGANIZATION AND RETRIEVAL PROBLEMS.
PROPOSALS FOR FUTURE ACTION.
SHORTHAND AND ABBREVIATIONS.
CRITICAL REVIEWS OF LITERATURE.

III. EVALUATION OF THIS CONFERENCE. INTERVIEWS OF PARTICIPANTS REGARDING SUCH FACTORS AS:

THEIR LEVEL OF PARTICIPATION.
REASONS FOR PARTICIPATING AS THEY DID.
EVALUATION OF THE EXPERIENCE.
EVALUATION OF THE RESULTS (THE TRANSCRIPT).

[221] Press FRI 30-MAY-75 12:57PM

THE ABOVE IS NOT INTENDED TO CALL FOR A PRECIPITOUS TERMINATION OF THE ONGOING DISCUSSION, BUT TO START US THINKING ABOUT HOW TO WRAP IT UP. PERHAPS IT IS TOO EARLY. PERHAPS YOU HAVE OTHER SUGGESTONS FOR A MEMO. PERHAPS WE SHOULD BEGIN SOME NEW ACTIVITY OR FOLLOW UP SOME OF THE PROPOSALS WHICH HAVE APPEARED IN THE TRANSCRIPT. (THE OPERATING SYSTEM JUST BEGGED ME TO DELETE UNNECESARY FILES.)

[222] Carlstedt FRI 30-MAY-75 4:25PM

<RE: [219,220 Press]; publication>
Some random thoughts: The list of content-topics looks good--in looking back thru the transcript, those do seem to be the major categories of discussion. We may need to add "publication", depending on response to Press's proposal. I'm in favor, assuming some consensus on what we have to say and to what class of readers....It would seem more useful to almost any class of readers to have the transcript distributed by topic rather than presented in its present or in purely chronological order. We need to decide which entries should be retained and which ones let go; how much editing (and possibly annotation) should be done on the retained ones, and by whom; and what kind of introductory and explanatory remarks should be included.

How about collaborating on the first step via a poll regarding which entries (or parts of entries) you think should be retained. You could submit your list as an entry here, or bring it to the June 4 meeting. What retention criteria should we use, both as individuals and as a body politic? Such a poll would actually constitute the kind of feedback needed to promote entries from "level 3" where most of them probably still reside, to "level 4" (see [97])! I suggest that after that, the author of each retained entry express himself on what editing changes he would like to see made (including possible deletion), annotations he would like to include with it in the publication, or other afterthoughts.

As with Press, this entry doesn't assume termination of this conference.

[223] DCrocker SAT 31-MAY-75 4:49PM

<Publication>
I agree with Press' [220] and Carlstedt's [222] suggestions with the following minor suggestions:
1. Under Results (which sounds so final) a section on "Remaining Questions". A lot of our work has been to survey the issues that are relevant, rather than to clearly resolve them.
2. Let's first generate a list of threads and, when suggesting what entries are to be retained, indicate what thread(s) they are part of. Might be useful, for long entries, to indicate what part of the entry (probably best not to get too much detail) belongs with the thread.

The online discussion ended with Bretz' [239] comment that "Had we encountered Carlstedt's ideas on collaborative, on-line editing earlier in the conference, we would be in a better position now to edit the transcript and make a publication of it."

During the summer of 1975, discussion about editing the transcript continued. Interestingly, the communication medium shifted from NCONFER to SNDMSG and MSG -- programs designed to send and process private messages within the ARPANet. The outline proposed by Press [220] above was used by six of us to classify our own entries. We each sent messages to a common directory mailbox, COMGUEST, with our classification lists and suggestions.

We organized ad edited these entries, both as an illustration of how teleconferences work in practice and also because we felt that valuable ideas about teleconferencing developed during the conference that we wanted to convey to you.

ACKNOWLEDGMENTS

General editing of this report was performed by:
Rudy Bretz (Media Consultant)

Editing of individual sections, as credited in each section, was done by:
Jim Carlisle (USC Annenberg School of Communication)
Jim Carlstedt (USC Information Sciences Institute)
David Crocker (USC Annenberg School of Communication)
Jim Levin (USC Information Sciences Institute)
Laurence Press (Editor of Interface)

Other participants in the seminar who contributed to the original conference transcript were:
Robert Anderson (THE RAND Corporation)
Steve Casner (USC Information Sciences Institute)
??? Donchin (???? - participated entirely over the ARPANet from some unknown place)
Dave Farber (UC Irvine)
Jean Iseli (Mitre Corporation)
Bill Mann (USC Information Sciences Institute)
Jack Nilles (USC Office of Interdisciplinary Studies)
Paul Raveling (USC Information Sciences Institute)
Lee Richardson (USC Information Sciences Institute)
Rob Stotz (USC Information Sciences Institute)
Ivan Sutherland (THE RAND Corporation)
Fred Williams (USC Annenberg School of Communications)

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PART I

Toward a Taxonomy of Teleconferencing.

ON THE DEFINITION OF TELECONFERENCING.

Edited by Rudy Bretz

It was well into the conference, after much discussion of what a taxonomy of teleconferencing should be like, before it was felt necessary to tie down just what it was that we all meant by the term "teleconferencing". Of course, a certain amount of discussion was needed just to examine the area, without which an attempt to agree upon a definition would have been premature. In order to give the reader an advantage which we participants were denied, the entries that led to a definition of the subject of the discussion are placed at the beginning of the report.

[71] Levin THU 1-MAY-75 12:44AM

Common characteristics of Teleconferencing Situations in [70]
1) More than two communicating people ("conference")
2) At least one remote member ("Tele")

[136] Bretz MON 12-MAY-75 4:44PM

<Cued by Levin [71]>
Levin's "Common characteristics of teleconferencing situations" could, with slight alteration, be made into a very good definition of teleconferencing. I think this definition is important, if only to save us working on something that is not relevant. While the first of Levin's two characteristics, "more than two communicating people" is indeed a characteristic of all teleconferences, it doesn't do for a definition. If a professor records a lecture which two years later is used as a springboard for a class discussion, this requirement would be fulfilled. Likewise if A sends a message to B, who relays it to C, who then relays to D, there are three communicating people, but not necessarily a conference. A conference, in my view, requires INTERcommunication. Messages originated by each participant must reach all other participants. This would eliminate such systems as CATV electronic-pulse polling, where digital pulse feedback from a large number of subscribers reaches only a central computer. Of course, the computer then totals and manipulates and tabulates and it can feed the aggregated result to all subscribers. Maybe we need a further requirement in order to eliminate this kind of thing. Or do we want to eliminate it; should it be included as teleconferencing?

Levin's second characteristic in [71] was "at least one remote member". In all its various applications the prefix "tele" has in the past generally implied distance, which is also implied by "remote". However, a participant may also be remote in time. Tele always implies distance. However, distance among participants characterizes teleconferencing only in real time systems. We would probably want to include our use of an electronic notebook as a "teleconferencing" system. Yet this bridges time, at least for the ISI staff members participating, not distance. If we are to include non-real-time systems as teleconferencing, then we must defy tradition, break the semantic bounds, or whatever else we may be doing, and broaden the meaning of "tele-" to mean distant, either in space or in time. How about "Teleconference : A situation involving more than two intercommunicating people at least one of whom is remote, either spatially, temporally, or both."

[139] Bretz MON 12-MAY-75 5:21PM

The definition of teleconference proposed in Bretz [135] would have the following results: It would cover a board meeting at which an absent member listens in by telephone and is heard on a speakerphone. It could also cover a board meeting that adjourns for two weeks after a certain amount of deliberation, so that a transcript can be prepared, sent to an absent member, and his input received by return mail, the meeting then being reconvened. It would cover an exchange of correspondence among three or more persons in which each participant sends carbons to all other participants, . who also do the same. I submit that if electronic notebook is teleconferencing, then so too is correspondence with multiple copies to several persons.

I think "teleconferencing" will have to clearly exclude intercommunication between two persons only. Person-to-person situations are not conference situations. This is not to say that a teleconference system cannot be used in the person-to-person mode; some of the meetings on the MRC-TV system consist of only two people. Nor is it impossible to use a system designed primarily for individual terminals, such as video telephone, with two or more persons at a terminal. I guess it is the major or primary purpose of the system design that determines whether it should be called a person-to-person or a teleconference system. Perhaps the term "node" could be substituted for "person" if we want to keep the terminology broad enough to include a computer or storage/retrieval system as one of the participants in a conference. The fact that the behavior of an organism is programmed would not prevent it from interacting with humans. Note the nearly totally programmed behavior of some telephone operators, civil service types etc. However, the term "node" implies a location, at which there might be one, or more participants. I guess if we mean person we had better say person.

[151] Levin TUE 13-MAY-75 3:29PM

<Re Bretz [136] re Levin [71]>
I agree with Rudy's suggestions, except that I would include systems where not every one gets a copy, but instead where there is the POTENTIAL that every one get a copy. (Perhaps a fine point, but I have the image of a network of people, where each person doesn't necessarily talk directly to all the others, but instead his contribution has the possibility of reaching all the others. In graph theory language, the nodes (people) form a connected network. I would also want to include systems where the others may receive some modification of your contribution, either annotated by others, or summarized in a statistic, or edited by others, etc. With our modern Einsteinian notions of space-time, "remote" can carry both kinds of meanings (distant in space and/or in time). However, making this explicit is probably better.

[161] Carlstedt TUE 13-MAY-75 5:12PM

Certain elements have been suggested as essential, some to make it a conference and others to make it tele.

Conference:

1. More than two participants. This is not as apparent to me as it (apparently) is to some. On what dimensions are there discontinuities between 2-person dialogues and 3-person conferences?

2. Interactive communication. The requirement for interaction, as opposed to mere intercommunication, seems to imply a content-dependent criterion. How can you tell whether there is actually interaction unless you can observe what is being said. If n people are merely updating each other periodically regarding certain attributes of themselves or their contexts, without any "interesting" or "effective" keyed response, as happens in our family round robin, can that be considered a conference? I think I agree, therefore, with Rudy's insistence on interaction, but it creates this difficulty. If the information content can be used as a criterion, why not the use to which it is put as well (so that one could, if so disposed, also exclude manipulative applications from the realm of TC!)

Tele:

The restriction to distance or remoteness, even when broadened to include both space and time, still seems a bit too narrow. It excludes, for example, the situation where three people engage in real-time conferencing (not remote in time) from three adjacent offices (not very remote in space). Maybe a better criterion is "separation," as a result of the barrier represented by the limitation imposed by the substitution of artificial channels for natural ones (where I use the word "channel" in a very broad sense, to include, for example, the behavior exhibited by entry-synchronization rules). The criterion, and the definition, then depend on what classes of artifices one wishes to include or exclude. For my part, I would tend to be very generous at this point.

You may have noticed that I can't resist the compulsion to enter every discussion about terminology. Its a disease.

[169] Press THU 15-MAY-75 11:57AM

OUR EVOLVING DEFINITION SEEMS TO INVOLVE HAVING TWO OR MORE PARTICIPANTS, SOME SORT OF SEPARATION, AND SOME SORT OF INTERACTION. WHILE SOME MIGHT WISH TO LIMIT THEIR INTEREST TO "ELECTRONIC" OR EVEN TO "DIGITAL" TELECONFERENCING, IT IS A FACT THAT THIS CONFERENCE HAS ALREADY DISCUSSED MANY EXAMPLES OF "UNQUALIFIED" TELECONFERENCING.

I WOULD LIKE TO BRING UP ANOTHER DIMENSION IN WHICH THIS DEFINITION MIGHT BE TOO BROAD. IT WOULD INCLUDE, FOR EXAMPLE, AN AIRLINE RESERVATION OR OTHER INVENTORY (DATA BASE MANAGEMENT) SITUATION. DO WE WISH TO INCLUDE SUCH SITUATIONS? IF WE DO WISH TO INCLUDE THEM, IGNORE MY NEXT ENTRY (BUT TELL ME WHY); OTHERWISE, READ ON. (I'M NOT DECIDED MYSELF, SO I WILL READ ON).

[170] Press THU 15-MAY-75 12:09PM

THE FEATURE OF THESE SITUATIONS WHICH SEEMS TO DISQUALIFY THEM IN MY MIND IS THE HIGHLY STRUCTURED NATURE OF THE ALLOWABLE INPUTS. TO PUT THIS INTO PSEUDO INFORMATION THEORETIC TERMS, THE INFORMATION CONTENT OF THE AVERAGE ENTRY IS LOW. CAN SOMEONE MAKE THIS CRITERION (MINIMUM ALLOWABLE AVERAGE INFO PER ENTRY) OPERATIONAL? CAN SOMEONE OFFER ANOTHER CONTENT-FREE QUALIFICATION THAT WOULD EXCLUDE AIRLINE RESERVATION SYSTEMS ET AL FROM OUR EVOLVING DEFINITION? (IF WE INDEED DECIDE THAT WE WANT TO EXCLUDE THEM).

[206] Carlstedt FRI 23-MAY-75 2:12PM

Another way of expressing the criterion "structuredness of inputs" might be "complexity of transformation" of inputs in representing them in the shared information base (whatever it's called), where "input" is taken as the thought or intent of the participant rather than what he is constrained by the system to express. i.e. transformations occur between brain & entry and also between entry (or command, etc.) and central storage. An extreme value on this dimension, but one that probably fits a common notion of conferencing, is that the inputs aren't transformed much at all, but are stored and read in a form very close to "natural". Then data base management would be included only if it consisted primarily of natural text. I think my own criterion lies somewhere in this area.

In other words, I think Press is on the right track here. Unfortunately (I somehow feel), this excludes a good portion of collaborative work, e.g. system design or programming. Maybe a collaboration that requires a highly-structured representation of the object of collaboration ("project state") can be partitioned into the relatively informal part (conferencing) and the formal part (updating the project state). Levels 6 & 7 defined in [97] might be a formal representation of the project state. Collaboration then, as via a shared data base, does not imply any (levels of) conferencing.

[213] Press MON 26-MAY-75 4:08PM

I DONT THINK THAT COLLABORATIVE WORK IS RULED OUT AND I CERTAINLY DONT MEAN IT TO BE. EXAMPLES 1 AND 2 IN MY ENTRY 3.17 POSTULATE A STRUCTURED PROJECT STATE WITH FREER COMMENTS WHICH ARE ORGANIZED AROUND THE STRUCTURE OF THE PROJECT STATE. IN SUCH CASES, A PORTION OF THE "TRANSCRIPT" IS STILL UNSTRUCTURED (AS YOU POINT OUT).

FURTHERMORE, MY SUGGESTED CRITERIA (INFORMATION) WOULD CONSIDER NOT JUST DEGREE OF STRUCTURE, BUT THE NUMBER (AND, IF WE WANT TO GET PICKY, DISTRIBUTION) OF POSSIBLE INPUTS. FOR EXAMPLE A DATA BASE ENTRY FOR "SEX" CAN ONLY HAVE TWO RESPONSES.

[252] Bretz TUE 10-JUN-75 2:36PM

<File: Terminology>
This is intended to be a working definition of teleconferencing, submitted for comments.

TELECONFERENCING:

Interactive discourse among more than two intercommunicating individuals at least one of whom is separated from the others by space and/or time and/or other barriers.

Discussion of the definition:

More than two. These words are used in order to indicate that we intend the term *conference* to be understood in its more limited sense. A conversation between two persons, for instance, is not a conference in this sense. It seems that the meaning of *conference* is not fully agreed upon among lexicographers. The Encyclopedia Britannica (1968), describes conference as "a bringing together, for purposes of discussion and sometimes decision, of representatives of sovereign states or of delegates of all sorts of bodies and societies". Funk and Wagnalls (1960), however, also defines

conference in a second sense as "2. conversation; discourse." Webster's 3rd International (1971) is even more definite about it : "3. A meeting for consultation, discussion, or an interchange of opinions whether of individuals or of groups." and "6a. An formal meeting for purposes of intensive instruction between a teacher and a small group of students or a single student." Despite the existence of a broader sense, we have chosen to narrow the meaning of conference so as to exclude one-to-one conversations (such as ordinary telephone calls) and include one-to-two-or-more discourse (such as telephone conference calls). In this we are following the usage of the telephone organizations who use the term conference to mean simultaneous interconnection among three or more terminals. A conversation between two persons on a telephone party line would not be considered a conference, however many eavesdroppers happened to be listening in, until one of these decided to put his own two cents worth into the discussion. A telephone party line COULD thus be considered a teleconferencing system, since it COULD be used for this purpose, but person-to-person conversations held on it would not be called teleconferences.

Intercommunicating individuals The alternative to intercommunicating is the simpler word communicating, which, however, is too broad to be useful. Three persons at adjoining desks could be on the phone, each simultaneously communicating to a different respondent, yet the group would not be conferencing. Likewise, if person A sends a message to person B, who then relays to C, who finally replies to B, the total exchange has not been a conference. Nor would it be a conference if B replied to A before relaying to C, or after receiving C's reply. At most it would amount to two or three telephone calls (one-to-one, two-way) or exchanges of correspondence, whatever the medium might be.

Individual The word individual is included to limit the communication nodes to humans; intercommunication with a computer or data base, however sophisticated and human-like the program might be, would not be considered teleconferencing. The use of the term *individual* is also meant to imply that to each participant, all other participants are individualized, even if they are not acquaintances or known by name. In short, there is no aggregated or undifferentiated "audience" in teleconferencing, but a discrete set of participants. Not all two-way communication is among individuals. In CATV electronic pulse polling, for example, it is proposed, if not actually demonstrated, that hundreds or thousands of cable TV viewers at their home terminals make simple yes-no or multiple-choice responses to questions presented in a TV program. These responses are received by a central processing unit, totalized or otherwise manipulated, so that almost immediately a considerable amount of statistical information concerning the responses of the entire population of viewers can be fed to all participants. Carrying this procedure a step farther, it could be extended into a simple Delphi system with the addition of 2nd or 3rd iterations, giving each participant the opportunity to modify his response in the light of the responses of the entire population. This is two-way communication, but it is not between individuals; it is between individual and computer (data from other individuals can be considered the contents of the messages that are returned). Also, an individual participant in such an exchange is not aware of other participants as specific individuals with whom he is in direct contact, but only in the aggregate - an undifferentiated mass of "other participants" with whom he has only secondary contact.

Interactive discourse implies several characteristics. First, it implies that all messages submitted by each participant must, in their essence, reach all other participants. I am thinking of a possible system in which audio and video transmissions reach some participants, while only audio transmissions reach others. On the assumption that audio carries the "essence" of the content, such systems could be said to comply with this criterion.

Even when a two-way system does provide for direct communication among a number of individuals,

it may still fail to provide for interaction. The minimum number of communications on a two-way system must be three before it can be determined whether INTERACTIVE communication is going on. First there will be an initial statement or question, to which there will, second, be a response. Assuming that this response reaches the original sender, as it must if the system is to be called two-way, INTERACTIVE communication will now require a third communication, based on, or recognizing this response, or altered in some way from what it might otherwise have been, due to the reception of the response. A system that does not provide for this third action could be called a "responsive" system, but not interactive. To take another example, a random-access system from which a learner may select recorded messages at will could be called responsive, but not interactive.

"*At least one of whom is separated from the others by space and/or time and/or other barriers.* This phrase recognizes and defines the meaning of *tele* in teleconferencing. Originally only technological devices that concerned long-distance perception, such as the telescope, or long-distance communication, such as the telegraph, were given the prefix Tele-, which is from the classical greek word tele, meaning far, far-off, or distant. Television, telewriting, telegraph, and telautograph all imply simultaneous communication, via electronic means, across distance, but not across time. Recorded visual materials (film, filmstrip etc.) and hard copy materials (the printed page) were necessary if time were to be bridged as well as space. In the last few decades, however, electronic means for recording and playback of pictures, sound and alphameric information have become increasingly important. The meaning understood by tele has been broadened. In common usage, "television" for example, includes anything that is transmitted via a TV channel and displayed on a TV screen, it need not be originated live, in real time, but can as well be a playback of previously recorded material on film, or video tape.

Teleconferencing, among computer users, has come to apply to a type of non real-time intercommunication in which a message may be entered into a computer file whenever convenient to the sender, and reviewed by other participants in a teleconference whenever it is convenient to them to do so. Distance may or may not be involved; the barrier separating sender and receiver of a message may be time instead, or some other barrier such as a wall. Electronic means are used. It is possible that in this context at least, tele may be understood to imply only the use of electronic means. It would not be necessary to depend on electronic means to record, store and playback messages; many means for recording and widely reproducing recorded materials are available (e.g., photocopying, mimeographing, printing). The fact is, however, that electronic means, though not widely available, are usually convenient, and faster. A correspondence "conference" might stretch out for so long that the interests and motivations of the participants change before the original goals could be achieved, or it might more likely fall apart before really getting started.

Since the prefix *tele* has been attached to *conferencing* in describing such non-real-time methods that do not necessarily bridge distance, it must have acquired a broader meaning. Either tele is now understood by many to mean transmission across a discontinuity of time, as well as space, or it simply refers to the electronic means that are used for recording, storage, and playback. Perhaps it is both of these. In order to remain flexible, we have chosen not to limit our definition of teleconferencing to conferences that are mediated electronically, and we do include the use of non-real-time systems, which bridge time or time and distance in addition to real-time systems that bridge distance alone. Other SPACE barriers include locations that are isolated because of quarantine, inconvenient accessibility or isolation for research purposes even when there is no discontinuity of distance. Other TIME barriers might be constraints of scheduling making it impossible or inconvenient for a group of conferees to meet together in a single room all at the same time. Still another kind of barrier might exist because of inherent limitations of a participant (such as deafness) or linguistic limitations (a foreign participant who can read English well, especially

when he can take his time over it and use the dictionary freely, but who cannot follow spoken English at normal rates of speed). What does teleconferencing exclude? To answer this question, and fix the bounds of the defined area more clearly, let us consider several possible examples of teleconferencing that have been submitted for this purpose.

Example: A speech to a remote audience
TC? : no
Criteria one-way only (no interaction), no individualization (awareness of other participants as individuals)

Example : A colloquium lecture with questions from a remote audience
TC? : yes
Criteria: if the group is small enough to be individualized, and if questions are answered by the lecturer.

Example : A real-time discussion among remote participants each isolated from the others.
TC? : yes, providing
Criteria: it is individualized, and has more than two participants (separation and interaction)

Example : A west coast college class taught by a professor in Pennsylvania
TC? : yes, providing
Criteria: it is individualized, and interactive

Example : A new participatory art form, where each participant votes for or otherwise influences each successive addition to a creation.
TC? : yes, providing
Criteria: interaction, individualization, separation of participants are involved. The creation would be the goal, just as solving a problem, coming to an agreement, etc, might be in some other kind of conference.

Example : A board meeting at which an absent member listens in by telephone and is heard on a speakerphone.
TC? : yes, providing
Criteria: It is interactive and individualized, and at least one participant is separated (spatially)

Example : A meeting which adjourns for two weeks after a certain amount of deliberation, so that a transcript can be prepared and sent to an absent member, and his input received by return mail, when the meeting is reconvened. Transcript is used rather than telephone because of the importance of the decision involved and the

careful consideration required.
TC? : yes, probably, but this is a real borderline case.
Criteria: At least one participant is separated temporally, and spatially, and it is interactive and individualized. However, to make these last two examples more extreme, what if the absent member entered into things only very briefly, perhaps only to vote on the final resolution, would the event then be known as a teleconference? I think it is most unlikely.

[260] Carlstedt WED 11-JUN-75 10:51AM

<First-level response to Bretz[252-259]>
Scale: 0-4 (neg-pos) [see entry [233], in the Feedback thread for the first proposal of this scale]

Understanding: 4
Agreement: 3
Interest coincidence: 3
Relevance: 4
Stimulation: 4

Comments: The above represents a very high rating! I don't have time for more than the first-level response right now.

CLASSIFICATION SCHEMES
Edited by Rudy Bretz

At the outset the conference was given the task of developing a taxonomy of teleconferencing, and it was this orientation that kept it moving mainly in one direction, even though some very interesting threads of discussion arose that were purely side issues. At the same time the classification directive discouraged a narrow view, forcing us to think in terms of a spectrum of media, of purposes and conditions and to include the future/possible as well as the present/actual in our thinking. Much of this took place during the first few bi-weekly face-to-face sessions. Dave Crocker made the first entry in this thread, recording a list of classifiable features of teleconferencing and the participants who had volunteered to explicate them.

[22] DCrocker THU 27-FEB-75 5:21PM

Initial List of TC Taxonomic Elements (and their explicators):

	1. Function of the system
RS	2. Type of communications media
JC	3. Storage (amount, form)
RS	4. Bandwidth of communications channel(s)
DHC	5. Synchrony of participation
DHC	6. Simultaneity of entry
DHC	7. Message rate (delay)
IS	8. Control Structure
JHC	9. Info analysis functions
JL	10. Auxiliary components
JL	11. Number of participants
	12. Display space (size, type)
JM	13. Proximity of participants
JHC	14. Economics
IS	15. Privacy-Security ("Protection")
	16. Reliability
JR	17. Ease of use
JR	18. Accessibility
JL	19. Classification of participants
	20. Hardware requirements
	21. Software requirements

Of the 21 elements listed above, sixteen were volunteered for, but only half of these actually became entries. Those that did not were relatively unimportant features anyhow. Classifications of these eight features follow in the first entries of this thread.

[28] Levin THU 6-MAR-75 11:17AM

19. TAXONOMY: CLASSIFICATION OF PARTICIPANTS TO A CONFERENCE

1. Role in conference:
   - Information seeker
   - Information supplier
   - Decision maker
   - Decision seeker
2. Degree of participation
   - Full
   - Partial
     - Consultant: brought in to give information on some topic
     - Visiting member: full member for a short time
     - Technical assistants: interface between full member and the medium
     - Assistants to full members: full participants in some sub-area of discussion
3. Status interrelations
   - All peer relations
   - One chairman, all others peer relations
   - Hierarchical

[29] Mann MON 10-MAR-75 11:02AM

<Comment on taxonomic classification of participants:>

In the FORUM6 teleconferencing medium, the participants' roles planned were: Observer, Full Participant, Editor, Chairman.

A FORUM conference is a proceeding which leaves a data base behind. As I understand it, the Chairman was to have full control over the proceeding, and the Editor was to have full control of the data base. The Observer was a read-only participant.

[26] Levin THU 6-MAR-75 11:17AM

10. TAXONOMY: AUXILIARIES TO A CONFERENCE

1. Information gatherers or retrievers: take specifications from participants and bring back data
2. Information processors: take data from participants and give back modified data
   - 2.1 Information condensers: take data and give back summaries, conclusions, statistics, etc.
   - 2.2 Information expanders: take data and give back results of simulations runs, implications, impact reports, etc.

3. Communication aids: interfaces between the participants that help in setting up and maintaining the communication links
4. Historians: record the interaction and/or its conclusions for posterity (i.e. "recording secretaries")
5. Parliamentarians: regulate the interactions according to agreed upon rules
6. Morale builders: cheerleaders, comedians, coffee bringers, chaplains

[30] DCrocker MON-10-MAR-75 4:02PM

<Keys: Taxonomy, Data entry, Conference participation>
5. SYNCHRONY OF PARTICIPATION

A. Presence during the conference

a) Only one member MUST be present at a time;
b) More than one, but not all members MUST be present at the same time;
c) Everyone MUST be present.

The first two obviously require an "interactive transcription" capability. The third would tend to imply no interactive capability (though Calvin's TCTALK is an exception). "Interactive transcription" means that members can selectively and alternately (even simultaneously?) review and add to the conference transcript.

B. Membership

1) Must be completely defined before start of conference;
2) May be modified during course of conference.

The latter case lends a flavor of asynchrony.

C. Of Data Entry (Member Contributions to the Conference)

This refers to the "permanence" of specific entries. Again, a quality of asynchrony is introduced if members can modify their previous entries.

[31] DCrocker MON 10-MAR-75 4:03PM

<Keys: Taxonomy, Conference participation>
6. SIMULTANEITY OF ENTRY

A. To the General Membership
(How many can have the "floor" at one time?):

1) Only one at a time;

2) More than one at a time.

Since humans can only usefully attend to one speaker at a time (a la Sutherland's demonstration at our last meeting), Alternative #2 implies entry buffering (See Message Rate).

Playing around with multiple display screens could allow immediate display of multiple, simultaneous entries, but I question whether this is more than merely using the screen as a buffer. ...

The one case in which it could be considered more than a buffer is with simultaneous entry and immediate display, in which case the "speakers" may say different things, contingent upon other speakers' (simultaneous) entries. However, this case can be viewed as an example of an entry merely containing several sub-entries.

This leads to the question:

B. What is an ENTRY?

1) Stream of data entered and explicitly delimited by an individual participant (as with FORUM);
2) Any relatively continuously stream of data entered by a member;
3) A unit of thought.

"Continuous" implies the definition of a timeout, to serve as a delimeter between entries. If the member does "say" anything within that period, the entry is considered complete. (Voice-controlled systems would tend to follow this approach.)

Alternative #3 leads to the questions of what degree of resolution (sentence, paragraph, chapter, ?) is desired and how are the units detected (natural language understanding, simple syntax, variations in the pitch of the voice ...).

C. To the Transcript

(How many can be entering data to the record at one time? For example, one person may have the floor, and therefore be entering his comments into the record, and another person may be entering background data directly into the record -- not taking up "floor" time, but making the information to anyone reviewing the transcript.)

The "transcript" may be a series of storage devices (one for each sub-conference, as with the recording of private messages by considering each unique group of message passers to constitute a separate sub-conference) or the entry may not be entered until complete, in which case the "apparent" simultaneity (e.g., FORUM) is really arbitrated sequential entry.

[32] DCrocker MON 10-MAR-75 4:03PM

<Keys: Taxonomy, Conference participation>
3. MESSAGE RATE (delay)

a) Data appears to members as soon as it is entered, as with

TCTALK and the New York Metropolitan Regional Council TV system. In typing systems (TCTALK) this is sometimes VERY painful; however it has the advantage of giving the members some feel for the speaker's thought process;

b) Entries are buffered into sub-units (e.g., sentences) to somewhat smooth out the burstiness of input, facilitating reading/listening by members;

c) Entries are distributed as complete units (e.g., FORUM). Highest reader/listener bandwidth, probably the least "realistic" feeling.

[46] Anderson MON 24-MAR-75 12:50PM

CONFERENCING CONTROL STRUCTURE
Bob Anderson & Ivan Sutherland

I. Types of leadership authority

a) All have equal authority (except for times very much smaller than the conference duration, e.g., when the speaker "has the floor".)

b) One central authority (hereinafter called the chairperson)

c) Executive Committee

d) Hierarchical authority structure

e) Other arrangement of authority

II. The topology of existing logical communication channels. In most computer systems, as in the telephone network, the actual channels are arranged in a star or multiple level star connection. It is the logical connections through this physical network which are of importance, however. From this point of view the telephone network is symmetric - an everybody connected to everybody kind of thing. The basic types are:

a) All connected to all

b) Star

c) Linear (each talks to nearest neighbors)

d) Local (2 dimensional version of linear)

e) Tree

f) Ring

g) Other

III. Using these channels, what types of message can be sent? One must examine items II and III separately for each MODE of transmission that can be used. Thus, in a face to face conference, for example, everyone is connected to everyone and all may transmit simultaneously by GESTURE, but by VOICE only one can transmit at a time. The nature and extent of "cueing" channels parallel to and simultaneously operating with the main channel can be very important.

Our categories here are:

Private/Record

a) Record of transmission available for later public scrutiny.

(a spoken communication is assumed to be private unless a tape recorder, stenographer or other means is used to capture it. Spoken communication is only a record communication if an official transcript of some kind is kept.)

Free/Permission

b) Permission of authority may be required to make the transmission, as in a radio net, usually because of limitations in the communication medium. Permission (i.e., approval) of the content of the transmission may also be required, as in the courtroom testimony of the witness (the jury will disregard the last comments of the witness).

Attention/None

c) A presumption that the addressee will accept the message is also sometimes made and sometimes not. The telephone, for example, somewhat lowers the usual presumption of attention associated with verbal transmissions. Broadcast transmissions usually carry no presumption of attention except, for example, for persons required to read certain bulletin boards daily and legal notices in the newspaper.

Point to point/Broadcast

d) The types of transmission used.

This distinction covers the number of addressees of a transmission. If the addressees are the message, or clearly implied by it, it is a point to point transmission.

d	c	b	a	
PTP	ATTN	FREE	PRIVATE	Ordinary phone call
PTP	ATTN	FREE	RECORD	Ordinary business letter
PTP	ATTN	PERMISSION	PRIVATE)	
PTP	ATTN	PERMISSION	RECORD)	Unfamiliar
PTP	NONE	FREE	PRIVATE	Gestures in conference
PTP	NONE	FREE	RECORD)	
PTP	NONE	PERMISSION	PRIVATE)	
PTP	NONE	PERMISSION	RECORD)	
BROADCAST	ATTN	FREE	PRIVATE)	Unfamiliar
BROADCAST	ATTN	FREE	RECORD	Newspaper legal notice
BROADCAST	ATTN	PERMISSION	PRIVATE	Face to face conference
BROADCAST	ATTN	PERMISSION	RECORD	Recorded conference☆ e.g., courtroom
BROADCAST	NONE	FREE	PRIVATE	3rd class advertising
BROADCAST	NONE	FREE	RECORD	Newspaper
BROADCAST	NONE	PERMISSION	PRIVATE	Talk show on radio
BROADCAST	NONE	PERMISSION	RECORD	Letters to editor

☆ Permission for content also in courtroom.
Permission in unchaired meetings by mutual consent.

[48] Carlisle(Chrmn) MON 24-MAR-75 1:09PM

Another issue with CONTROL STRUCTURE is the authority to edit and revise or delete entries in the record. The conference facilities in PLATO are different from those of NCONFER in that in the PLATO conference authors can edit or delete their entries prior to a certain proportion of participants voting on the propositions. This is obviously a very complex aspect of Computer-Based Conferencing. I'm working on a set of conventions to deal with this. I would appreciate references to any known conventions for editing/revising/deleting entries in records. (Congressional Record, court records, minutes, bylaws, etc.)

[33] Carlstedt Wed 12-MAR-75 2:49PM

<TC Taxonomy. Category 8. Storage>
The preliminary attempt that follows is based on the assumption that our taxonomy is concerned primarily with external/functional/behavioral properties of TC systems rather than their computer system implementations. Thus I interpret "storage" as meaning "information structure" as well as (or more than) physical storage. Sections A-C are concerned with structural properties but at decreasing levels of abstraction, and will be highly correlated. References to other currently proposed categories of the taxonomy are indicated by [n].

A. Purpose (see [1]). What kind of object or process is the information structure designed to represent?
   1. Goal-oriented or -constrained: project state/history
      a. Scientific/technical/industrial
         i. Research
         ii. Development (design/implementation)
      b. Organizational/political
         i. Information gathering/Decision making
      c. Social
         i. Identification/pursuit of shared interests
      d. Other
   2. No goal assumed: Discussion transcript

B. Element types
   1. Primitive types (supported by associated operators) (see [9], [10])
      a. Directed messages
      b. Transcript entries
         (Facts, opinions, considerations, comments, decisions, policy statements, agreements, disagreements, criticisms, proposals, definitions, changes,...)
      c. Documents
      d. Tables/files
      e. Object representations
      f. Polls
      g. Versions (of elements of various types)
      h. Conference description
         i. Static (user assistance)
         ii. Dynamic (usage data)
      i. Other
   2. Extendible set of types?
   3. Maximum size of elements of each type

C. Access structure
   1. Primitive
      a. (Unordered) sets of elements
      b. Ordered sets
         --Natural sequences
         --Other orderings
      c. Maximum lengths/sizes
   2. Complex

a. Trees
   i. Sets of sequences
   ii. Sequences of sets
   iii. Maximum number of levels
b. Networks
   i. Fixed set of relations
      --Which ones?
   ii. Extendible set of relations

D. Allocation
1. Bases
   a. System
   b. Conference
   c. Subconference
   d. User
2. Total storage available
   Per bases a-d
   a. On-line
   b. Off-line
3. Allocation policies
   Per bases a-d
4. Storage required by TC system software

The next two sections will overlap or be contained in other categories. They are included here in nominal form because they can in some cases also be regarded as storage properties.

E. Retrieval functions (see [9])

F. Control (see [5,6,7,8,15])
1. Contents control
   a. Entry/submittal control
      --based on author, timing, relevance, quality,...
   b. Modifiability
      --by author or others
   c. Integrity/consistency
      --of structure/content
2. Dissemination control

[56] Carlstedt TUE 8-APR-75 12:27PM

<Taxonomy, Storage>
The attempt at storage taxonomy in [33] above proposes classification attributes for "transcript" storage--only one place where conference information resides. There are many other possibilities, differing in several dimensions that I will mention before the end of this entry.

A taxonomy should start at the highest levels of abstraction, in our case by viewing a conferencing system, I suppose, as a network whose nodes are information holders or storage places, and whose arcs are communication channels (ignoring any storage used only for buffering or transduction). One way to start classifying conferencing systems is in terms of configurations of major storage nodes.

Once the major types of information repositories supported by a system have been identified, it can be described in terms of the types of channels and transducers interconnecting them. At a lower taxonomic level, more detailed characteristics of these storage and channel elements can then be stated. Below are eleven major storage types that have been suggested during our seminar.

1. The storage that composes the starting point for the study of conferencing systems is the MIND of the human PARTICIPANT. The most rudimentary configuration contains only this type, as in ordinary face-to-face, telephoning, etc.

2. Conference information may be directly entered from or written out to OTHER types of SOURCES and DESTINATIONS, such as prewritten notes and documents, external files, etc. Systems may differ in the types of such sources and destinations they can accommodate.

3. Personal EDITING STORAGE may be provided by or for a participant to assist him in creating entries. Examples are notepads, the edit storage of an input terminal, and storage allocated to the use of a computer-based text editor.

4. One of the biggest distinctions among conferencing systems is whether or not (or the extent to which) conferences are recorded. A RECORDING refers to storage in which the ordering of "entries" is primarily chronological (although not all entries may be recorded). A single conferencing system might allow several subconferences to be recorded simultaneously. Also, many types of records of the same conference or subconference might be maintained simultaneously, and transcriptions might be made from one type to another. Examples are hand-recorded minutes, audio sound track, video, film, and computer-stored text.

5. A system might provide for STRUCTURED TRANSCRIPTS whose contents are essentially those of a recording but whose primary apparent structure is designed or can be modified to reflect more closely that of the conference itself with respect to topics or participant relationships, or to enhance retrievability.

6. Because transcipts tend to become voluminous and because entries tend to have a short expected period of relevance or non-obsolescence, one or more DISCUSSION ARCHIVES may be provided, distinguished along those lines. An example is provided by the "old-" and "ancient-messages" files of ISI's BBOARD directory.

7. If a conference has a specific decision-making or problem-solving goal, then approved or adopted results might be distinguished from other material for purposes of easier identification and reference, and a special information structure, the PROJECT STATE, provided for this purpose. For example, if the conference is engaged in interactive design, the project state would consist of specifications of the design object (e.g., a system of computer software) at various levels of detail/ abstraction.

8. Because it is sometimes necessary to change decisions after they have been made, and because it is also sometimes useful to know what the former decisions were, a system might provide for the maintenance of a PROJECT HISTORY consisting of since-changed, -replaced and -updated decisions, specifications, or versions.

9. The project state and history are the sources of information composing REPORTS to the outside world--reports that might be retained in the system for future reference by participants but that might best be regarded and accessed neither as part of the project state nor project history.

10. As a counterpart to the personal edit storage used for preparing inputs, personal or group-shared storage can be provided into which information is retrieved from various of the above categories, and from or on which it is displayed. This RETRIEVAL/DISPLAY storage might be used to restructure conference information according to the personal desires or needs of a participant or subgroup, and to allow him or them to associate private comments with it. Included in this category (at the present level of abstraction) are personal computer storage, character-display storage, and hard-copy output.

11. A final category consists of DESCRIPTIONS of the conference itself (information on how to use the system, topic definitions, mediation and control policies, etc.) and of its participants (names and various characteristics).

A system can be characterized first of all, then, by which of these types of storage (or others we might add) it supports at all, and secondarily in terms of their more detailed attributes, together with the operators provided. The following is a recap of some of the more useful generic attributes (not necessarily orthogonal):

A. Structure, Capacity
   1. Structure
      a. Basic units
      b. Relations
   2. Restructurability
   3. Total capacity

B. Times, Rates
   1. Access (seek) time
      a. Read
      b. Write
   2. I/O rates
                a. Maximum b. Typical
      i. Input
      ii. Output

C. Control (protection)
                a. Policy b. Enforcing mechanism
   1. Read
   2. Write

D. Contents
   1. Type, purpose
   2. General qualitative characteristics
      a. currency
      b. stability
      c. editorial quality

E. Reliability

[52] Levin MON 31-MAR-75 5:10PM

Further notes on our Taxonomy
It seems like the purpose of a conference may be of overriding importance in determining the optimal structure for the communication network within which it should occur. There is no simple dimension to specify the kinds of goals (instead probably these would have to be specified in a separate taxonomy!) but one major distinction is between interactions that are essentially cooperative and those that are competitive. Of course, no interaction is purely one or the other, but many types fall along one end or the other (cooperative: seminars, information gathering meetings, problem solving groups (brainstorming); competitive: bargaining meetings, conflict resolution meetings, political caucuses).

[62] Carlstedt WED 16-APR-75 12:45PM

Still on the subject of taxonomies!
A desirable feature of a taxonomy is that its primary categories or dimensions exhibit classificational "power" --the degree to which they separate the property space into regions into which elements--in this case TC systems or conferences themselves--tend to cluster. (I doubt if it makes much difference whether the higher taxonomic levels deal with systems or conferences--i.e. whether one talks about conferences having property x or systems designed to accommodate conferences with property x.) For my vote, the most powerful of the 21 proposed categories (see [22]) are those having to do with entry rates, entry dissemination, and the role of conference transcripts (shared information bases). I believe most of the proposed categories apply quite differently to the major classes distinguished along these lines. I would like to attempt to make these distinctions clearer by making these criteria more explicit via the following two dimensions:

(a) to what extent a conference is "real-time";
(b) to what extent transcripts play a role.

By a real-time conference we mean, I suppose, one in which the expected inter-entry time (from all participants) is sufficiently short, i.e., short enough that costs of waiting for someone to say something are judged low relative to the value of the information gained, so that participants are in fact waiting in an attentive or at least easily-interruptible "plugged in" state rather than joining occasionally and having to get caught up. The real-time-ness of a conference could either be considered a measure of the proportion of the participants present, or a Boolean attribute that is true whenever two or more participants are conversing. I think experience has shown that the latter view is more useful, since conferences tend to be real-time either always/mostly or else rarely/never; so that this dimension can be considered to carry only the values R and N.

There are three major values in the transcript-role dimension, namely

N--no transcript or record that plays a significant role in the conference; communication among participants is direct only;
A--communication among participants is direct, but entries are also stored in a transcript, which plays an ancillary role in providing an additional source of feedback and interaction for the conference. This implies that previous entries may be referred to and retrieved in real-time, where real-time" here means simply that retrieval time is short enough to make such

uses economical. Whether or not the transcript is considered to play a significant role, i.e. whether or not retrieval is considered to be real-time, depends on the definition of a conference.
C--the transcript is central, and communication among participants takes place primarily thru it.

The six (formal) classes defined by the above:

RN--real-time, no transcript role. This class is typified by ordinary face-to-face conferences or simulations thereof.
RA--real-time, ancillary transcript. An example occurs in the courtroom, where the judge may say, "Will the recorder please read the testimony of witness x regarding y."
RC--real-time, central transcript. Examples are on-line, interactive games.
NN--non-real-time, no transcript role. This class is typified by (the use of) message or mail services.
NA--non-real-time, ancillary transcript. An example is our current use of nconfer.
NC--non-real-time, central transcript. This class is typified by shared information bases in general, of which data base management systems, bulletin boards, and published forums such as letters to the editor and Harper's Weekly are examples.

I would like to show how various of the proposed categories apply to these classes, and also how some of the distinctions made e.g., by DCROCKER in [30-32], Anderson/Sutherland in [46], and Carlstedt in [33,56] fit in, but this will have to be left as an exercise.

[88] Carlstedt WED 7-MAY-75 11:17AM

<KEYS: Taxonomy, Systems, System def.>
Taking the approach that a system, most generally, is a pair (X,R) where X is a set of (classes of) components and R is a set of relations giving structure to X: I spent half an hour trying to come up with such a definition of "conferencing system", and could arrive only at such abstractions as those mentioned in [86]. But this seems to impose a whole new taxonomic dimension of systems, since one can begin by trying to classify configurations (interconnections) of "carrier" and "station" nodes (an impossibility?) abstractly, before even considering their types. The latter would come from independent taxonomies of carriers, repositories, transducers/interfaces, processing functions, and control functions. The abstract configuration is what Anderson & Sutherland [46] called the "channel topology" (I think), although their stations were only participants and didn't include intermediate storage, processing and control functions.

I frankly don't see the significance of all this unless one is interested enough to pursue the system taxonomy thing vigorously, which I doubt if any of us are at this point. I started to make some notes about effector/sensor relationships among nodes & about manual vs automatic types of control, but have discontinued it.

[132] Carlstedt MON 12-MAY-75 12:58PM

<Categories of conference input>

1. Substantive, task/topic-oriented, that without which the conference presumably wouldn't exist. The "levels" discussed in [97,100,111,113-116] apply to this material.
2. Metaconference, discussion about the conference itself as a whole (not individual participants) or the supporting subsystem.
3. Social-emotional, interpersonal reactions.
4. Formalized responses, polling inputs, etc.
5. Formalized metadescriptive, used for structuring a transcript (classifying & relating entries, subentries, & sets of entries) to facilitate transit and retrieval.

Comments: (a) These seem to me to be mutually exclusive (but not necessarily exhaustive) except for conferences about conferencing like this one. (b) The distinction between 1&2 and 3 is NOT made on the basis of fact vs. feeling. (c) The significance of the observation represented here, if it has any, is that it provides another possibly useful dimension for structuring the material. (d) I seem to be obsessed with categorizing things.

THE BLINDFOLD SESSION
Edited by Rudy Bretz

For the face-to-face meeting of April 30 we all put on blindfolds to see what an audio-only face-to-face situation would bring forth. In a way,I guess, we thought we were simulating audio-only teleconferencing, with the added feature that the roster of participants and identity of each speaker was constantly apparent to us from direction and quality of voice. Of course there was a near-total lack of visual stimulation/distraction. Several people said afterward that the elimination of the visual forced a concentration on the audial, with the effect that abstract thinking seemed to be encouraged. We felt some of our best ideas came out at this meeting. Unfortunately not all of the meeting was recorded; in our blind state one of us apparently pulled the power on the cassette recorder without knowing it and a section was lost before this was discovered.

The audio transcript of this meeting was rough-typed and heavily edited to best convey the thoughts that took form, at the expense of an accurate verbatim record. Because the conference finally seemed to reach core issues at this session, it is placed early in the report. The following persons were present : Jim Carlisle, Dave Crocker, Paul Raveling, Larry Press, Jim Carlstedt, Rudy Bretz, Lee Richardson and Jim Levin.

Carlisle : The topic that had been proposed last week, if everybody is agreeable, is what we should do in order to develop a taxonomy paper out of the existing transcript and ideas that we have. Is there any discussion about what we ought to do with respect to developing a taxonomy paper?

Carlstedt : I'm raising a hand. (laughter)

There followed some general warming up, suggestions about how we might order and edit the various entries in the transcript and the question about intended audience was brought up.

Carlisle : That orientation could be translated to mean that we might want to consider preparing a taxonomy that would assist users of - or people who are likely to be consumers of - communication, conferencing technologies, as one target audience.

Levin : One of the useful things, just for me, of the process of developing a taxonomy is considering options. I had a very narrow view of teleconferencing when I started, just my experience with CONFER. Rudy's talk, the first or second session, was valuable for me in just opening up possibilities of what teleconferencing might consist. Designers might very well find that useful. It seems to me we can also hit the researchers in the field, If there was a taxonomy it would be much clearer what the questions were and how to tackle them. I felt that for instance in that Scientific American article, one of the shortcomings of that whole research effort by Chapanis was that the kinds of questions they were addressing seemed kind of trivial in the light of all the issues that we had been talking about.

Press : Would it be too ambitious to try to include a survey of existing systems in the context of this document? Instead of just an abstract taxonomy you'd want to maybe try to be relatively exhaustive in talking about a lot of actual systems. This could make it more valuable to the research community.

Carlisle : I have a list- a file that I am building - that I was going to invite people to add names to when it gets a little fuller, -a list of people that I know that are doing teleconferencing research. There are at least three or four dozen people doing research involving digital computers, so I think there's enough there even if we wanted to limit ourselves in scope.

Crocker : I've liked the fact that we have not limited our thought. The bulk of it has been about computer-based stuff, but the fact that we have not limited it to that has helped me at least see the computer component as merely a tool to facilitate certain activity, but not in fact a prerequisite.

Carlstedt : I agree. One subject is conferencing itself and another is the technologies that you find. The "tele" part comes in with telecommunications meetings and so forth but that is pretty much independent again of the computer assistance which you include or exclude - so you can get as broad or narrow as you want in those categories.

Bretz : I think one of the advantages of a taxonomy is that it lays out all possible systems and combinations of systems - those that are familiar and those that are unfamiliar, which is what Anderson did in an early entry [46]. What I did a year or two ago was to divide interaction into three different actions or events : 1) the initial transmission of a statement, 2) the medium that is used to carry the the response from the viewer or listener back to the sender, and 3) the reaction of the sender to that response - all three of which are necessary for interaction. I took all the various known media and combined them in matrices so that I could determine what possible combinations there might be of media that could be used for statement, media that could be used for response, and media that could be used for the reaction to the response. This gave me a chart with a lot of cells in it that were unfamiliar - there were no examples that had been worked out. I think maybe such an approach as that might be more fruitful than simply gathering information about existing things and making the taxonomy out of them. We could fit those things into cells that might have been generated by this more generalized and abstract approach.

Crocker : I don't think the two are mutually exclusive.

Levin : In fact I think one suggestion the last time we met was to take, for instance, all the categories that we have now - all of the dimensions - a lot of which are orthogonal but some of which overlap, and take as many of the existing systems as we can gather together easily and run them through a test. We might be able to discard certain dimensions as not discriminating or not interesting, or not relevant to this abstract taxonomy. There would probably be unfilled cells that would hopefully suggest new and possibly interesting combinations.

Carlisle : It's a good point that I hear a couple of people saying that the empty cells in this matrix or the things about which no existing system has any of the features may turn out to be the most interesting parts of the taxonomy. Because, either those are sections that have been overlooked in the development of current systems or they perhaps involve synthesis of technology that just hasn't been done yet, or they may require development of technology that hasn't occurred yet. In any case that could be used to encourage people to pursue certain kinds of development or try certain combinations or new technologies.

Crocker : The fact of those empty cells may also reflect the differences in goals - people have selectively filled in these boxes because they had certain ends in mind - and I suppose we would get some sense of almost a ranking of goals during communication between people by seeing what facilities, what features were provided first.

Levin : I think you'd find that there is a strong historical context effect, namely, the kinds of things you think about doing, whatever your purpose, are strongly influenced by what has been done that you know about. There may be cells that are just what you needed but you wouldn't think of them because they lie in a different direction from the way things are currently going.

Crocker : The two things that had occurred to me were almost two extremes : the New York system attempting to provide absolutely as much of the simulation of face-to-face as at least was economically possible, and the CONFER/FORUM systems, oriented towards an on-line implementation of the DELPHI technique with its highly structured intent.

Press : I think one thing that will turn up in a lot of these boxes will be things that you really wouldn't call teleconferencing - things like Harper's Weekly for example. What we'll really end up with will be a sort of a definition of teleconferencing, which is what we need. Its really not clear what constitutes teleconferencing and what doesn't. There are other things, like just a data-base system - like an airline reservation system - and you will have to ask yourself - is that teleconferencing or not?

Crocker : If it isn't, then what is this larger thing that we are talking about - is there a label we can tack onto it?

Carlstedt : One way of approaching a taxonomy and I think it's kind of what we're talking about, is at the very highest level to think of all the partitioning criteria that you can that would be in some sense orthogonal and then apply these consecutively to the broadest possible universe of teleconferencing systems and then take the cross product, then you get a sequence much like Rudy's three-dimensional matrix - it might be n-dimensional.

Carlisle : It seems to me that there are two different kinds of beast that we are calling taxonomies, and it may be that my definition is different from most everybody else's, but the way I saw the taxonomy starting, was much more like a feature analysis of systems.

Carlstedt : For my own purposes initially at least I was really bothered by the fact that I didn't have any conceptual idea of what the universe of teleconferencing systems consisted of.

Carlisle : Right, and your example, in a somewhat recent entry [62] of picking what you thought were a couple of important dimensions - and ending up with a two by three table, is an example of what I would see as being a much more condensed and in some respects a more powerful taxonomy - and maybe that's the true sense of the word taxonomy - a set of variables that clearly distinguish systems - so each system falls into one and only one cell of a matrix. Rudy, is that the more clear sense of what a taxonomy is?

Bretz : I think so -I think the primary step is to determine what are the relevant criteria for distinguishing or classifying - what are the natural ways in which we can classify so that a system for example, if you can call such a thing a system, once put into one class and named, will not have to be reclassified when it is given some other use, or used under some other conditions. Whatever characteristics we use for the classification, whatever our criteria are - have to be inherent in the systems we classify, and basic, beneath any particular use or condition.

Levin : One way we might proceed on this is to collect together systems that people are very familiar with and add to that list as we go on. Each of us could take a single dimension and lay out those systems on that one dimension - that's a very easy thing to do - and then we can pull that

all together into n-dimensional space afterwards if we want. One of the things about dimensions is that you can do them one at a time.

Press : You're making the assumption that the person responsible for dimensions is familiar with the various systems ..

Carlisle : It might be a useful exercise just to try to make a list of dimensions kind of in the abstract.

Levin : Well we do sort of a have a list of - what - 20 or so ...

Carlstedt : I don't think those are partitioning dimensions.

Carlisle : Why don't we distinguish between what I would prefer now to call not a taxonomy but a feature analysis, - and a taxonomy. It seems that we have a least two taxonomies that have been proposed in the conference, one is Jim Carlstedt's two-by-three taxonomy [62] and another one is Sutherland and Anderson's taxonomy, [46] If a person proposes a particular system for consideration, it's only really a matter of mapping that system into one or two cells in each taxonomy, then it's fairly simple to consider a large number of systems. On the other hand I imagine we would only want to take a small number of systems and try to map them into the feature analysis where you're going down to the level of what kind of security do they have and can you edit the data bases and so forth; the long feature list can be tested with a small subset of systems with which at least one or two people are intimately familiar.

Levin : I guess I don't understand the distinction between a feature list and a taxonomy.

Carlisle : Well in what I am understanding to be a taxonomy now, each system falls into one and only one cell. A taxonomy has dimensions and NCONFER, for example, goes in one particular cell, and that's the extent of the analysis of NCONFER. The taxonomy, by being a powerful discriminator, very quickly tells you an enormous amount of information about NCONFER and how it might be used and what its domain of applications and its characteristics are. On the other hand a feature analysis is very verbose and each system is evaluated on every single feature, so you have an enormous amount of information reported on each system which is left to the reader to synthesize.
Tom Martin, for example, a Britisher, did a feature analysis of interactive bibliographic systems. The feature analysis is one way of describing and comparing a number of systems and it tends to be very verbose and in some respects sort of redundant, and fairly non-integrative whereas, say, the taxonomy of communication media that Rudy did and the one that Jim Carlstedt has proposed is much more condensed- you can map a large number of systems together and really make some important comparisons between them. You're getting more the gestalt of the system.

Press : Can you take that example of Jim's six-cell taxonomy and classify CONFER, which cell does it go in? - it seems to me that a system could be used in several different ways or in several different applications, and depending on the application it would fit into a different cell. It doesn't seem like it is a property of the system that it fits into one of those cells.

Carlisle : Well, one might argue that a teleconferencing system would be capable of accommodating activities that fit into all of those cells and that an indication of the limitation of a particular system would be its inability to deal with some of those cells.

Bretz : There's another approach to a taxonomy which makes an arbitrary division of things into classes and subclasses, and sub-subclasses, which even in biology is arbitrary. In reality there is a total continuum between one species and the next and within a species a great range of varieties, which are just arbitrarily named species or subspecies, and so forth. We could presumably do the same sort of thing by saying, well there is a class - a major order, lets say, of telemedia, that is always in real time, and there is a class that is never in real time, or something of this sort, and then begin to break down each of those into sub-orders down to classes.

Carlstedt : Sure I think that at the top level you can have a multi-dimensional array of cells, into which each system in spite of what you said, Larry, fits in one cell only. Then after that, certainly when you begin to apply various kinds of mono, orthogonal and so forth features, it will begin to discriminate into lots of variations. The difference between that and the biological taxonomy is that biologists are forced into a tree structure because of the partial ordering imposed by evolution. We could never use a tree structure to classify teleconferencing systems because there's no single one top discriminator which will then subdivide.

Carlisle : I agree completely with what you are saying, I think one of the problems in trying to have a taxonomy which will discriminate each teleconferencing system into one cell is that we would have to do that based on characteristics of the systems that were more or less unchangeable- I mean species are basically inflexible - if you are born a tree you are a tree - and if you're an oak tree you're an oak tree, and theres no notion of adaptability in the sense of changing the kind of species you are. You can say things about people - physiologically - tall people, short people, male/female, so on, but if you start talking about behavior or applications of something - if you start talking about the applications of trees in society, or the applications of CONFER, then it seems to me that now flexibility becomes a problem. It's a desirable virtue, but it now becomes a problem in classification. An example of this is psychotherapy - they have tried to classify people's behavior - Personality theory is another - many of the people within personality theory just gave up on nomathetic research and went to ideographic. I see the feature analysis as being ideographic- lets take the cases one at a time and have categories that enable us to capture characteristics or features of each individual person rather than try to say this person is an introvert and that person is an extrovert and I have now divided all people into one of two classes.

Crocker : It sounds like a feature analysis would be the right thing to do for implementations and a taxonomy would be the right thing to do for goals - of communicating between people.

Carlstedt : I have the idea that you can classify conferences maybe along the same lines. I was thinking that the classification of systems that provided facilities for certain types of conferencing would be isomorphic to the classification of conferences.

Bretz : I think you have to separate the system from the uses of the system. You can classify uses and you can classify the systems that are used, but I don't see how you can do both at the same time.

Carlstedt : Its the difference between actual and potential uses; a system has a potential for use by virtue of the features it contains. The actual use may be different from the potential use. I guess what I meant by conference was the potential use.

Carlisle : Rudy was making a distinction to me two weeks ago between a communication medium and a communication aid, and it strikes me there is that kind of distinction here too, even if

you take the mail - which I would call a medium, you find it can be used in a lot of distinctly different ways. For instance there is Jim Levin's use of the mail to circulate a sort of a chain-letter type news letter - you would have to classify that quite differently than an application where personal mail is sent back and forth between two people. There is also business mail where you send something to somebody and they send you a copy back, as well as keep a copy of what they sent you - now you have different characteristics. I'm raising a problem, not offering a solution.

Press : Isn't this another case where you're using the word "medium" and we maybe would use the word "system". The postal service is a system.

Carlisle : Right, but when you characterize the postal service, and try to put it into a taxonomy, you don't normally characterize it as something that would be used the way Jim Levin is using it, with his newsletter thing.

Crocker : In fact a relationship seems to me possible to describe between a feature analysis which is merely listing specific capabilities, or features, of an implementation, and how some of those features are better than some other features for particular goals. One can use CONFER for essentially true interaction, discussion between people who are all linked together in real time. However it is infinitely better to have them all sitting in the same room. Band width is higher, it's more convenient, you get a whole variety of things which make that a better thing to do. The feature analysis merely lists what things can happen and a mapping between subsets of possible features and subsets of the goals can be made to rank order the applicability or appropriateness of particular implementations.

Levin : So you are saying you could represent the sets of uses with maybe a set of features, and then you could represent the set of systems with a set of features, and some uses will correspond better with some systems and other uses would correspond less - maybe only 20% overlap - where CONFER would overlap with desirable features of real-time interaction.

Carlisle : It seems to me you could do some sort of canonical correlation to figure that out.

There was some kind of a break here - of unknown duration. Maybe this is where the plug was pulled, discovered after a while and replaced. The recording continues with laughter.

Levin : A semantic network representation might be another way to go - the notion that there will be certain dimensions, on which only a subset of all of the members will have values one way or the other and there will be a large set of other things that don't have a given dimension at all. It just doesn't make sense to talk about these. So instead of thinking of it as a space and everything has got to be located in that space, and everything has to have a value - its either hot or its cold, or it's not applicable - we could instead think of more sophisticated representation, and talk in terms of drawing up a representation of these two things - 1) the systems that have been developed and that we can immediately foresee being developed, and the relationship of these representations. I just want to point out that the two things we are contrasting - the feature analysis and the taxonomic sort of spatial relationship, plus even the hierarchy that Rudy brought in are things that have been proposed as representations of knowledge, and that there are, I think, more general representations that we might want to draw on.

Carlisle : How would you use a semantic net to characterize, interpret or differentiate systems ?

Levin : OK - each system is a concept in the semantic network, which has a set of properties say, and they are general properties, like real time, that's a characteristic of, say, telephone conference calls, and a number of other ones, the New York System for instance, and then there's another characteristic that they have, and this characteristic might be only applicable to conference calls, but it's not that it applies or doesn't apply to the New York system, but it just doesn't make any sense to talk about it in that context.

Press : You mean like attribute value lists? associated with each system, is that what you mean?

Levin : Yeah, it sort of develops directly out of that kind of thing. I mean, that's one way to represent a semantic network. So you have these representations of the systems, and then you can turn around and say, these are a set of characteristics that are valuable for this particular use. Where is the best mapping, what system has most of these characteristics? So you follow the characteristics backward,like if making a decision or resolving a crisis requires instantaneous feedback and high band-width, those are concepts that are interrelated to many systems, and so you find the system that has the most of those characteristics.

Crocker : Having systems completely feature-analyzed and then having a taxonomy of conference goals - you can then map between them and get your ranking of different systems along different goals. You want your rapid feedback and instantaneous communication and having two people in the same room is clearly the best thing you can do. On the other hand, if they are on opposite ends of the country and we need to connect them immediately, we find we don't have a television link we can make, but we can set up a telephone between the two people - for two people that's OK - and then it works on from there. What's developed then is a ranking appropriateness of different systems for a given use - for a given situation.

Bretz : But then there's another dimension which is equally important and that is practicality - practicability, which has usually been the primary consideration in establishing systems. We do what is possible and practicable to do under the existing circumstances.

Levin : But it seems to me that the economics could be another feature - that is - a system would be expensive, moderate, or cheap, and the situation is that you can only afford say a cheap or moderate or expensive system.

Crocker : And there's probably some cut-off points at which you may be able to pour in twice as much money for twice as much, or for ten percent more effectiveness. In most cases it won't be necessary to do that, and so rather than feel as if it would be nice to be able to spend the twice as much, you will be quite happy with the smaller amount of money knowing you will be getting close enough to the same effectivness. What comes to mind is having voice communication and some slow-scan TV to give occasional updates of pictures of the participants, may in fact be not all that much worse than having just gobs of television equipment connecting people.

Bretz : And you could also apply that to the question of audio fidelity. How far up the scale do you need to go - do you need stereo sound for your particular use, can you do with ordinary fidelity - or do you need high fidelity -- do you need anything better than voice quality that is barely intelligible - a position on this kind of a continuum scale could be determined.

Crocker : That was one of the things that I did like about the Chapanis work (although several people here said his results weren't as clear as he put down on paper), was that the

presence of the voice channel seemed to make more difference than anything else in time-to-solution.

Another break here, but just to change sides of the tape

Levin : I'd be willing to adopt the word "system", or something like that; something broader than the term "medium", when we are talking about a specific application, it involves so much more than just the means for interfacing between people.

Carlstedt; It could for example involve a set of mediation rules,

Crocker : Can I offer for a vote the term "implementation".

Anon : I don't like it.

Levin : I think that "application" is a synthesis of both, - it's a particular system in a particular situation.

Crocker : What I have in mind in fact is not how it's used but just what it can do.

Levin : What it can do? It seems to me that is the system.

Bretz : Implementation to me has always been an action - a process. The implementation of something.

Carlstedt : Implementation is always contrasted with design.

Levin : Can we agree on system? CONFER would be a system, or the mail would be a system, or the telephone? - then - I would propose "situation" for the particular characteristics of what is going on, what the people want to do, what their financial constraints are, what their physical constraints are - all those things.

Bretz : You mentioned the mail, the post office being a system. I would say that the Los Angeles Post Office is a system, and that the Post Office of Sao Paulo Brazil is another and possibly different system, but the mail, in general, is a medium.

Levin : But that's like distinguishing between NCONFER and FORUM.

Crocker. There is a generic system of mail which implies certain behaviors.

Carlstedt : What Rudy is saying is to distinguish between system and system type.

Levin : On the whole side of "system" we could come up with characteristics, general characteristics - like Dave is suggesting for the general categories and then the more specific characteristics for the more specific ones. Until we get down to a particular instance like the mail system which is the guy who delivers the mail to my house. We could come up with a taxonomy for that whole bag. Then we could talk about the mapping for a particular situation - like a bunch of businessmen, that are located all across the country who have unlimited amounts of money, and want to get to know what each other has done over the last week. OK, with that set of characteristics - high cost for instance - there'll be a series of systems that'll be limited by requiring high cost -

there'll only be a small set of systems that will have that characteristic. Then interchange of information - whatever that implies - broad band width or whatever, will further select a set of systems, so that for any given situation there'll be a set of systems that apply.

Crocker : I'm not comfortable with the term "system", but if everyone else is, then I won't push it any further, but I would rather use some other word. Carlstedt : System is as broad as the word "set" almost.

Anon : How about "environment"?

Crocker : OK - I was thinking of "mechanism".

Someone evidently opened the door to the conference room and as quickly closed it and left, leaving the participants delighted with the thought of what reactions the poor person might have had to a room full of blindfolded people around a conference table.

Carlisle : It's five oclock.

Anon : How do you know?

Carlisle : I exercise a little bit of control. I can tell from the sun. So let me try and summarize and see if there is any strong disagreement. I'll take a risk. It seems that three different kinds of analysis have been proposed : we don't have to agree to do only one of them, but at least we made a distinction between three types of analysis. One is a feature list along which some thing, whether it's a system or an application or whatever else, gets run down the list and checked on all the features in some way. The second one is a taxonomy in which the things are placed into one cell of an n-dimensional matrix, and the third one is the semantic net type of representation of attributes of entities. And I can just make a slight summary comment that the feature analysis, even if it never flies, even if you never publish it, is at least a reasonable way to start identifying the features you would want to use to build the taxonomy. So it may be that the taxonomy is a stronger theoretical statement or a stronger descriptive statement than the feature analysis, but somehow they are distinct. The second thing we tried to distinguish is what we would apply one of these first three things to, and it seems to me that the words "medium" and "implementation" have been superseded by the word "system" and we would like to find something better than that, but maybe a good definition of "system" will permit that to be used. And the other thing from which that is being distinguished is use or situation. OK - how about this - would there be strong disagreement if we tried to distinguish these two concepts by the terms "system" and "application" ?

Levin : I think application would cross cut a particular system and a particular situation.

Press : Why don't we just say "system" and "situation" but always put them in quotes.

Carlisle : OK why don't we we continue this in topic one and let me add to the complexity slightly by saying that if you are talking about a taxonomy as opposed to a feature list give some examples, in other words what exists now as examples of taxonomy are : Anderson and Sutherland's taxonomy, Jim Carlstedt's taxonomy, and Rudy Bretz's taxonomy which isn't in the conference, but is in his book. What exists as a feature analysis is that long list of 20 features and the list of behavioral characteristics. When we get to talk about systems, if you're trying to distinguish those or come up with a better term for them, give some examples, because it was clear

that when people gave examples of what they meant by the words, that was what brought on the greatest amount of disagreement, not just the semantic notion of the word. So, give examples when you are proposing something.

There followed a sort of planning session in which it was decided to establish a "systems" and a "situations" file to which anyone could add examples by using the "put" command and listing the appropriate file. There was also a rather interesting discussion of the participants' subjective impressions during the blindfold conference.

- It seemed just like a normal conversation.

- There were two very interesting differences : one, the obvious one, of down there - over there

- The other thing was that the silences between speakers were markedly longer.

- But that was only at the beginning - after we got into it I found toward the end that it became more and more lively and natural. **[Comment : a marked difference in liveliness and speaking volume was obvious between the two sides of the first interruption when, apparently, the cord had been disconnected for a while. This would thus seem to indicate that the time had been longer rather than shorter.]**

- There were only a few instances of overlapping of voices.

- Many said they found themselves using their hands, gesturing,

- Some said they found themselves nodding agreement

- I found myself acknowledging - I mean saying uh-huh, as I would do over the telephone. Especially when somebody was talking back to something I had just said. But not very loudly - I don't know if it was picked up.

- I never found it confusing who said anything. There was directionality and enough distinctive voices.

I think I can concentrate on what is being said a lot better when I am blindfolded.

- I found myself disliking it for two reasons, which were really one -I had trouble following - this was exactly the same as having a narrow window to the data - I had trouble following relatively long statements. You were saying some good things and I was just getting lost in it. And it was partially because I have very high internal noise, and I just sort of get wrapped up in thinking about whatever I get involved in- it's much easier for me to go off on those internal tangents because they don't have all those stimuli coming in to focus me.

Carlisle : I'll offer a hypothesis about that, because I experience the same thing too. What I guessed was that probably I get just as lost when I'm looking but I'm not aware of it. (Laughter). - It's sort of like John Lilly's sensory deprivation work - when you go into his tank you have just as much yamma-yamma going on as you normally do, but you are distinctly aware of it - I am distinctly aware that I am jumping from topic to topic in my mind, and possibly cutting out just the visual sense makes you aware that you are not following the train of thought.

Crocker : It may be that I can do a sampling of something you are saying while I am watching you - even though there's a lot coming in that I'm just not attending to, but in fact I think that the recorders are going and I can play them back later and re-establish. But when it's only by voice, then there is a direct conflict and overlapping between your voice coming and my internal voice which is only one channel, but while you're talking there's a whole range of things coming in - I can retrieve the contexts of what you're saying, over time, without in fact attending all the time.

Press : When I was talking one time it was very obvious in my head that systems, if you'll pardon the expression, were on the right, in some sense, and situations were on the left, and it wasn't because of the positions of the various proponents either.

Crocker : Somebody must have looked into what blind people do with internal vision, they probably have still got the ability to formulate things in that way - they just don't have the easy translation.

Did anybody get a paranoid feeling that everybody else had their blindfolds off ?

I checked you a couple of times.

I never took it off - I could see out the bottom a little.

A few more comments on the blindfold experiment.

Crocker : Most of the time I just kept my eyes closed - the blindfold was on in such a way that it was very convenient, and I am used to doing telephone counselling and I've gotten used to keeping my eyes closed - I did that most of the time, but occasionally I got very tired of that and what I would do is - it was like what you were describing, I would open my eyes and I could see clearly in this very narrow area, and it had a completely different effect - in fact I started feeling much less cut off from what was going on, and also less focused, which is interesting.

Levin : Probably the biggest loss was the side effects, that when somebody's talking, you can see how everyone else is reacting, their faces, and whether they're sleeping or what - -

Crocker : I know that at one time I said something and there was a long pause and I was going thud in my head - all I could think of - I almost said it - finally asked if it had made any sense.

Carlisle : Yeah, why don't we - it's five twenty - call it a day. (click)

TELECONFERENCE SITUATIONS
Edited by Jim Levin

During the face-to-face blindfold session, it was decided to divide the task of constructing a taxonomy of teleconferencing into two - a classification of teleconference SITUATIONS and a classification of teleconference SYSTEMS. Once this step had been taken, progress was faster and more consistently directed. It was proposed that an "application" would consist of a situation paired with an appropriate system. "System" required a still further subdivision, and "system networks" and "system media" were proposed. (A given medium, for example, may function in a variety of different network configurations; a given type of network may apply to a number of different media). The distinction between system and situation was defined in entries during the first week in May, the first of which were input by Levin during the small hours of the night following the particularly productive "face-to-face" blindfold session the transcript of which constitutes a section of this paper.

[67] Levin THU 1-MAY-75 12:19AM

<Development of the Taxonomy>
In our discussion today, we developed a notion of two separate kinds of entities that are important for teleconferencing, which we are tentatively calling Teleconferencing Systems and Teleconferencing Situations. I'll make an attempt to describe these in following entries. We agreed to collect examples of each of these, both here and in conglomerate files on <Comguest> called Systems. and Situations. Because of various shortcomings with CONFER, I will take responsibility for adding entries here to these files.

From these two collections of instances, we will work out dimensions and features that distinguish among them. Given these general descriptions, we will be able to compare a system to a situation. In particular, for a given system, we will be able to determine what situations it would be good for (and what ones it would be bad for). Also, for a given situation, we may be able to determine what systems would be good and what ones bad.

[68] Levin THU 1-MAY-75 12:28AM

TELECONFERENCING SITUATION. This includes the function of the conference (what it is to achieve), the physical constraints, characteristics of the participants, the nature of the topic or content material, the actions that the participants will want to perform in the conference, etc. Alternative names proposed: applications, goals.

[69] Levin THU 1-MAY-75 12:33AM

TELECONFERENCING SYSTEM. This is a specification of the components of a communication medium capable of supporting a teleconference of some kind. Aspects include the kinds of channels provided and their bandwidth, the number of channels and the time delay of each, the timing of interaction, storage characteristics, etc.

Alternative names: Medium, Channel

[76] Press MON 5-MAY-75 4:29PM

TERMINOLOGY. IN THE FOLLOWING ENTRIES I'LL USE A FEW TERMS BASED ON OUR LAST FACE TO FACE DISCUSSION. A "SYSTEM" IS A COLLECTION OF HARDWARE, SOFTWARE, PEOPLE AND PROCEDURES ORGANIZED TO FACILITATE COMMUNICATION. A "SITUATION" IS COMPRISED OF TWO OR MORE "PARTICIPANTS" IN A PHYSICAL AND ORGANIZATIONAL (RELATIONAL) "SETTING" WITH (PERHAPS COMMON) "GOALS". AN "APPLICATION" IS A PARTICULAR SYSTEM-SITUATION PAIR.

(I SEE THAT LEVIN HAS ALSO OFFERED DEFINITIONS FOR THESE TERMS - THESE ARE NOT ALTERNATIVES, JUST USED IN THE FOLLOWING ENTRIES. I FEEL THAT IT WOULD BE VALUABLE FOR OTHERS TO WORK ON DEFINITIONS OF THESE AND OTHER TERMS -- EITHER IN AN "OFFICIAL" GLOSSARY OR "IN-LINE").

[77] Press MON 5-MAY-75 4:56PM

CARLSTEDT'S TAXONOMY [62] IS VALUABLE NOT ONLY IN THAT IT CLUSTERS SYSTEMS OR SITUATIONS IN A PROPERTY SPACE, BUT IN THAT IT HELPS ONE TO FOCUS ON APPLICATIONS WITH A HIGH LIKELY PAYOFF.

FOR EXAMPLE, IT WOULD SEEM THAT APPLICATIONS TENDING TOWARD "CENTRAL" TRANSCRIPTS ARE THE MOST PROMISING PLACES FOR KEYED-ENTRY, DIGITAL SYSTEMS. IF A TRANSCRIPT IS CENTRAL TO A REAL-TIME APPLICATION, THE NARROW BANDWIDTH COST IS OFFSET. IF A TRANSCRIPT IS CENTRAL TO A "NON REAL-TIME" (JIM, HOW ABOUT "ASYNCHRONOUS"OR SOME OTHER TERM?) APPLICATION, APRIORI DATA BASE STRUCTURING CAN HELP OVERCOME THE RETRIEVAL PROBLEMS (SEE 3.17 AND 20)

CONVERSELY, WE CAN FOCUS ON LOW PAYOFF REGIONS OF THE PROPERTY SPACE AND FIND SPECIAL CASES (VALUES ON OTHER DIMENSIONS) FOR WHICH THE DISADVANTAGES MIGHT BE JUSTIFIED. FOR EXAMPLE, REAL-TIME COMMUNICATION WITH LOW TRANSCRIPT VALUE MIGHT STILL BE JUSTIFIED IF THE PARTICIPANTS HAD CERTAIN CHARACTERISTICS (DEAF, MUTE, EXTREMELY SHY, STUTTERER) OR IF THE SETTING HAD CERTAIN CHARACTERISTICS (A HIGHLY EMOTIONAL SETTING, WHERE AN IMPERSONAL CHAIRTHING, WITH A SPECIFIED SET OF FLOOR PASSING RULES WOULD BE OF VALUE - AS IN MARRIAGE COUNSELING).

[86] Carlstedt WED 7-MAY-75 10:33AM

<Cued by Press[76], Levin[68,69]; Keys: Terminology; System, def.; situation, def.; conference, def.>
Wherever "situation" has been used recently, "conference" could have been substituted without changing the denotation in my mind, both denoting some bounded time sequence of human communication/interaction, generally under some kind of unusual or unnatural constraint or limitation (the thing that makes it interesting for us). The constraints are associated with the means used to communicate, i.e. the things that carry, store, and transduce or process information, as well as to control this carrying, storing, and processing. So I would define "system" in these terms, a bit more abstractly than has been done, and distinguishing between a system and its users. To study systems, to my way of thinking, is to study the variety of means for carrying, storing, and

processing/ transducing information, and for controlling these functions, possibly with given classes of conferences in mind a priori, possibly not.

Of course, when I try to sort the index of keywords into the major categories "systems" and "conferencing" it doesn't work because so much of each implies so much of the other, sometimes very directly.

[89] Carlstedt WED 7-MAY-75 12:06PM

<Keys: Layers of systems>
A note to myself from the last meeting says "Comment on the fact, mentioned by Carlisle or Levin, that one conferencing system can support or be supported by another within or around it." Example: A published journal using the US Mail Service. Comment: It's well to be aware of the abstraction dimension when discussing systems of any kind. Many of the qualities of NCONFER are due to the (teleconferencing) system in which it is implemented, namely the TENEX operating system.

[98] Levin WED 7-MAY-75 4:02PM

<Re: Terminology, in response to Jim Carlstedt's [86]>
I think that his use of "conference" is closer to Larry Press's "application" [76], that is, a particular system used in a particular situation.

[99] Carlstedt WED 7-MAY-75 4:50PM

<Re: Levin[98], Conference vs situation, def.>
Okay, you're saying that one should use the term "conference" only when the particular system is given or known. (But I just reviewed the list of situation examples, [see entry [70] below] and they all sound like conferences to me!)

[104] DCrocker WED 7-MAY-75 6:59PM

< Keys:Taxonomy, Terminology, Situations, Applications>
I have a feeling that we are getting awfully picayune about the terminology that distinguishes between situations that are typically called 'conferences' and the mechanisms used for supporting those conferences. My impression is that the intrepid man (or woman) on the street would call the former a 'Conference' and the latter a 'Conferencing System'.

Some fun does develop when we notice that there are general CLASSES of conferences, as well as particular conferences (e.g., professional conferences vs. a particular National Computer Conference) and individual pieces of communications tools vs an integrated schema (e.g., television vs the New York MRC system).

So far, we do not seem to be very successful in finding a term to describe the (process of) mapping between the taxonomy of Conferences and the taxonomy of Conferencing Systems.

At the moment we have the following sets of alternative terms:

Conferencing Systems Mechanisms Implementations Components	<- ? ->	Conferences Situations Types Events

I suppose that the question mark could be replaced by "conference planning".

[109] Levin WED 7-MAY-75 7:19PM

<Re [104]>:
I may have said this before somewhere, but there are at least two interesting different mapping questions that arise as real issues:

1) given a (situation, conference, event), what (system, mechanism, components,...) should one select to maximize the goals of the situation within the limits of the constraints (cost, distance, kinds of interactions required).
2) given a (system,...), what application could we use it for.

[160] Bretz TUE 13-MAY-75 5:08PM

<Keys: Taxonomy, Situations, Systems>
I would like to propose that we accept Press's entry [76] in which he very adroitly summarized what we had discussed in the last meeting, as at least level 4, possibly level 5 material. **[See entry [97] for explanation of these levels.]** Press suggests that " a system is a collection of hardware, software, people and procedures organized to facilitate communication." This satisfies me fully. He further suggests that "A situation is composed of two or more participants in a physical and organizational (relational) "setting" with (perhaps common) goals. This could take a little more work.

Finally he suggests that an "application" is a particular system-situation pair. This definition I accept without hesitation. I think this is his own addition, I don't remember anyone saying that exactly, although it may be. I propose to do most of my work in the area of systems since that is what I know the most about.

EXAMPLES OF TELECONFERENCING SITUATIONS

While we were developing a good definition of TC situation, we were also collecting examples of different situations. Following are several entries suggesting instances:

[70] Levin THU 1-MAY-75 12:37AM

Examples of teleconferencing situations

A colloquium lecture with questions from a remote audience

A speech to a remote audience

A discussion among remote participants oriented toward mutual information interchange

A conflict resolution conference between Egyptians (in Cairo) and Israelis (in Jerusalem)

A West coast college class taught by a professor in Pennsylvania

A weekly policy problem discussion by the branch managers of a California bank (each one in his home office)

A decision making meeting of NSF grant reviews, all at their homes.

A town meeting to discuss and vote upon a proposed tax hike, with each voter participating and voting (secretly) at home.

A conference to develop new energy conservation ideas, with each member at his own office

A new participatory art form, where each participant votes for and sees the next addition to the creation

[74] DCrocker THU 1-MAY-75 5:11PM

<Situations>
In Jim's creative list, there were never two (or more) individuals in the same room, so I'd like to add:

Monthly management meeting of the manager and assistant manager of each branch of the Bank of America. They are at their respective branches.

[78] Press MON 5-MAY-75 5:16PM

<SITUATIONS>.
I SKIMMED BACK OVER THE TRANSCRIPT LOOKING FOR PREVIOUSLY MENTIONED SITUATIONS. HERE ARE THE ONES I FOUND (I AM IGNORING THOSE IN [52] SINCE THEY ARE MENTIONED AGAIN IN [70]). [10] DYNAMIC TEXTBOOK FILES FOR COURSES IN A UNIVERSITY DEPARTMENT. [12] CONFLICT RESOLUTION IN INTERNATIONAL RELATIONS. [15] NOTEBOOK FOR AN RD PROJECT. [16] THE CONDUCT OF DELPHI STUDIES. [3.2] SUPPORT OF COLLABORATION AMONG RD WORKERS (IN GENERAL). [3.17] JOINT DESIGN OF QUESTIONNAIRES, COMPUTER PROGRAMS OR ELECTRICAL CIRCUITS. [3.17] JOINT ANALYSIS OF A DATA BASE. [3.20] BULLETIN BOARDS FOR RESEARCHERS OR THE GENERAL PUBLIC. [3.20] SHARING OF WORKING MEMOS AMONG RESEARCH WORKERS. ...

[85] Carlstedt WED 7-MAY-75 10:14AM

<Situations, examples>
1. A group of deafmute children trying to talk to each other by drawing pictures on a chalkboard. 2. A group of more than 2 forest rangers communicating by walkie-talkie while searching for a lost child. 3. Earthlings communicating with some extra-galactic intelligence, each trying to find out the second thing about the other. (By someone's definition, (see [62]) this is a realtime conference.)

These are very arbitrary examples, as is the length of this contribution.

[71] Levin THU 1-MAY-75 12:44AM

Common characteristics of Teleconferencing Situations in [70] 1) More than two communicating people ("conference") 2) At least one remote member ("Tele")

[92] Bretz WED 7-MAY-75 2:27PM

Some time last year I attended a conference in Washington for the purpose of discussing Marshall Jamieson and Jim Bett's study of the cost of satellite educational systems. There were about 150 people at the conference, maybe more. Jim Bett gave a short introductory review of the project and then called for discussion. Dozens of hands went up. Everyone had read the report and had suggestions to make. One after another people were heard and the number of hands raised didn't seem to diminish very much. I had the feeling that the number of unexpressed comments must have been ten times as great as those that were heard. This is point one.

Point two: Group thinking, around a conference table, for instance, is stimulating to the individual and broadening to the conference. Individual thinking, on the other hand, is faster, and deeper , provided that it starts at a sufficiently high level of stimulation, and has sufficient breadth. The two should be somehow combined.

[118] Carlstedt FRI 9-MAY-75 4:18PM

<Re: Bretz[92]>:
The phenomenon of unexpressed comments could stand more discussion. How best to balance their value vs their cost in listener/reader time and transcript volume.

[49] DCrocker MON 31-MAR-75 12:11PM

<Taxonomy, TC goals>
In establishing a teleconference, it is necessary to decide whether the goal is to try for the best possible emulation of a face-to-face conference or whether the mediating electronics are to be used to control the participants' environment.

In the case of controlling the environment, the control can (insidiously) be used to manipulate participants -- without their knowledge, such as perceived audience, presence/absence of authority-figures, and the particular information that is passed on to them (purposeful censorship -- refer to my entry on Bargaining [2.3], (in Behavioral Topics).

Alternatively, the electronics can be used to help the participant keep clear as to his role. As a simple example: use a portion of the participant's display screen to display his current role information (..."consultant on procedures in political lobbying; comments are off the record; ...").

CONFERENCE SITUATION CHARACTERISTICS

Given this separation of Teleconferencing Situation from Teleconferencing Systems, there are two kinds of dimensions along which Situations vary.

1. The most important of these is the Goal of the conference.

[52] Levin MON 31-MAR-75 5:10PM

Further notes on our Taxonomy: It seems like the purpose of a conference may be of overriding importance in determining the optimal structure for the communication network within which it should occur. There is no simple dimension to specify the kinds of goals (instead probably these would have to be specified in a separate taxonomy!) but one major distinction is between interactions that are essentially cooperative and those that are competitive. Of course, no interaction is purely one or the other, but many types fall along one end or the other (cooperative: seminars, information gathering meetings, problem solving groups (brainstorming); competitive: bargaining meetings, conflict resolution meetings, political caucuses).

Of particular interest are Problem Solving conferences. These conferences have a variety of different goals: Information dissemination, information gathering, persuasion, conflict resolution, idea generation. The utility of a particular Teleconferencing System will differ for groups with different kinds of conference goals.

2. Constraints on participants

A second major aspect of Teleconferencing Situations is the set of constraints on the participants. Some participants need to be separated in space and/or time, or need particular kinds of intercommunication. For example, all participants in a conference may be individually isolated, or subsets may be face-to-face but remote from other participants. The amount of isolation that is optimal for the participants strongly determines which Teleconferencing Systems are appropriate.

Teleconferences also vary in the communication channels required, and the nature of these channels. Some conferences funnel all communications through the chairman, while others require that each participant be able to communicate directly with all the others. Some conferences rely almost exclusively on voice communication, while other rely heavily on visual media.

Finally, some conferences require various kinds of public, private, and/or anonymous communications, while others need only one of these.

IMPLICATIONS FOR TELECONFERENCE DESIGN: MATCHING SYSTEMS TO SITUATIONS AND VICE VERSA

The separate consideration of teleconference situations from teleconference systems suggests that teleconference design consists of building an appropriate system for a given situation, and of finding an appropriate situation for an existing system. The evaluation of a teleconference (a system applied to a situation) should consider how well the system facilitates the goals of the conference, within the constraints of the conference. The benefits for any conference must outweigh the costs for it to be considered useful by its participants. Existing teleconference systems increase the benefits to the participants in some situations, but also raise the costs.

A Teleconferencing System will be judged valuable only when its NET benefit (value minus cost) is larger than the net benefit of alternative kinds of conferences.

TELECONFERENCE SYSTEMS
Edited by Rudy Bretz

A highly simplified expression of the distinction that was developed between situation and system might go like this : "The situation is what the teleconference is trying to do, plus the human context and conditions within which it is trying to do it. The system is the technological or physical equipment, people and their relationships, which make it possible." Press's definition of system (from [76]) puts it more precisely: "A system is a collection of hardware, software, people and procedures organized to facilitate communication".

Sometimes systems are described, or denoted, simply by naming the medium involved, (e.g., an audio or a video system), sometimes by a particularly important component, (e.g. a computer assisted [or managed, or controlled system), sometimes by the type of network or relationships between separated participants (e.g. two-way system, round-robin system etc). None of these alone is adequate for distinguishing a class of systems, since any system is composed of a set of several such elements. Statements such as "an audio system is what we need" are close to meaningless. Thus it was decided to at least separate "network" from "medium", classifying all the examples we could come up with in each case, with the thought that an eventual matrix of the two lists would generate a large number of cells, many of which were bound to be, as yet, unfamiliar.

The term "medium" remained undefined; probably all participants would agree, however, with the "type of information" sensory approach in which media are distinguished as audial or visual, alphameric or graphic, still or motion visual and the like. The term "channel" is often used interchangeably with "medium", or it may be found used to denote an entire system (e.g. "Communication: who says what to whom through what CHANNEL, with what effect") A more limited meaning of channel was intended by the participants in this conference; a definition is attempted in the discussion of networks.

Since nearly all participants in this seminar were specialists in the human use of computers, it is inevitable that the most sophisticated thinking concerned computer-based teleconferencing systems such as CONFER, which we were using. Some existing teleconference systems, and some that are only possibilities utilize a combination of media, either sequentially, or simultaneously (e.g. audio and video, text and graphics) Such combinations are referred to here as "multimedia systems" or simply as "multimedia". Some excellent analysis by Carlstedt, [56], listed eleven categories of storage, and in [62] matrixed the realtime vs the nonrealtime dimension against the role played by a recorded transcript (either none, auxiliary, or central), resulting in six classes.

The taxonomy of teleconference media proposed by Bretz in entries [273-279] was based on the sensory modes in which information is received. When two or more modes are used, the system is considered multimodal, but different combinations are not separately classed.

[56] Carlstedt TUE 8-APR-75 12:27PM

<Taxonomy, Storage>

. . .

Below are eleven major storage types that have been suggested during our seminar.

1. The storage that composes the starting point for the study of conferencing systems is the MIND of the human PARTICIPANT. The most rudimentary configuration contains only this type, as in ordinary face-to-face, telephoning, etc.

2. Conference information may be directly entered from or written out to OTHER types of SOURCES and DESTINATIONS, such as prewritten notes and documents, external files, etc. Systems may differ in the types of such sources and destinations they can accommodate.

3. Personal EDITING STORAGE may be provided by or for a participant to assist him in creating entries. Examples are notepads, the edit storage of an input terminal, and storage allocated to the use of a computer-based text editor.

4. One of the biggest distinctions among conferencing systems is whether or not (or the extent to which) conferences are recorded. A RECORDING refers to storage in which the ordering of "entries" is primarily chronological (although not all entries may be recorded). A single conferencing system might allow several subconferences to be recorded simultaneously. Also, many types of records of the same conference or subconference might be maintained simultaneously, and transcriptions might be made from one type to another. Examples are hand-recorded minutes, audio sound track, video, film, and computer-stored text.

5. A system might provide for STRUCTURED TRANSCRIPTS whose contents are essentially those of a recording but whose primary apparent structure is designed or can be modified to reflect more closely that of the conference itself with respect to topics or participant relationships, or to enhance retrievability.

6. Because transcripts tend to become voluminous and because entries tend to have a short expected period of relevance or non-obsolescence, one or more DISCUSSION ARCHIVES may be provided, distinguished along those lines. An example is provided by the "old-" and "ancient-messages" files of ISI's BBOARD directory.

7. If a conference has a specific decision-making or problem-solving goal, then approved or adopted results might be distinguished from other material for purposes of easier identification and reference, and a special information structure, the PROJECT STATE, provided for this purpose. For example, if the conference is engaged in interactive design, the project state would consist of specifications of the design object (e.g., a system of computer software) at various levels of detail/abstraction.

8. Because it is sometimes necessary to change decisions after they have been made, and because it is also sometimes useful to know what the former decisions were, a system might provide for the maintenance of a PROJECT HISTORY consisting of since-changed, -replaced and -updated decisions, specifications, or versions.

9. The project state and history are the sources of information composing REPORTS to the outside world--reports that might be retained in the system for future reference by participants but that might best be regarded and accessed neither as part of the project state nor project history.

10. As a counterpart to the personal edit storage used for preparing inputs, personal or group-shared storage can be provided into which information is retrieved from various of the above categories, and from or on which it is displayed. This RETRIEVAL/DISPLAY storage might be used to restructure conference information according to the personal desires or needs of a participant or

subgroup, and to allow him or them to associate private comments with it. Included in this category (at the present level of abstraction) are personal computer storage, character-display storage, and hard-copy output.

11. A final category consists of DESCRIPTIONS of the conference itself (information on how to use the system, topic definitions, mediation and control policies, etc.) and of its participants (names and various characteristics).

[62] Carlstedt WED 16-APR-75 12:45PM

This entry is found in its entirety in the Classification Schemes section. Repeated here are only: 1) an excellent definition of "real-time", and 2) six classes created by matrixing the real-time and non-real-time dimension against the three transcript roles: none, ancillary, and central.

By a real-time conference we mean, I suppose, one in which the expected inter-entry time (from all participants) is sufficiently short, i.e. short enough that costs of waiting for someone to say something are judged low relative to the value of the information gained, so that participants are in fact waiting in an attentive or at least easily-interruptible "plugged in" state rather than joining occasionally and having to get caught up.

...

RN--real-time, no transcript role. This class is typified by ordinary face-to-face conferences or simulations thereof.
RA--real-time, ancillary transcript. An example occurs in the courtroom, where the judge may say, "Will the recorder please read the testimony of witness x regarding y."
RC--real-time, central transcript. Examples are on-line, interactive games.
NN--non-real-time, no transcript role. This class is typified by (the use of) message or mail services.
NA--non-real-time, ancillary transcript. An example is our current use of NCONFER.
NC--non-real-time, central transcript. This class is typified by shared information bases in general, of which data base management systems, bulletin boards, and published forums such as letters to the editor and Harper's Weekly are examples.

[69] Levin THU 1-MAY-75 12:33AM

TELECONFERENCING SYSTEM
This is a specification of the components of a communication medium capable of supporting a teleconference of some kind. Aspects include the kinds of channels provided and their bandwidth, the number of channels and the time delay of each, the timing of interaction, storage characteristics, etc. Alternative names: Medium, Channel

[72] Levin THU 1-MAY-75 12:45AM

Examples of Teleconferencing Systems

FORUM/CONFER - this is what we are now using

TENEX LINK - everyone immediately sees everything anyone types, all intermingled on one line

PLATO TALKOMATIC - everyone immediately sees everything anyone types, but each person has a separate part of the screen where their typing appears

TENEX SNDMSG - you send text to some specific set of others, who see it at some later time (a "mail" facility)

ISI BBOARD - you send text to BBOARD, where other people look for these general notices if they're interested

Conference Telephone calls - all hear what anyone says immediately all intermixed

The U.S. Postal service - you send written text, which the other receives sometime later

The mass media (tv, radio, newspapers, books) - you send text to some vaguely specified others, who see it some later time

Office memos - you send text to some sequence of others, who see it in a sequence, possibly adding to it comments

[77] Press MON 5-MAY-75 4:56PM

CARLSTEDT'S TAXONOMY (62) IS VALUABLE NOT ONLY IN THAT IT CLUSTERS SYSTEMS OR SITUATIONS IN A PROPERTY SPACE, BUT IN THAT IT HELPS ONE TO FOCUS ON APPLICATIONS WITH A HIGH LIKELY PAYOFF.

FOR EXAMPLE, IT WOULD SEEM THAT APPLICATIONS TENDING TOWARD "CENTRAL" TRANSCRIPTS ARE THE MOST PROMISING PLACES FOR KEYED-ENTRY, DIGITAL SYSTEMS. IF A TRANSCRIPT IS CENTRAL TO A REAL-TIME APPLICATION, THE NARROW BANDWIDTH COST IS OFFSET. IF A TRANSCRIPT IS CENTRAL TO A "NON REAL-TIME" (JIM, HOW ABOUT "ASYNCHRONOUS"OR SOME OTHER TERM?) APPLICATION, APRIORI DATA BASE STRUCTURING CAN HELP OVERCOME THE RETRIEVAL PROBLEMS (SEE 3.17 AND 20) CONVERSELY, WE CAN FOCUS ON LOW PAYOFF REGIONS OF THE

PROPERTY SPACE AND FIND SPECIAL CASES (VALUES ON OTHER DIMENSIONS) FOR WHICH THE DISADVANTAGES MIGHT BE JUSTIFIED. FOR EXAMPLE, REAL-TIME COMMUNICATION WITH LOW TRANSCRIPT VALUE MIGHT STILL BE JUSTIFIED IF THE PARTICIPANTS HAD CERTAIN CHARACTERISTICS (DEAF, MUTE, EXTREMELY SHY, STUTTERER) OR IF THE SETTING HAD CERTAIN CHARACTERISTICS (A

HIGHLY EMOTIONAL SETTING, WHERE AN IMPERSONAL CHAIRTHING, WITH A SPECIFIED SET OF FLOOR PASSING RULES WOULD BE OF VALUE - AS IN MARRIAGE COUNSELING).

The following four or five entries constituted a short thread that ran for a few days. The subject was multimedia in teleconferencing, and a proposed experiment.

[79] Bretz TUE 6-MAY-75 4:26PM
Here is an idea for some future Wednesday afternoon experiment. If it will work. How about trying out a combination CONFER/Phone system where a set of, say, ten participants is provided with a party line phone to all, plus CONFER terminals for all. We could maybe discuss a topic for fifteen minutes, then each make electronic notes for fifteen minutes, then read each other's notes for five minutes, etc. Since these would be hurried, informal notes, they probably should be edited and weeded out by their authors before becoming permanent entries.

[118] Carlstedt FRI 9-MAY-75 4:18PM

<Re: Bretz[79,92-93]>:
. . .
Me too for an experiment in mixed realtime/nonrealtime conferencing.
. . .

[81] DCrocker TUE 6-MAY-75 6:53PM

<Rudy's suggestion for CONFER/phone experiment [79]>
I vote in favor. Dave Farber even said that IFF was trying to include such a feature into the FORUM system. Since the phone is so much more convenient than typing, but is limited to one speaker at a time (whereas CONFER lets all of us type at once) it will be interesting to see how the two media are used.
. . .

[156] Bretz TUE 13-MAY-75 4:02PM

<Keys: Taxonomy, Systems, Multimedia>
I am interested in any data supporting (or undermining) the use of more than one medium in a teleconference situation. This might take the form of a multimedia system, or it might involve the simultaneous application of two different systems, or it might involve a sequential use of two systems. For example:

1) A multimedia SYSTEM such as Plato, lends itself to simple alphanumeric display, alphanumerics and line graphics, or using locally stored materials, still pictures alone or in combination with either or both of the other means.

2) A multimedia COMBINATION, such as audio tape and pictorial or graphic material on paper, has no integration of hardware but there must be integration of software, i.e., comments on the audio tape

are planned to refer to specific drawings or pictures. As in the case of 1) above, software must be integrated; it would be impossible for each of two media to be doing separate things.

3) A multimedia SEQUENCE such as our current seminar, which alternates face-to-face conference with electronic notebook, need not be integrated, except by general topic, purpose and the like. As in 2), hardware is separate. It is my guess that the proposed CONFER/party line phone system will turn out to be more useful as a sequence than a simultaneous combination. How the hell can you type while you are talking on the phone?

The following entry, while it does not actually refer to this thread, may be inserted here because it suggests an application where multimedia might someday be appropriate.

[92] Bretz WED 7-MAY-75 2:27PM

Some time last year I attended a conference in Washington for the purpose of discussing Marshall Jamieson and Jim Bett's study of the cost of Satellite Educational systems. There were about 150 people at the conference, maybe more. Jim Bett gave a short introductory review of the project and then called for discussion. Dozens of hands went up. Everyone had read the report and had suggestions to make. One after another people were heard and the number of hands raised didn't seem to diminish very much. I had the feeling that the number of unexpressed comments must have been ten times as great as those that were heard. This is point one.

Point two: Group thinking, around a conference table, for instance, is stimulating to the individual and broadening to the conference. Individual thinking, on the other hand, is faster, and deeper, provided that it starts at a sufficiently high level of stimulation, and has sufficient breadth. The two should be somehow combined.

[118] Carlstedt FRI 9-MAY-75 4:18PM

<Re: Bretz[92]>:

. . .

The phenomenon of unexpressed comments could stand more discussion. How best to balance their value vs their cost in listener/reader time and transcript volume?

. . .

[131] Levin SUN 11-MAY-75 6:21PM

<Re: Proposed computer/voice experiment>:
We could certainly round up enough terminals at ISI to do the computer part, but I don't think there is any easy way to hook the phones together to provide the voice part. That is, ISI's switchboard doesn't have this capability. We could probably find a secretary whose phone shares one or more lines, so that we could have three separate voice connections (or four, if we could talk two secretaries into allowing us to displace them for the duration of the exp.). Well you see the problem - maybe four is enough. (One person typing and the other talking at each station?)

Unfortunately, this promising proposal bogged down on the problem of setting up a conference phone; it had a happy five-day life, and expired.

[86] Carlstedt WED 7-MAY-75 10:33AM

. . . To study systems, to my way of thinking, is to study the variety of means for carrying, storing, and processing/transducing information, and for controlling these functions, possibly with given classes of conferences in mind a priori, possibly not.

Of course, when I try to sort the index of keywords into the major categories "systems" and "conferencing" it doesn't work because so much of each implies so much of the other, sometimes very directly.

[88] Carlstedt WED 7-MAY-75 11:17AM

<Keys: Taxonomy, Systems; System def>.
Taking the approach that a system, most generally, is a pair (X.R) where X is a set of (classes of) components and R is a set of relations giving structure to X: I spent half an hour trying to come up with such a definition of "conferencing system", and could arrive only at such abstractions as those mentioned in [86]. But this seems to impose a whole new taxonomic dimension on systems, since one can begin by trying to classify configurations (interconnections) of "carrier" and "station" nodes (an impossibility?) abstractly, before even considering their types. The latter would come from independent taxonomies of carriers, repositories, transducers/interfaces processing functions, and control functions. The abstract configuration is what Anderson and Sutherland [46] called the "channel topology", although their stations were only participants and didn't include intermediate storage, processing and control functions.

I frankly don't see the significance of all this unless one is interested enough to pursue the system taxonomy thing vigorously, which I doubt if any of us are at this point. I started to make some notes about effector/sensor relationships among nodes and about manual vs automatic types of control, but have discontinued it.

[89] Carlstedt WED 7-MAY-75 12:06PM

<Keys: Layers of systems>
A note to myself from the last meeting says "Comment on the fact, mentioned by Carlisle or Levin, that one conferencing system can support or be supported by another within or around it." Example: A published journal using the US Mail Service. Comment: It's well to be aware of the abstraction dimension when discussing systems of any kind. Many of the qualities of NCONFER are due to the (teleconferencing) system in which it is implemented, namely the TENEX operating system.

[109] Levin WED 7-MAY-75 7:19PM

<Re [104]>:
I may have said this before somewhere but there are at least two interesting different mapping

questions that arise as real issues: 1) given a (situation, conference, event), what (system, mechanism, components,...) should one select to maximize the goals of the situation within the limits of the constraints (cost, distance, kinds of interactions required). 2) given a (system,...), what application could we use it for.

[105] Levin WED 7-MAY-75 7:07PM

Here is a rather different teleconferencing application that I have been involved in developing recently. I have recently left a rather closely interacting research group, and we were interested in maintaining the level of our interactings (above the level of Christmas card greetings and seeing each others' papers in the journals). However, most did not have access to the ARPAnet, etc. and could not afford large telephone bills (most being new assistant profgessors, etc). So the following entry was sent to each of us, in an attempt to use the good old US Postal system as a (admittedly slow) tele- conferencing mechanism. The reason I submit it is partly in response to the discussion about review mechanism by other members (Bretz and Carlstedt above).

[107] Levin WED 7-MAY-75 7:13PM

RECURRENT NEWS LETTER

Purpose: To encourage the communication of interesting ideas.

Procedure:

1) Read through the contributions in this version of the News Letter.

2) Add some contribution of your own. This can be a paper or short note concerning your own work, your responses to the other contributions, an interesting article by someone else, some interesting data, etc. Put your name and address on the front page of your contribution.

3) "Edit" the News Letter, by deleting contributions you have already seen before or that you don't think are worth passing on. Remember that you are paying for "publishing" (xeroxing and mailing) this version of the News Letter, so you want to keep the size down. Feel free to annotate the contributions of others.

4) Xerox a complete copy of all of the contributions (plus copies for yourself, if you want to keep any). Mail the copies to TWO of the people who have contributed. You can choose the people who would be most interesting in seeing your contribution. Or you can select someone new to send the News Letter to. Be sure to enclose this instruction sheet.

Properties of the News Letter: Since this News Letter is edited and published by each reader, it has the following incentives:

Participation: The more often you contribute, the more often you will get a future version. Contributing keeps your name in circulation - those who don't contribute eventually won't receive any feedback.

Quality: The higher the quality of your contribution, the more widely it will be circulated, since it will be more likely to be passed on by each person who receives it.

Quantity: The shorter the contribution, the more likely each person receiving it is to xerox and send it on.

[119] Carlstedt FRI 9-MAY-75 5:08PM

<Application, example>
Levin's "Recurrent News Letter" example brought this to mind. In our family, we have had a Round Robin letter which has made the circuit among an average of probably eight participants about once every 3-4 months continuously since the summer of 1944. (As a conference, it has occasionally engaged in some high controversy--religion and politics--but rather unsatisfactorily.)

[121] Levin FRI 9-MAY-75 6:31PM

Re: Evaluation of Recurrent News Letter [105], [107], [118]
The first round was sent out in mid Feb. I haven't gotten back any versions, but I have heard from various people that it is still circulating. This may be a major (and possibly fatal) drawback - the slowness of feedback. (possibly on the 3-4 month period mentioned by Carlstedt for his family's round robin). That is, will people find feedback that is that old useful enough to keep participating. Of course, this is incredibly fast in comparison to journals, but still incredibly slower than face to face.

One interesting comment I got when explaining this to someone was: "You may never know if it succeeds or not!" - that I may walk down the street 10 years from now and see someone with an 80th generation xerox of the original instructions.

One advantage over the round robin is that it isn't completely dependent on cooperation by all members. Our family has also been participating in a round robin letter (but only for about 10 years - Jim, I salute your family!), and failure by any of us to send on quickly would have a fatal effect (and periodically does - I've gotten "news" that was as much as 6 months out of date).

The most interesting feature for this discussion is the filtering that takes place. Contrast it with 1) blackball filtering of a journal reviewer, who can decide what everyone else can or cannot see of someone's entry, 2) non filtering of CONFER or round robin, where everyone sees what everyone enters. By failing to send on someone's contribution, you only lower the probability that any other given member will see it, since there is at least one other copy of that entry in circulation. Complete deleting results only from a set of independently made decisions to delete it. In some sense, it takes advantage of the fact that each person bears some of the maintenance cost of the network (xerox _ postage). Perhaps this notion of "cost" could be artificially introduced to a teleconferencing network: you get to send on only so many characters/unit time, and each copy sent

to another member adds to this. Plus allowing one to spend his allotment on forwarding other worthy entries. Well, I've bankrupted my daily allotment. Enough.

[135] Press MON 12-MAY-75 4:28PM

<RE LEVIN (107)>
GEE THAT SOUNDS LIKE A GOOD IDEA! I'D LIKE TO GET "INTO" THE SYSTEM. IT FEELS LIKE A "BULLETIN BOARD" ON WHICH YOU CAN TRY OUT AND EVEN GIVE AWAY IDEAS - IS THAT A CORRECT UNDERSTANDING?

YOU MIGHT CHANGE THE INSTRUCTIONS TO SAY SEND TO "AT LEAST" TWO PEOPLE. YOU MIGHT ALSO DATE ENTRIES AND KEEP TRACK OF WHO HAS SEEN THEM IN ORDER TO ASSIST IN DELETION DECISIONS.

<RE: LEVIN (109)>
LET'S CONSIDER "RD BULLETIN BOARDS" AS A SITUATION IN SEARCH OF A SYSTEM. (I GUESS THIS IS ALSO A MARGINAL NOTE TO 107).
A BULLETIN BOARD IS NOT SO NECESSARY IN YOUR OWN SPECIALTY (IF YOU HAVE ONE), WHERE YOU KNOW WHO THE OTHER WORKERS ARE, BUT IT WOULD BE MOST HELPFUL IF YOU GET AN IDEA OUTSIDE OF YOUR SPECIALIZED AREA . I THINK THAT IDEAS OUTSIDE OF YOUR SPECIALTY --WHERE YOU LOOK AT SOMEONE ELSE'S PROBLEM WITH YOUR WORLD VIEW AND VOCABULARY -- ARE IMPORTANT BECAUSE THEY HAVE THE POSSIBILITY OF BEING RADICALLY , RATHER THAN MARGINALLY INNOVATIVE.

THE BULLETIN BOARD WOULD BE USED BY A PERSON SEEKING CRITICAL FEEDBACK, REFERENCES TO PEOPLE AND DOCUMENTS, AND/OR COLLABORATORS WITHE COMPLEMENTARY SKILLS OR INTERESTS. WHAT ARE SOME SYSTEMS FOR THIS SITUATION? (A FEW IDEAS FOLLOW):

LEVIN'S "CHAIN LETTER"
A "BULLETIN BOARD" SECTION IN EACH SIG PUBLICATION
A MIMEOGRAPHED NEWSLETTER SENT ONCE PER MONTH TO EVERY FACULTY MEMBER AT X UNIVERSITY.

[154] Levin TUE 13-MAY-75 3:58PM

<RE: Press [135],RE Levin [107] (recurrent news letter)>
1) I'm not sure what more you need to "get into the system" that what you have now (i.e., the instructions). One nice feature of this kind of (dare I say it) teleconference is that it isn't closed in any way, yet, there are kinds of naturally occurring restrictive mechanisms. That is, if your comments aren't considered worthwhile, they won't circulate very far, and you will be less likely to get responses.

[155] Levin TUE 13-MAY-75 4:01PM

<RE: Press [135] etc. (continuation of 154)>
2) Each person "keeps track of" what he has seen before and just doesn't send on again those that have already been sent to him before. Thus, any particular entry will only circulate for a definite time (unless annotations on it, etc. make it interesting enough for any of the participants to decide to send it around again).

Again, the general flavor is that of a "distributed intelligence network", i.e., no central control, editing, administration, veto, etc.

[162] Bretz TUE 13-MAY-75 5:27PM

<Keys: Taxonomy, Systems>
As a level-three entry (see Carlstedt: [97])for the system taxonomy I suggest the following tree taxonomy :

A. Real time systems
   1. Media (these are all telemedia)
   2. Network configurations. (I'll define these terms below)
B. Non-real-time systems (Asynchronous ?)
   1. Media (These are all recording media)
   2. Distribution configurations. (I'll figure out what I mean by this and add it in the next entry I make.)

This can be visualized as a pair of matrices, 1 matrixed against 2 in A, and 1 matrixed against 2 in B.

[186] Bretz MON 19-MAY-75 10:12AM

NETWORK: A set of nodes connected or interconnected by channels.

NODE : The location of a terminal or set of individual terminals having a COMMON OUTPUT CHANNEL. One or more participants may be located at a node. (these are proposed definitions)

PROPOSED TAXONOMY OF REAL-TIME NETWORK CONFIGURATIONS: This refers to item A,2 in the systems taxonomy proposed in entry [162]. Two-way, two-node systems. These systems are probably the most common type of teleconferencing system to date. The first systems, connecting downtown and midtown conference rooms of New York banks, were of this category. Some were audio-only systems, some audio-video. One was audio-video until the video equipment wore out and they continued it in audio only -no one felt that the video was important enough to justify asking for the funds for a new set of equipment. Of course, one reason for this is that the video picture was such a wide shot, showing the entire room, that any one face was almost microscopic in size on the tv screen - its no wonder they didn't miss it, it wasn't contributing anything. Two-node systems can be divided into two general types, depending on the media that are used. These subdivisions are : symmetrical and non-symmetrical. A symmetrical system employs the same medium in both directions. a non-symmetrical system employs one medium or set of media in one direction and another medium in the other direction.

[205] Carlstedt FRI 23-MAY-75 1:52PM

<Re: Bretz: Taxonomy>
When this media-network configuration taxonomy gets finished (in first-cut form or whatever) it would be nice if it were all collected into one place. Are you working on section B of [162] (non-real-time systems) also, Rudy? I have in the past thought about trying this approach to a taxonomy (see [88]) but decided it was too strenuous for me.

The rest of this section was generated as a series of consecutive entries in the teleconference, without, at that late stage, receiving any responses. Since it was more in the nature of monologue than dialogue, and not really part of the conference, it has been taken out of the entry form and included in the form of editor's notes.

TELECONFERENCE MEDIA

A medium is an artificial means of communication between persons who are not together in the same place and time. Since in most face-to-face communication messages are expressed so they can be heard or seen, or both, it is natural that communication media should be based on audial, visual, or audio-visual means. Visual means include written (printed) language as well as graphic and pictorial means. It will not be very definitive, however, to classify teleconference systems according to the media that are used, referring to one system as an "audio " system, another as a "television" system, and so forth, since a given system may use several media. The various channels that interconnect nodes in a teleconference network may carry different media in different links of the network, or even on the same link, as when television is used one direction and audio-only for feedback. When the output channel at a given node carries the same medium as the input channel, the system may be said to be symmetrical at that node, and if all nodes share this characteristic, the whole may be called a symmetrical system. An asymmetrical system is thus another example of the use of more than one medium in a teleconference system. The most common example, however,is the simultaneous use of two or more media on the same channel (or on parallel channels along the same route). Such multi-media uses are of three kinds : l. multimedia sequences, where the two or more media are used alternately. 2. multimedia combinations, where they are used simultaneously, but are not fully integrated. 3. multimedia systems in which the hardware, at least for the display function, is fully integrated.

In a multimedia SYSTEM one medium cannot be detached from the other and the two used separately, although of course one medium may be used alone, at the expense of allowing the other to go unused. There are many familiar examples of multimedia systems: sound film strips in which a record or audio cassette is integrated into a projection device; and sound films, videotapes, and live TV in which a motion picture and a sound system are so thoroughly integrated that the sound may be carried on the same film as the picture, or the same magnetic tape, or in some cases, over the same microwave transmission channel, although separate channels for sound and picture transmission are the rule. In a multimedia COMBINATION, the two or more media involved remain separate systems, they are only USED in combination, not permanently combined, although any software prepared for such a system must itself be integrated.

It is almost always difficult to make clear and hard distinctions: transitional forms frequently appear, to prove that your classes are only clusters of examples on a continuum. Audio is an exception to this; a system either has sound or it has not, so far there is nothing in between. But just where a multimedia combination becomes a multimedia system, and vice-versa, is difficult to define. In theory at least, in multimedia systems, the two media involved are of equal importance, although they may not always be used as though they were. Audio visual systems, for example, are notorious for neglecting the visual channel. In multimedia sequences and combinations, however, one medium is usually considered the primary medium with the other(s) secondary. The primary medium, logically, should be the one that is used to carry the essence or the most important elements of most messages. Whether two combined media are used equally, or one is primary, and which one this is, can be determined by a

simple test: attend to each component medium separately, and observe which causes the least loss in comprehension of the message.

Since teleconferencing of nearly any sort depends on language, and since language carries the essence of most information transfer among humans (although far from ALL communication), it is logical that the media that can convey words are nearly always primary. These are the audio media, conveying information via human speech, and the various visual media that convey words in printed or written form. Graphic and photographic information is required in some teleconference applications, although usually only in a secondary supplementary role. It would be logical to expect that when a graphic or pictorial means is combined with a verbal means, that the verbal means would be primary. It is most unlikely that a visual pictorial means alone, not containing printed or written language, and not accompanied by audio narration, would be useful in a teleconferencing system.

A communication system consists of three main subsystems: 1)origination, 2) distribution (which may be via direct transmission or via recording, storage and physical transportation, or both) and 3) display. Direct electronic transmission distributes a message in real-time and is mandatory if teleconference participants are to speak together in a normal manner. An audio teleconference COULD be operated in the manner of a computer conference, with entries made and stored when convenient to the sender, then played back and heard when convenient to the receiving participant. However, the speech situation would not be normal, just as speaking on one-way radio or television is not a normal situation for persons who are not experienced in these media. The speaker, unless he has been specially trained and is endowed with a certain degree of imagination, relates only to the microphone and/or camera before him, not to a person to whom he is speaking, and hence speaks in a formal and stilted manner (or tries to sound like a radio announcer). Constant immediate feedback is necessary for natural interaction, and this must be provided in real-time. Some media, because their means of origination at one end and display at the other as well as the intermediate transmission are electronic, are naturally real-time media. Symmetrical audio and television systems are examples of this. Other media, such as film, utilize methods of origination and display that are naturally related to storage. Film may be transmitted and displayed electronically (via TV), but not simultaneously with the events that take place before the camera.

Thus another important division to make in classifying teleconferencing media, is the distinction between real-time media and storage media. Each of these areas contains single basic media, multimedia combinations, and multimedia systems. It is important to note, however, that when a teleconferencing system utilizes more than one medium in a multimedia system or combination, all media components do not have to be all real-time, or all storage in nature. A combination of real-time and storage media is often the most valuable. As long as a multimedia teleconference system has at least one real-time component, especially if this happens to be the primary medium, the system can be used in real-time and the whole thing can be thought of as a real-time system. Participants are "assembled" and are all "present" at once, no matter how widely separated in space they actually are. Meanwhile the advantages of recorded transcript, graphic materials for extended study, and the like, may also be enjoyed by means of the storage media components.

A kind of real-time film existed in the days just preceding the era of electronic television. It was called the "intermediate film TV system". The 1936 Berlin Olympic games, for instance, were televised by this method. Sound and picture were recorded on film, developed in the camera, then scanned and transmitted a few seconds later - in real-time at least, if not actually

live. The British experimented with a similar system. I remember actors who had performed on early BBC television describing how they would finish a scene in the studio, then rush around to the control room and catch themselves still on the screen.

A CLASSIFICATION OF TELECONFERENCE MEDIA

In formulating this classification we could limit the total field to one of four sets of media:

1. Currently available media (and multimedia) that have been or are now being used for teleconferencing.
2. All currently available media, whether used for teleconferencing or not.
3. All known teleconference media, PLUS all other known media that seem to be logical possibilities for teleconference application.
4. All known media and all possible future media that seem to be logical possibilities for teleconferencing.

In the interests of time (reader and well as writer), I am taking the third approach, listing and classifying media that have been used, plus other logical possibilities. In the following taxonomy the primary classifiers are the means of representing information, i.e., alphameric, audio, graphics, still visual, and motion visual (film, video, etc.). The real-time vs non-real-time (or storage) features, which are highly discriminating, are only noted, (by R: realtime or S: storage) but not used in the classification. This is in order to incorporate MULTImedia systems and combinations, (see [273]), as well as single media. Some multimedia systems or combinations (see examples in table below) include both real-time and storage media. These could not be classified by the system I first proposed in entry [162], where real-time and non-real-time are the major classifiers, without having to be subdivided for the purpose.

The two primary classifiers in this taxonomy are the alphameric and the audio capability. This is based on the observation that most communication, whether real-time or storage, depends on words to encode information, and words may be conveyed either by voice or by alphabet. Here the taxonomist's dilemma again appears : what about multimedia systems that utilize BOTH alphameric and audio means? An audio and facsimile system might be an example. The way I have handled this is to assume that one of the multimedia, the audio in this case, is primary and is supported by the other(s), in this case the facsimile. This is a reasonable assumption in this case, but might not be so clearcut in other examples. In instructional systems, for example, when a foreign language is being taught, words must be seen in printed form as their pronunciation is heard.

How many media are there that may be used for, or in, realtime teleconferencing? In their simplest uncombined form there are only six classes. The first two of these are the media that are the most efficient means for carrying words: the audio and the alphameric. One of these is always used in any teleconferencing system. Then there are three classes of visual media. The first of these is Semimotion : media such as telautograph, telepad, and telemation. These make it possible to convey information by the simple visual means of writing or drawing. There are two classes of pictorial/graphic means : stillvisual and motionvisual. Finally there is the "signal"class, simplest of all, which provides for the transmission of pulses

to operate signals such as lights, bells, flags, clicks, beeps and the like, plus selected responses chosen from a menu.

Only two of these media, audio and alphameric, can be expected to be used alone in teleconferencing, since these are the media that can most efficiently carry language. Media of the various visual classes: semimotion, stillvisual and motionvisual are capable of carrying words, but not efficiently. In the case of semimotion the words must be slowly inscribed in cursive form, and in the case of the still and motionvisual classes, words may be rapidly transmitted and displayed, but only at a relatively high cost - while wasting the medium's full visual capabilities. (tonal scale, motion, and possibly color).

How many additional media are there that may be used for, or in, nonrealtime teleconferencing? The answer to this calls for a review of the definition of teleconferencing with which this paper began. If "teleconferencing" is to justify the prefix "tele" it must include all conference uses of realtime (tele) media, (bridging space but not time), and it may also include some nonrealtime media (bridging both space and time), provided they are used for relatively short periods of storage, and especially if they can be distributed by electronic transmission. So far, computer-based methods are the only nonrealtime means to satisfy teleconference requirements. Mail and audiotape correspondence, for example, although they can be interactive, involve so much delay that they are rarely used for inter- nodal communication and never for anything called "teleconferencing ". This is not to say that other media will not find such uses in the future. Facsimile would be a good candidate and would probably be so used if there were enough other regular uses for the terminal equipment so that individual terminals were widely available. Videotape might be used for conferencing; new equipment such as "Betamax" and "Mavicard" have made great breakthroughs in reducing the cost and bulkiness of video recording. However, this use will have to wait for inexpensive broadband transmission: videotape correspondence by mail would be no more useful for teleconferencing than written letters. Still picture television, however, (combined with audio as in the case of videotape) is a more immediate possibility. Equipment for recording, transmitting, storing and displaying electronic still pictures is available off-the-shelf today, although it is still not as inexpensive as it could become under conditions of volume sale. Most importantly, however, transmission costs are comparable to those of telephone transmission.

We have noted that to classify teleconference media we can either begin by dividing them into those that accept the spoken word, and those that accept the printed word, or we can divide them first into those that operate in realtime and those that operate in nonrealtime. (See entry [62] for a good discussion of these terms) Which of these pairs we use as the major classifiers will depend, I suppose, on which pair of features makes the greatest difference in system use. There is a relationship between these pairs which should be noted : realtime systems lend themselves best to the spoken word, or to put it the other way around, human speech is most natural under conditions of realtime response, while nonrealtime systems, at least what we are using today, utilize the written or printed word. Also, since typewritten words may be readily converted into digital form, the alphameric systems lend themselves to short or long-term storage and computer manipulation. Written style of expression rather than oral is used. Noting these relationships between spoken language and realtime, written language and nonrealtime, we somewhat reduce the importance of choosing the right pair of major classifiers: whichever pair we choose we are assured that the other pair will be almost equally operative.

Arbitrarily, then, I have begun this taxonomy of teleconference media by a division between the alphameric-based and the audio-based. In each of these two major categories there is one, and most probably only one, class of medium that may alone be used in teleconferencing. These are the alphameric-only class (e.g.typing) in the first instance, and the audio-only class in the second. All the others must be used in concert with other media, either as systems, combinations, or multimedia sequences. When audio is used as the basic medium, some means is generally necessary to keep participants aware of who is present at each node, which node is responding, and specifically who is the speaker at all times. This CAN all be done by verbal announcement, but becomes unwieldy, can be readily overlooked, and tends to be disruptive to the conference. Some audio teleconferencing systems have added signals such as lighted nameplates, separate speakers for each participant and the like. These have been referred to as "augmented" audio systems. It is possible that augmented audio will also be required when an audio semimotion system is designed. (See class 6 in the taxonomy below). The MRC television system does it all visually, an occasional wide shot showing who is present, a sign on the conference table identifying each location, and closeups of people identifying them as they speak. It is possible that future still picture TV systems may solve the problem in the same way.

An interesting multimedia system is suggested in class 9 in the media taxonomy. This is a three-media system incorporating audio, still pictures, and an electronic type of semimotion called Telemation. With these three capabilities, still pictures could be transmitted, discussed by voice while details are pointed out, symbols moved, lines drawn, or areas filled in by Telemation.

A fourth medium, one of the alphameric class, could be added to this if characters were generated and superimposed on the screen to identify speakers by name (class 10). Since all visual elements should be displayed on the same screen if possible, this would be a multimedia system. While all of this and more could be achieved with one television system, using now very inexpensive off-the-shelf origination and display equipment, the cost of TV transmission remains very high in comparison with the narrow-band circuits that voice, slow-scan TV, semimotion and alphamerics would require.

To summarize and apply the points mentioned above, a suggested taxonomy of teleconferencing media is given below.

CLASS	REALTIME EXAMPLES	NONREALTIME EXAMPLES
ALPHAMERIC - BASED		
1. Alphameric only	Computer conferencing	S Same with storage
2. Alphameric and semimotion	Computer text and graphics	S Same with storage
	Computer text and telepad	C Computer file and mag tape
	Computer text and telautograph	C Same as above

3. Alphameric and stillvisual	Still TV with superimposed alphamerics	S	Video disc
	Computer CRT with facsimile	C	Computer file and facsimile
AUDIO-BASED			
4. Audio only	Telephone/radiophn.	S	Audiotape
5. Augmented audio	Teleph. w signals, separate spkrs etc.	C	Stereo tape, signals on 2nd track
6. Audio and semimotion	Telewriting	S	Audiotape, 2-track
7. Aug. audio with semimotion	Unfamiliar	C	Mag tape
8. Audio and stillvisual	Stillpicture TV	S	Video disc
	Facsimile + voice	C	Fax + audiotape
9. Audio, stillvisual + semimotion	Unfamiliar	S	Video disc
10. Same as above plus alphamerics	Unfamiliar	S	Video disc
11. Audio and motionvisual	Television	S	Video tape

There are two media and nine multimedia systems and combinations listed in this taxonomy. Some are identified by two or more examples, others by only one. (The letters S and C distinguish between probable systems and combinations.) This taxonomy may not be complete at the present time and it will probably have to be revised in the future. It is a classification of media that are used only in the act of teleconferencing and does not include media suitable only for other kinds of communication, such as planned information presentation.

Presentation is often associated with a teleconference, for example, as the springboard from which the discussion ensues. In such cases the presenter may want to distribute printed materials or slides to each location by mail in advance of the meeting and integrate these additional media into combination with the existing conference media.

Media may also be used to record a conference, for the benefit of interested persons who were unable to attend (MRC-TV records all conferences on videotape for this reason), or as a data bank suitably indexed so that participants may refer at will to what was said. (see entry [59] in this section) Here again, the media that are used for this are not necessarily the same as those used for the conference itself, although in the case of nonrealtime computer conferencing this may be so. Examples of such recording media are listed in the last column of the taxonomy where they may be referred to either as media for nonrealtime conferencing

in the manner of our present computer-based methods, or as suitable media for recording a complete transcript of a conference for future reference.

It should be noted that there is no constraint on teleconferencing that requires a given conference to use only one medium (or multimedia set) from beginning to end. In fact, most conferences may use different combinations in sequence; audio alone when appropriate, audio with pictures of the speakers, audio with graphic materials and so forth. In these cases the full capacity must be available throughout the conference even though it is not fully used. This is typical of media in general and is not to be deplored. What is deplorable is the use of a channel when it is not appropriate. The history of media is filled with examples where a producer felt obligated to use a capacity, say a visual channel, even when there was nothing to show, with the result that his efforts at providing "visualization" only caused distraction.

Kinds of links are determined by media. Thinking of a teleconferencing system as a network of nodes and links, we have so far considered only the media or multimedia by means of which a given node will output, thus determining the channel, or set of channels running from one node to another (or to all other nodes). The same link will also include incoming channels as well. The simplest network relationship is the binodal, where a single channel, or set of channels, is reversed between utterances, either automatically, or manually, using a convention such as the word "over" to serve as a cue. In this case the media in each direction are identical (since they are one and the same) and the system is symmetrical.

When the binodal network consists of two channels, as in the case of the telephone, one running in each direction, the possibility exists for them to consist of different media or multimedia, and hence to produce an asymmetrical system of which there can be many kinds. Sometimes the inversion of an asymmetrical link will result in a link that has very different uses.. e.g. A system that had, in a given link, audio, still pictures and facsimile going out from a "headquarters" node, but only audio coming back in, would be mainly useful for instructional purposes, while a system with all these media coming back and only audio going out from the central node would be useful for detailed reporting, consulting and the like).

The following table matrixes the 11 different teleconference media (and multimedia) against themselves to determine how many pairs are logical. For example it does not seem logical that one node would converse in audio while its respondent could reply only by typing, so the three alphameric-based media are not combined with any that are audio-based. A total of 42 different kinds of links results.

	1	2	3	4	5	6	7	8	9	10	11	
1	×	×	×									1 Alphameric only
2		×	×									2 Alphameric and semimotion
3			×									3 Alphameric and stillvisual
4				×	×	×	×	×	×	×	×	4 Audio only
5					×	×	×	×	×	×	×	5 Augmented audio
6						×	×	×	×	×	×	6 Audio and semimotion
7							×	×	×	×	×	7 Aug audio and semimotion
8								×	×	×	×	8 Audio and stillvisual
9									×	×	×	9 Audio, stillvisual and semimotion
10										×	×	10 Audio, stilv, semim, and alpham.
11											×	11 Audio and motion visual
	1	2	3	4	5	6	7	8	9	10	11	

NETWORK CONFIGURATIONS

Real-time communication systems are based primarily on electronic circuits and switching. Consequently, network theory was developed by electrical engineers and involves much that is unfamiliar to non-technical people. However, some of the more basic concepts of network design are needed when designing a teleconference system even in the non-engineering aspects of the design. What follows is a highly simplified discussion and classification of real-time teleconference networks based on obvious distinctions that make substantial differences in how the resulting systems can be used, i.e., in possible applications to teleconference situations. Each of the network types can be under stood to apply to a wide range of real-time media, the classes of which will be described below.

For instance, network configurations of the same type could be devised for audio-only media, alphameric-only media, telewriting, still-picture TV, full audio-visual television, etc. Parts of a network may involve one medium, while other parts may use another medium. For instance, two-way TV systems used in instruction frequently incorporate audio-only feedback. Combinations of network types are not only possible, but may become as common as pure forms. A complex network may incorporate a loop in one portion, a star-shaped distribution pattern in another with perhaps switched and unswitched portions. The types listed are the basic figures which may be combined in various combinations to make individual network patterns. Since teleconferencing requires that all participants be able to interact with all other participants, simple linear and local network patterns, in which each node may inter-communicate only with its immediate neighbors (see entry 46), have not been included in this listing.

Networks of any kind consist of nodes, and links between the nodes. The functions of these nodes and the ways in which they are linked determine the kinds of networks that are formed. In the case of teleconferencing the nodes are individual participants or groups of participants (depending on media or mode employed) or they may be switching centers forming junction points in the network. (Data banks such as computer files may also constitute nodes in a teleconference network.) A link may thus be a single channel, either one-way or reversible, or it may constitute two or more channels running in one or both directions. A channel may constitute a single wire, or it may be a range of frequencies (radio frequencies or RF) which is known as a band. Many RF frequencies may be carried in a single wire (if it has broad-band capability). A "circuit" may be a single wire (or RF channel) running in one direction only, or

it may consist of two channels operating in opposite directions, as in the case of the usual telephone circuit.

Unswitched or open systems are "hard-wired" so that each channel runs from one specific node to one (or more) other specific nodes. In a open audio system, all participants in a teleconference hear each other at all times ; in an open TV system all participants see and hear each other continuously. In a open alphameric system, such as Plato Talkomatic, the screen is divided into areas of several lines each so that each participant may type and simultaneously receive typing from all other participants at any time. Obviously such systems are limited in the number of nodes it is practicable to include.

SWITCHING

In the network taxonomy that follows the terms "switched" and "unswitched" are used as major classifiers. The switching that this refers to is "internal" switching, meaning internal to the conference in the sense that it is carried on during the conference as a necessary part of it. It is switching of which the participants may be aware if they wish to note it. Such switching may be required, for instance, to select the source from which the next message will originate, i.e., which among several participating nodes will have the floor.

"External" switching, which is done prior to a conference in order to establish routes and interconnect the proper nodes, is not considered in the taxonomy. Switching for the purpose of allowing participants to join or to leave the conference, and switching in order to change routes or equipment, of which participants are normally totally unaware, is also considered external. The most familiar example of external switching is the telephone conference call. External switching at a telephone exchange, or series of exchanges, may set up a conference in advance, add or subtract participants during the conference, change routes or equipment, but the conference itself in which everyone may speak or hear all others at all times remains an unswitched system. Unswitched systems are also referred to as "open" systems since anyone may speak at any time. Telephone conferences are usually multinodal, with three or more participants at different locations. An ordinary binodal telephone call may be a conference, however, if we assume the presence of two or more persons at one or both nodes. In such cases extension handsets may be used, or speakerphones for group listening.

Another kind of switching which is familiar in existing teleconference systems could be called "intra-node" switching. A human controller, or a voice-actuated device, switches among the several microphones, cameras or other sending devices at the node to determine which will feed to the output of the node at any given moment. Similarly, in an augmented audio system, intra-node switching may select one of the several signals to transmit along with the participant's voices, to actuate lights or switch among several speakers at the other node(s) in order to identify speakers. There is no constraint which forces all teleconferences to use just one and only one network configuration throughout a conference. It is conceivable that a system might be used, for instance, which would allow a conference to begin in an open unswitched mode and then, if the chairman felt that more control was needed, be changed to a switched configuration in midstream. In the classification that follows, each class should be understood to represent the distribution pattern of some single representative conference, not an overall network facility (such as a telephone network) capable of carrying many conferences at once over the same or different routes.

A CLASSIFICATION OF TELECONFERENCE NETWORK CONFIGURATIONS

1. Bi-nodal configurations.

Most of the teleconferencing systems that have been constructed and operated to date are bi-nodal systems.

1.1 Unswitched bi-nodal configurations. (See figure 1)

Two nodes permanently linked by a pair of channels facing opposite directions. The first system that connected conference rooms at uptown and downtown branches of a New York City bank, was bi-nodal. It later added a switching center so that any two of three possible locations could be interconnected, but not all three at once. Thus it remained bi-nodal, and because the switching was external, an unswitched system.

1.2 Switched bi-nodal configurations. (See figure 2)

One-channel-reversible, local switching. It is possible for a single circuit to be used in two directions, alternately, as in the case of a push-to-talk audio intercom system. Control pulses are required to operate some such systems; for instance, when a participant at one node puts his switch into output mode a signal will travel down the line (or another, special control line) to automatically put the distant switch at the other end of the line into input mode so he can be heard. Television microwave channels may also be made reversible by a similar procedure.

2. Multinodal

2.1 Unswitched.

2.1.1 Loop (See figure. 3)

The advantage of the loop system is that all channels face the same direction. Thus it is useful in a situation such as a multiple-channel but one-way CATV system. If the system can be closed on itself in some way, it can be used as though it were a two-way system. The problem with a loop is that it must be designed so that no channel feeds into itself and causes continuous and progressive electronic feedback. An unswitched loop could be devised, in which all nodes are in constant communication with all others, if each circuit is terminated before it gets back to its originating node.

2.1.2 Home run (See figure. 4)

Each node is connected by a separate circuit to every other node. The advantage of this system is that each node may simultaneously display all other nodes, which is useful for TV, facsimile etc. However, since each node must thus have the same number of input and output channel sets as the number of other nodes in the system, home-run configurations can become very expensive as the number of nodes increases. (Number of channels increases approximately as the square of the number of nodes.)

2.1.3 Star

The star system is based on the use of a central distribution node. Each node has one input for every other node in the system, but only one output, which is branched to all other nodes in the system at the central point.

2.2 Switched

2.2.1 Loop

2.2.1.1 Single channel (See figure 6)

According to this system, nodes share time on a common channel. Switching is done locally, although this could be done by remote control. There is a 2-position switch at each node, which, when placed in "talk" position, breaks the loop to prevent feedback. All switches must be interlocked, however, so that when node two, for instance, talks following node three, node three's switch will automatically leave the talk position and the channel will be complete again around the loop.

2.2.1.2 Multiple-channel (See figure 7)

With two channels a node may receive on one channel while transmitting on the other one. If the system uses the TV medium, a person listening may be seen by a speaker, or persons wishing to speak may possibly switch themselves on.

2.2.2 Star and tree.

The star and the tree configurations are similar and can be classed together. The tree, having several branching points, will have more than one switching node, while the star has but one. A tree, in other words, is a combination of two or more stars. An unswitched tree would be impracticable because of the large number of channels required in each link. The primary characteristic of star/tree systems is one or more central nodes, which may be only **switching centers or may contain provision for origination and participation. It may be clearest to think about such a combination node as a PAIR of nodes, a switching node plus a participation node, the latter being the same as any other participation node, differing only in its proximity to the switching center.**

An exception must be made of a system in which switching and participation are so integrated that the "chairman" of a teleconference actually controls the switching himself, or it is controlled by someone in the central conference room. In this case the central switching node and the central conference node are actually one.

2.2.2.1 Single program line. (See figure 8)

In the switched star/tree each node has only one outgoing channel(per medium), and in this case only one incoming channel onto which is switched, probably by a central controller, the output from the most appropriate other node. If this channel is a common "program line" it is also fed to all other nodes. (See figure 8c, which represents the New York Metropolitan Regional Council system.) This configuration greatly simplifies switching, so it may be done by a meeting chairman or participant for instance, but it means that an originating node is fed its own origination. In a TV system this is undesirable because people who are talking need to see someone that they are talking to, not just themselves. M.R.C. solves this problem by a heavy use of the split screen. Of course a node's own audio cannot be played back within range of its microphones without the danger of acoustical feedback howl.

2.2.2.2 Multiple program line (See figure 9)

There is also the possibility of two or more program lines, one carrying the speaker, the others the participant who spoke last or some other appropriate choice of listener, such as a person who is expected to respond. This applies mainly to realtime visual systems.

Other network classifiers.

There are other characteristics of network systems that could be used as classifiers if the resulting classes made a difference to the users of the resulting taxonomy. One of these is the broadcast vs point-to-point dichotomy. (see entry [46]). The channels that make up the links of a network may be dedicated or shared circuits; they may be carrier frequencies transmitted by wire, by microwave beam or even via omni-directional broadcast. However, transmission means do not often determine the teleconference media usable on a given network nor the teleconference situations to which the resulting system can be applied, except as they may affect capital cost, operating cost, and time for implementation. While these factors may determine a system's viability, they do not generally directly govern the way it can be used. The immediate use of this classification is to map against a classification of teleconference media to produce a taxonomy of teleconference systems. This in turn will hopefully be mapped against a future classification of teleconference situations. Because these are the goals, the point-to-point vs broadcast dichotomy is not considered an important classifier.

Similarly, various methods of switching, specifically the message-switching vs packet-switching dichotomy, are not considered to have sufficient direct effect on how a switched system is used, to function as major classifiers. The presence of one or more than one outgoing program line is considered more important. This is not to say that packet switching makes no noticeable difference to users in the responsiveness and thus the efficiency of alphameric teletransmission. However, it made little difference in the WAYS in which the networks were used.

FIGURE 1: BIMODAL, UNSWITCHED

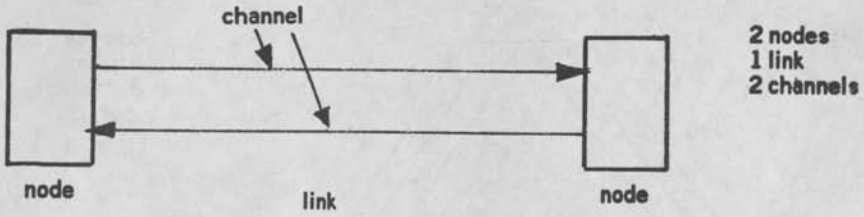
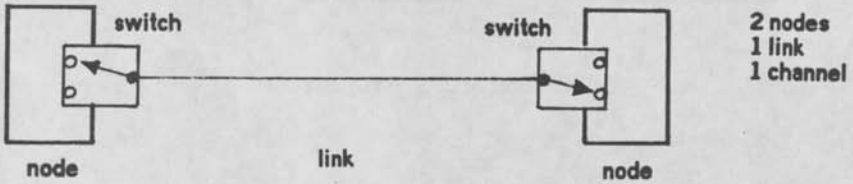
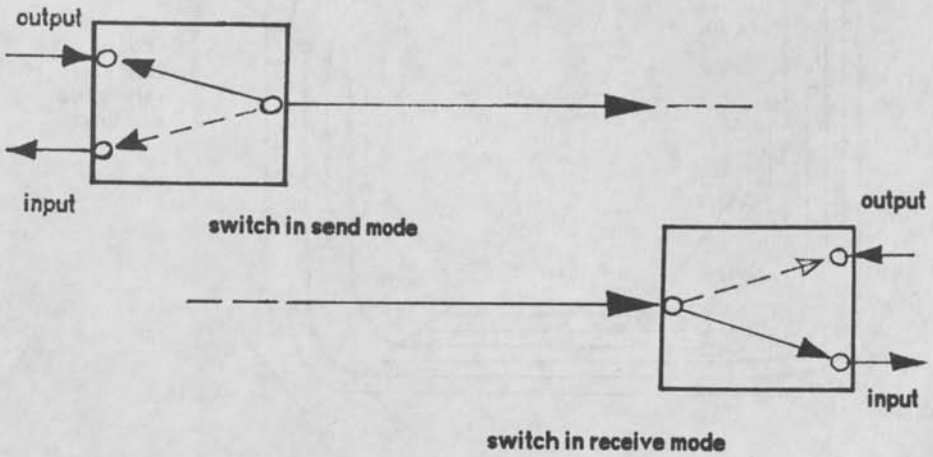
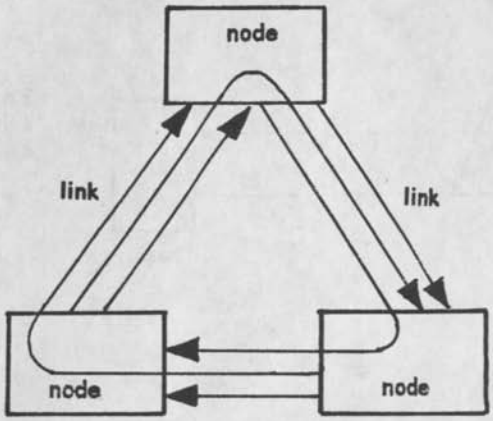


FIGURE 2: BIMODAL, SWITCHED

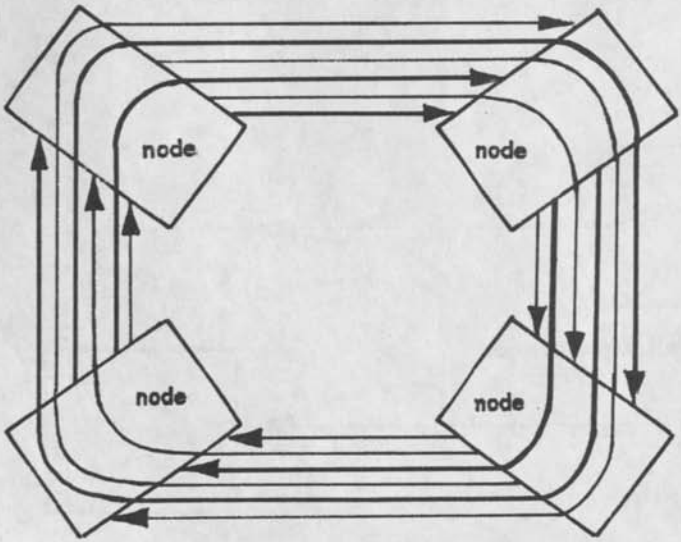






3 nodes
3 links
3 channels
per link

FIGURE 3: UNSWITCHED LOOP



4 nodes
4 links
6 channels
per link

FIGURE 4: UNSWITCHED HOME RUN

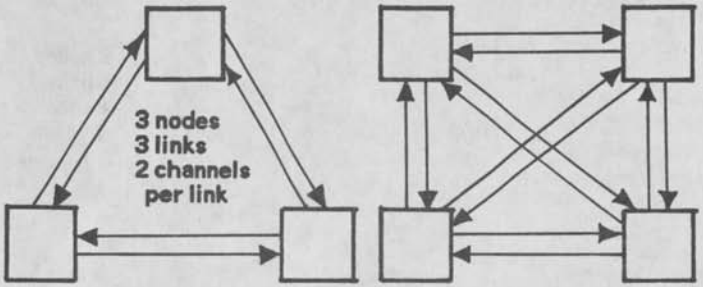


FIGURE 5: UNSWITCHED STAR OR TREE

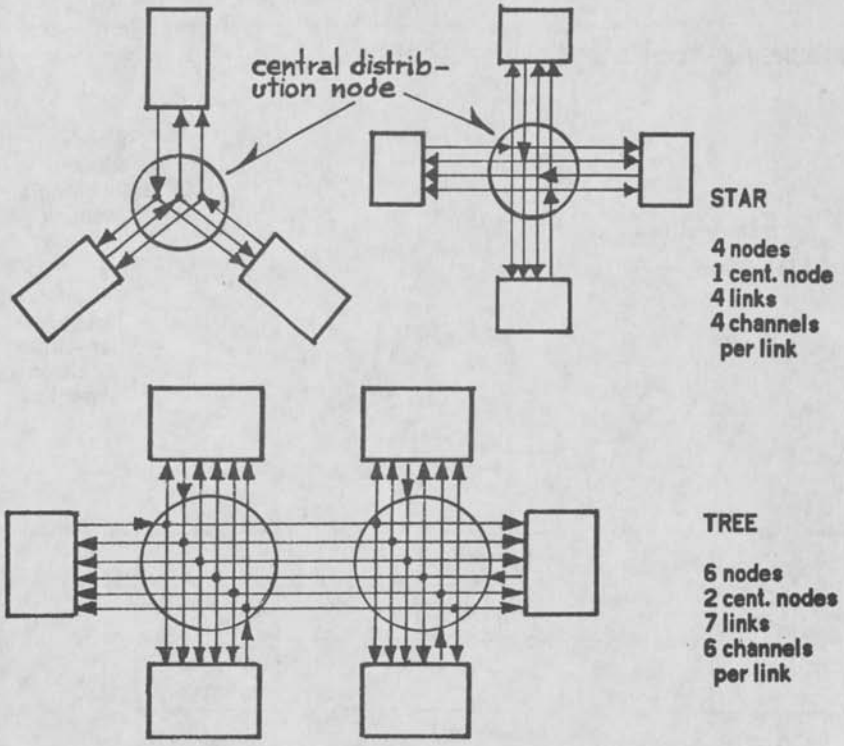
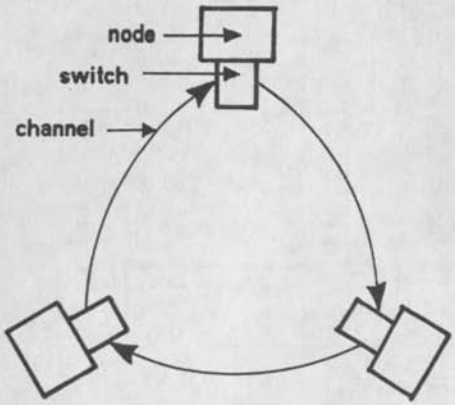
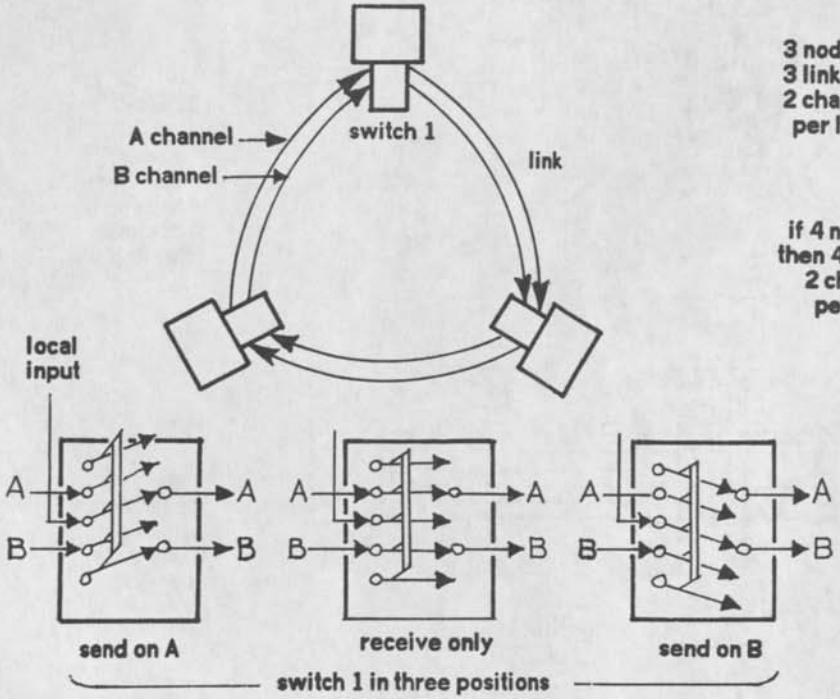


FIGURE 6: SWITCHED LOOP, SINGLE CHANNEL



3 nodes
3 links
1 channel
per link

FIGURE 7: SWITCHED LOOP, MULTIPLE CHANNEL



3 nodes
3 links
2 channels
per link

if 4 nodes
then 4 links
2 channels
per link

FIGURE 8: SWITCHED STAR OR TREE, SINGLE CHANNEL

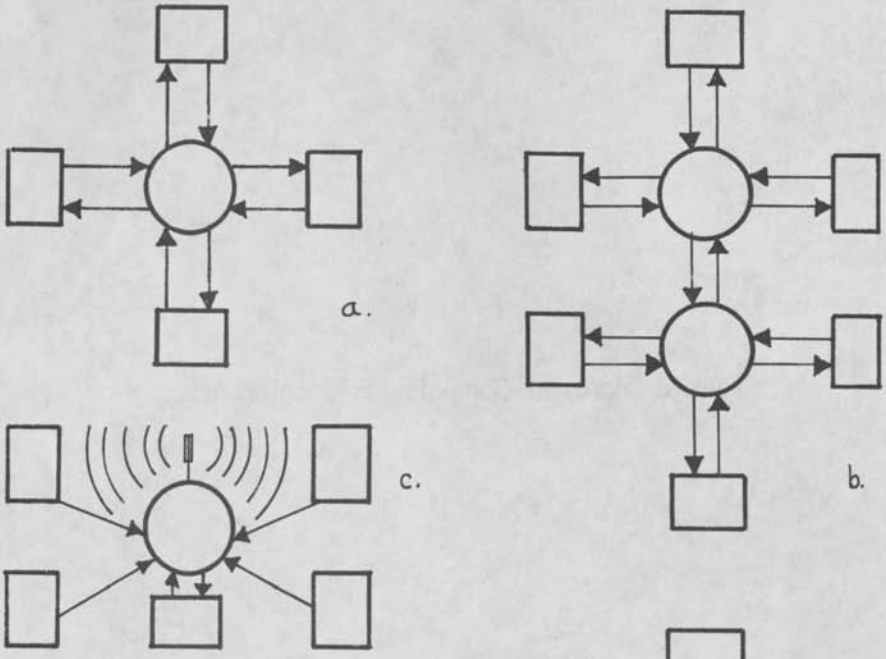
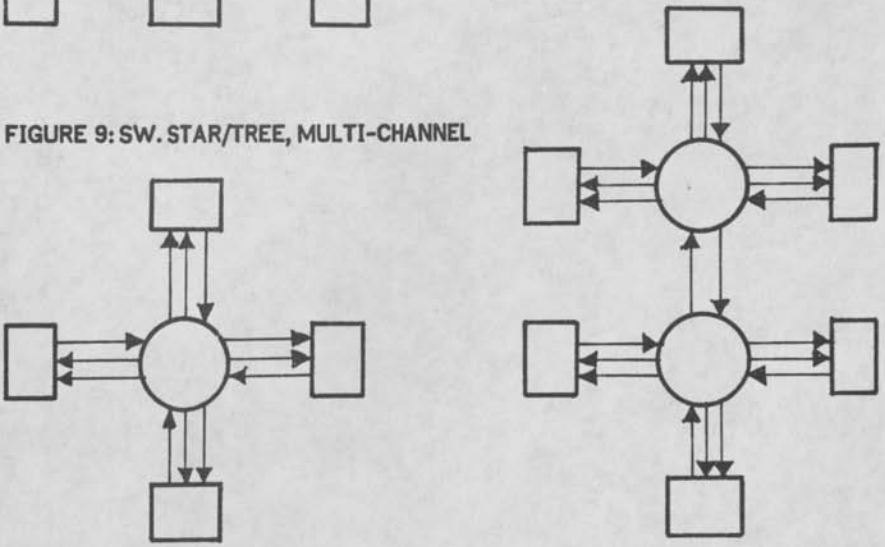


FIGURE 9: SW. STAR/TREE, MULTI-CHANNEL



PART II

Toward Improved Computer Teleconferencing.

THE USER INTERFACE AND THE NCONFER SYSTEM, I

Edited by David H. Crocker

During the face-to-face portion of the conference, there was some discussion of interfaces for possible and existing teleconferencing systems which do not necessarily use computers. In general, a distinction was made between a teleconferencing system "control cockpit" which acts as a personal communications center, and those systems which can be used between two or more GROUPS of people. The New York Metropolitan Regional Council TV system is an example of this latter perspective. Comments in this conference dealt amost exclusively with human-computer interfaces tailored for highly interactive use by individuals.

In the online portion of the conference, discussion about design of user interfaces for teleconferencing systems focused on both the "ideal" system and, in particular, use of the NCONFER system. Teleconferencing systems are, themselves, interfaces between humans. Consequently, the line between "the interface OF a teleconferencing system" and "a teleconferencing system AS an interface" is fuzzy. Our use of NCONFER, a derivative of the IFF's FORUM system, both biased and diffused discussion on both sides of the line. With occasional exceptions, the conference did not directly and coherently address the general problems of interface design. Discussion of human factors, such as typing and terminal-display problems, tended to deal with specific situations arising from use of the NCONFER system. A sampling of unexpurgated examples, comments and exchanges is therefore included to give the reader an indication of the potential impact of interface misbehaviors.

User interface issues were often raised indirectly and thus not all entries discussing the interface are included in this section.

The few extended sub-conversations which did develop considered 1) Feedback on entries, 2) Structures of the transcript and retrieval of entries, and 3) Shortype -- a method for facilitating user input (by reducing the number of keystrokes). Each of these topics is discussed in a subsequent section of this document. A catch-all category of Behavioral Issues contains entries which focus on personality and higher-level cognitive processing factors of users. In the Review of Literature section, entries [19], [23], and [2.2] comment upon work by Sheridan, Calvin and Hedberg which is also relevant to interface design.

In this section, entries are organized into 1) Sample Problems with the User Interface, 2) Specific User Complaints about NCONFER, 3) the Psychological Impact of Channel Bandwidth and Response Latency, 4) Obtaining Status Information and Notification of New Entries, and 5) Problems with Displaying Entries from the Transcript. The next section continues the discussion about particular interface issues, with an emphasis upon recommendations for improvements.

SAMPLE PROBLEMS WITH THE USER INTERFACE

In NCONFER, a user is either "listening", "inputting" or issuing commands. In the first case, new entries are automatically printed at the user's terminal; the second case occurs when the user begins typing any but a few special characters. (Input is terminated by typing a blank line, which is done by typing carriage-return twice.) The user switches from "listening" to "command" mode by first typing a carriage-return and then typing the desired commands. Commands to NCONFER allow changing attention to different parts of the transcript, reviewing the contents of entries, and obtaining various status information about other members of the conference. Reversion to listening mode is, of course, accomplished by typing a carriage return.

The above description is likely to be confusing to the user, largely because users new to NCONFER do tend to find it confusing to exercise. However, after an initial learning period, users can become relatively facile with the system, although some surprises await even the most accomplished users.

The following four examples demonstrate the kinds of difficulties which are involved in the use of NCONFER. It is worth noting that all of the players in the following scenarios had extensive prior experience with the use of other interactive systems.

Example 1 -- A brand new user

```
[35] Anderson  MON 17-MAR-75  2:16PM
|

[36] Anderson  MON 17-MAR-75  2:28PM
THIS IS A TEST MESSAGE

[37] Anderson  MON 17-MAR-75  2:29PM
THIS IS ANOTHER TESTT ABCDEFG
THIS IS A TWO LINE MESSAGE (HOPEFULLY)
THIS IS THE SECOND LINE OF THE TWO LINE MESSAGE

[38] Anderson  MON 17-MAR-75  2:30PM
2

[39] Anderson  MON 17-MAR-75  2:31PM
35
*

[40] Anderson  MON 17-MAR-75  2:32PM
REVIEW

[41] Anderson  MON 17-MAR-75  2:37PM
REVIEW 2
AS YOU CAN SEE WE HAVE BEEN HAVING A HARD TIME.
SORRY ABOUT THE EXTRA ENTRIES IN THE FILES GUYS -
WE HAVE DECIDED THAT THE SIMPLEST WAY TO DISTRIBUTE
```

OUR COMMENTS THIS WEEK IS VIA XEROX.
ANDERSON/SUTHERLAND

[42] Levin MON 17-MAR-75 2:59PM
This is a sad comment on the state of teleconferencing.

[43] DONCHIN MON 17-MAR-75 10:32PM
this was indeed an exciting exchange.
here is a voice from a very remote listening-in conferee
for whom xerox wont do much.

Example 2 - A brand new terminal.

[95] Carlstedt WED 7-MAY-75 3:16PM
You won't believe this. I started composing a fairly long entry about feedback mechanisms. I don't know whether you'll ever see it. While in the middle of it--30-35 lines in--it suddenly started disappearing from before my very eyes, line-at-a-time, bottom up. I started over, very discouraged. After [94] it started giving me a new entry. About 20 lines in, the same damn thing happened--it just went away, same way as before! But this time I saw what had happened. Yesterday they came and took away my Beehive and replaced it with this HP2640, which is hard enough to get used to without having to beware of the fact (just sadly discovered) that the "cancel line" function key, which NCONFER interprets as "delete entry", is located right next to "backspace" which I use ALL THE TIME!!!

Example 3 - Simultaneous entries in a real-time interaction.

[3.33] Levin TUE 29-JUL-75 5:38PM
Starting with this entry is an experiment with on-line real time use of NCONFER.

[3.47] Press TUE 29-JUL-75 5:49PM
HAVE YOU GUYS FINISHED EDITING YOUR SECTIONS?

[3.48] Levin TUE 29-JUL-75 5:49PM
Not quite (what's Dave Crocker's Metasymbol for "guilt")

[3.50] Press TUE 29-JUL-75 5:50PM
I HAVE EDITED 2 OF MY SECTIONS ON PAPER, AND WILL KEY THEM IN MANANA.

[3.51] Carlstedt TUE 29-JUL-75 5:51PM
Are we supposed to put them in the comguest directory as files, or make NCONFER entries out of them?

[3.52] Carlstedt TUE 29-JUL-75 5:51PM
This is very difficult, because....because of lots of thimgs.

[3.53] Levin TUE 29-JUL-75 5:51PM
Probably better as files, since we will want to keep changing them.

[3.54] Press TUE 29-JUL-75 5:52PM
DONT ASK ME. (ANY IDEA WHAT QUESTION WAS THE ANTECEDENT TO THAT ANSWER?)

Example 4 - Limitations of a terminal.

[172] Press THU 15-MAY-75 12:32PM

<RE BRETZ (160) - METACOMMENT>
RUDY, I DON'T TYPE IN ALL CAPITALS OUT OF SOME SORT OF EGO MANIA. MY OLD FASHIONED TERMINAL CAN ONLY MAKE CAPITAL LETTERS.
. . .

[174] Press THU 15-MAY-75 12:38PM

I BLEW IT - THE CARRIAGE RETURNS GOT ME. THIS IS REALLY RE ENTRY 4.13 FF.
I AM RESPONDING TO THIS ENTRY SEVERAL WEEKS LATE, BECAUSE I JUST DISCOVERED IT. NCONFER COULD AT LEAST POINT OUT ENTRIES WHICH HAVE BEEN MADE IN OTHER ACTIVITIES WHICH HAVE YOUR NAME IN THEM WHEN YOU LOG IN.
. . .

[176] Anonymous THU 15-MAY-75 12:45PM

WHAT A TRAVESTY! HOW CAN ANYTHING I INPUT BE ANONYMOUS WHEN ALL I HAVE IS UPPER CASE CHARACTERS?? IN THE INTEREST OF JUSTICE, I PROPOSE THAT EVERYONE TYPE EVERYTHING IN CAPS FROM THIS POINT ON. -- THE HANDICAPPER GENERAL.

SPECIFIC COMPLAINTS ABOUT NCONFER

Topic 3 was the official repository for comments and complaints about NCONFER. Consequently, entries put there tended to be more formal. Most deletions from the following entries are simply to avoid duplication with other portions of the document.

[3.1] Raveling FRI 28-FEB-75 8:31PM
. . .
2. There appears to be no way to access (review, in particular) entries in multiple activities with a single command. Keyword retrieval for multiple activities would make it much easier to

correlate information among related topics.

. . .

4. Sending a private message to NCONFER seems to have the same effect as the "*" escape. Is this how it's intended to work, or have I missed something? In any case, sending a message is an illogical way to do an escape back to command mode (NCONFER subexec?).

. . .

Some specifics:

a. Consecutive carriage returns is a bad choice for a string delimiter. This demands extra effort for entering a blank line, which has to contain an explicit space, and it's inconsistent with the control-Z convention used by nearly everything else in Tenex.

. . .

c. Why do tabs vanish? Their purpose is to improve readability of the entered text, so it seems senseless for NCONFER to remove them.

. . .

6. "Review" command mechanics:

a. Escape and "?", for prompts and option lists, aren't implemented in the review command. It would be worth the effort to supply these conveniences.

b. There's no way to abort an entire review command. It should at least be possible to get back to command mode with an "*", but that doesn't work here.

The alternative of two keystrokes per entry for an abort is hardly a thrilling way to pass time in long activities.

[3.5] DCrocker WED 5-MAR-75 3:47PM

< Keys: Raveling [1], NCONFER bugs, private messages>

. . .

I personally dislike not being able to review private messages I have sent/received.

. . .

[3.7] Carlstedt MON 10-MAR-75 1:32PM

Here's a YES to almost all of Raveling's criticisms [3.1]. I feel most strongly about the use of entry mode rather than command mode as the top-level mode. That aspect of the design clearly reflects the anticipation that NCONFER would be used for on-line conferencing, with more listening and immediate reacting rather than looking at what has been said previously.

[However, note the effect of such an interaction style, in Example 3, above.] Used offline as it is, most of what one does is give commands, and it is just maddening not to be able to give one without first telling it that you want to give one. Or even to know, without any prompt character, that the system is done with the current command and is waiting for further input!

[3.27] Press THU 10-APR-75 3:02PM

. . .

2. I DONT WANT TO BE REMINDED OF THE NAMES OF EACH ACTIVITY WHENEVER I LOG IN.
3. I COULDNT GET OUT OF "DESCRIBE" WITHOUT USING CTRL-X.

. . .

[3.29] DCrocker THU 24-APR-75 3:54PM

Big NCONFER nit: If I type <cr>g<sp>1.1<cr> fairly quickly, I do NOT find myself placed into activity 1.1. Instead, NCONFER attempts to execute command "g1.1" and (of course) gives its standard, verbose error message. To get to activity 1.1, using the above sequence, I have to wait, after typing the <sp>, until the command is expanded. Looks like wake-ups/breaks are not set correctly.

[3.30] DCrocker THU 24-APR-75 3:59PM

Small nit: <cr> is getting confusing to use. Depending upon context, NCONFER interprets it to mean: 1) go into command mode; 2) go into text entry mode (from command mode); 3) (for crt devices) continue printout; 4) execute command.

[4.3] Carlstedt TUE 1-APR-75 5:25PM

That's interesting--I just submitted the above entry [4.3], and STATUS shows I'm the only participant on-line, but it marked the entry as having been submitted by Carlisle(chmn). I guess what I said about the role of the leader wasn't taken in the right spirit.

Psychological Impact of Channel Bandwidth and Response Latency

[153] Bretz TUE 13-MAY-75 3:46PM

<Cued by an article by Chapanis which appeared during the course of our seminar reporting on an investigation of problem solving behaviors between individuals linked by different combinations of communication channels. The article was reviewed in entry 2.4.>
It is very interesting to notice that in all cases where two media are combined, the multimedia mode allows the subjects to solve their problems faster. Sometimes this is a significant saving in time. Adding handwriting to voice, for example, reduced the time 25% over voice alone. (It only took them 75% as long). Adding typewriting to voice reduced the time by 20%.

Adding voice to handwriting reduced the time by 63% over handwriting alone, and adding voice to typewriting reduced the time by 60%.

What I want to know is HOW these media were used in combination- just WHY there were such time savings. Had they each been used in some other way might the savings have been less, or greater still?

These are all verbal media. What kind of results can be obtained by combining media of a visual nature, or maybe a digital pulse nature (touchtone phone pad output, if that can be considered digital)

More important yet, what about conveying or obtaining information, changing emotional state or attitudes. Chapanis' experiment concerned only one of Argyle's social skill goals : working at a cooperative task. The others are far more common in teleconferencing.

[276] Bretz FRI 18-JUL-75 2:19PM

. . .

Constant feedback is necessary for natural interaction, and this can only be provided by a real-time medium.

. . .

[225] DCrocker SAT 31-MAY-75 5:13PM

. . .

one of the descriptions of the shorthand facility
[see Shortype section] implied that the facility would evaluate every word and respond immediately. This would interrupt the continuity of typing and probably limit the input bandwidth considerably. I therefore suggest that any such facility postprocess the entry, after it is typed and before it is submitted.

. . .

[268] Bretz WED 25-JUN-75 4:45PM

. . .

In the case when someone is typing the stuff as you read it, the realization that display is simultaneous with origination makes it live, and the delay is tolerable. (or is it? Forum researchers attempted one "live" teleconference and reverted thereafter to non-real-time. Do we need further experimentation here?) What will happen, however, in the case of wide bandwidth facsimile transmission in which a page of material is available a few seconds after its transmission?

. . .

Note, in passing, that real-time print-out on hard-copy (while it is being typed) has both the characteristics of live simultaneous communication, and the advantages of non-real-time display. Note also that fast facsimile, in association with live audio, for instance, could be integrated into a real-time audio-visual communication system, making it possible to incorporate still-visual materials into an otherwise live program.

[292] Bretz THU 20-NOV-75 3:09PM

[From the transcript of the Blindfold session.] There seemed to be general agreement afterward that the elimination of the visual channel forced a concentration on the audial, with the effect that abstract thinking seemed to be encouraged. At least this was the feeling we had;

. . .

There were two very interesting differences : one, the obvious one; of down there - over there. The other thing was that the silences between speakers were markedly longer. But that was only at the beginning - after we got into it I found toward the end that it became more and more lively and natural.

. . .

And lastly:

. . .

Levin : Probably the biggest loss was the side effects, that when somebody's talking, you can see how everybody else is reacting, their faces, and whether they're sleeping or what

. . .

OBTAINING STATUS INFORMATION & NOTIFICATION OF NEW ENTRIES

[51] DCrocker MON 31-MAR-75 12:46PM

. . .

In the case of controlling the environment, the control can (insidiously) be used to manipulate participants -- without their knowledge, such as perceived audience, presence/absence of authority-figures, and the particular information that is passed on to the them (purposeful censorship -- refer to my entry on Bargaining, in 2.1).

Alternatively, the electronics can be used to help the participant keep clear as to his role. As a simple example: use a portion of the participant's display screen to display his current role information (. . ."consultant on procedures in political lobbying; comments are off the record; . . .").

[174] Press THU 15-MAY-75 12:38PM

. . .

I AM RESPONDING TO THIS ENTRY SEVERAL WEEKS LATE, BECAUSE I JUST DISCOVERED IT. NCONFER COULD AT LEAST POINT OUT ENTRIES WHICH HAVE BEEN MADE IN OTHER ACTIVITIES WHICH HAVE YOUR NAME IN THEM WHEN YOU LOG IN.

. . .

[3.1] Raveling FRI 28-FEB-75 8:31PM

. . .

1. There's no convenient way to find out what the current activity is -- only ways are Status command & human memory, which tends to be faulty.

. . .

[3.27] Press THU 10-APR-75 3:02PM

I WISH THE SYSTEM WOULD TELL ME IN WHICH ACTIVITIES THERE ARE UNSEEN ENTRIES WHEN I LOG ON. IN GENERAL, THE "BARRIERS" BETWEEN ACTIVITIES SEEM A BIT HIGH - FOR INSTANCE WHEN SOMEONE LEAVES YOUR ACTIVITY YOU ARE TOLD THAT HE HAS LEFT THE CONFERENCE AND HE DOESN'T SEEM TO RECEIVE YOUR PRIVATE MESSAGES ANY MORE. ALSO MANY ENTRIES "FIT" IN SEVERAL ACTIVITIES. (DOES "REVIEW" CROSS ACTIVITIES?) 2. I DONT WANT TO BE REMINDED OF THE NAMES OF EACH ACTIVITY WHENEVER I LOG IN.

. . .

[3.28] Press THU 10-APR-75 3:37PM

AN AFTERTHOUGHT ON THE ABOVE (27TH) ENTRY. IT WOULD BE NICE TO BE ABLE TO REQUEST THE "STATUS" OF A PARTICULAR CONFEREE IN ORDER TO DETERMINE THE POSSIBILITY OF STRIKING UP A "REAL TIME" CONVERSATION WITH HIM.

PROBLEMS IN DISPLAYING ENTRIES FROM THE TRANSCRIPT

[32] DCrocker MON 10-MAR-75 4:03PM

< Keys: Taxonomy, Conference participation >

. . .

3. MESSAGE RATE (delay)

a) Data appears to members as soon as it is entered, as with TCTALK and the New York Metropolitan Regional Council TV system. In typing systems (TCTALK **see description in review of article, entry [23]**) this is sometimes VERY painful; however it has the advantage of giving the members some feel for the speaker's thought process;

b) Entries are buffered into sub-units (e.g., sentences) to somewhat smooth out the burstiness of input, facilitating reading/listening by members;

c) Entries are distributed as complete units (e.g., FORUM). Highest reader/listener bandwidth, probably the least "realistic" feeling.

[148] Bretz TUE 13-MAY-75 3:08PM

. . .

Would print-outs always have to be in full English, or could Stenoscript typists read each other's stuff without difficulty ? How fast could a good stenotyper read back his own shorthand? Someone else's?

. . .

[24] Press TUE 8-APR-75 11:56AM

NIT PICKING NCONFER.
1. I AM USI NG A TELETYPE (REMEMBER TELETYPES?) WHICH HAS A RELATIVELY SHORT LINE. WHEN AN INPUT COMES FROM AN EDITED FILE, SOME OF THE LINES END IN OVER-PRINTED JUMBLES ON MY TTY.
2. A NCONFER-GENERATED CARRIAGE RETURN **[a feature which is intended to remove from the user the burden of worrying about reaching the end of a line]** SHOULD NOT COUNT AS ONE OF THE TWO USED TO TERMINATE AN INPUT. (TWO CRS IS A SILLY WAY TO DELIMIT **[indicate the termination of]** AN INPUT IN THE FIRST PLACE.)
3. WHEN YOU JOIN THE CONFERENCE LATE, YOU SHOULD BE ASKED WHICH INPUTS YOU WISH TO SEE UNDER EACH ACTIVITY. AS IT IS NOW, IT ASKS FOR ACTIVITY 1, AND THEN AUTOMATICALLY TRIES TO SHOW YOU EVERYTHING UNDER SUBSEQUENT ACTIVITIES. THIS WOULDN'T MATTER SO MUCH IF YOU COULD ASSUME THAT NEW USERS KNEW ABOUT CTRL-O **[which terminates output to the terminal, on most**

Tenex systems].

A short time later, Bretz found another way to suffer from the problem described by Press, in item 2 of entry [24]. Bretz was using a line-at-a-time terminal, sending lines that were too long to be accepted by NCONFER without being broken up.

[188] Bretz MON 19-MAY-75 10:42AM

PROPOSED TAXONOMY OF REAL-TIME
NETWORK CONFIGURATIONS.
THIS REFERS TO ITEM A,2 IN THE SYSTEMS TAXONOMY PROPOSED
IN ENTRY [162].
1. TWO-WAY, TWO-NODE SYSTEMS. THESE SYSTEMS ARE PROBABLY
THE MOST COMMON TYPE
OF TELECONFERENCING SYSTEM TO DATE. THE FIRST SYSTEMS, CONNECTING
DOWNTOWN
AND MIDTOWN CONFERENCE ROOMS OF NEW YORK BANKS WERE OF THIS
CATEGORY. SOME WERE
AUDIO-ONLY SYSTEMS, SOME AUDIO-VIDEO. ONE WAS AUDIO-VIDEO
UNTIL THE VIDEO
. . .

[120] Levin FRI 9-MAY-75 6:27PM

< Metacomment about [118] >:
This made the shortcomings of using an NCONFER-like device on a soft copy terminal very apparent! Even with a H-P, I couldn't hold all the pointers while going off to see what they were pointing to. However, with a printout it wasn't bad.
. . .

[3.8] Carlstedt MON 10-MAR-75 1:44PM
. . .
Even with only 30 messages in an activity, and even with a command as flexible as REVIEW, I'm already beginning to get lost and feel it necessary to resort to a printout so I can draw my usual frames around what seems relevant or exceptional and make my usual little comments in the margin--all to help me when I come back to it later. And especially so I won't be forced to screen through a long entry every time I want to find or recall something of interest in it!
. . .

[3.32] DCrocker WED 7-MAY-75 7:58PM
. . .
We have acknowledged the severe limitations inherent in having only a (slow-speed) CRT terminal for using NCONFER. Keeping entries small will greatly help circumvent the handicap. Most terminals have at least 24 lines, so that seems like a nice size. The problem is really similar to the structured programming concern for keeping sections of code small enough to fit on one page. "If you can not see all of it at one glance, you will miss some implication of the code."

BEHAVIORAL TOPICS
Edited by Jim Carlstedt

A large and diverse set of topics is included in this section --although not as large and diverse as those listed in entry [4.10] below. With the exception of the discussion on "feedback", which is listed in this report as a separate section, very little sustained interaction in any particular behavioral area occurred. Entries are grouped below around the following topics:

Taxonomies
Subconferences
Participation, competition, and coherence
Group decision-making mechanisms
Anonymity

TAXONOMIES

[4.10] DCrocker FRI 11-APR-75 11:49PM

The following is the list that Jim [Carlisle] put on the blackboard at our last meeting:

```
PERSONALITY                          SENSORY MODES
        Intro/Extro-version                  Channels
        Need for structure/control           Bandwidth
        Dominance/submission                 Birdwhistle taxonomy
        Active/passive                       Irritations/distractions
        Competition                          Filtering

SELECTIVE DISSEM. OF INFO SECURITY
        Alerts to types of msgs              Confidentiality
        Review facilities                    Private msgs

INCENTIVES                           ALTERNATIVE CHANNELS
        Ease of access                       Phone
        Cost/time, effort                    Mail
        Benefits                             Face-to-face
        Attention                                    meeting
                One on one
                Other tasks

INTERACTION STYLE                    GROUP DYNAMICS
         /text/votes -- entry style          Cohesion
        Length of entries                    Conformity
        Formality                            Coalitions
        Bargaining                           Attritions
        Private msgs                           of participants
```

Msgs to subsets
Status of participants
Rate of info flow
Response time
Attention

Anonymity

[28] Levin THU 6-MAR-75 11:17AM

. . .

2. Degree of participation
   Full
   Partial
      Consultant: brought in to give information on some topic
      Visiting member: full member for a short time
      Technical assistants: interface between full member and the medium
      Assistants to full members: full participants in some subarea of discussion

3. Status interrelations
   All peer relations
   One chairman, all others peer relations
   Hierarchical

5 [29] Mann MON 10-MAR-75 11:02AM

<Comment on taxonomic classification of participants:>
In the FORUM6 teleconferencing medium, the participants' roles planned were: Observer, Full Participant, Editor, Chairman.

A Forum conference is a proceeding which leaves a data base behind. As I understand it, the Chairman was to have full control over the proceeding, and the Editor was to have full control of the data base. The Observer was a read-only participant.

[31] DCrocker MON 10-MAR-75 4:03PM

<Simultaneity of entry>

. . .

A. To the General Membership
(How many can have the "floor" at one time?):

1) Only one at a time;
2) More than one at a time.

Since humans can only usefully attend to one speaker at a time (a la Sutherland's demonstration at our last meeting), Alternative 2 implies entry buffering.

Playing around with multiple display screens could allow immediate display of multiple, simultaneous entries, but I question whether this is more than merely using the screen as a buffer. . . .

The one case in which it could be considered more than a buffer is with simultaneous entry and immediate display, in which case the "speakers" may say different things, contingent upon other speakers' (simultaneous) entries. However, this case can be viewed as an example of an entry merely containing several sub-entries.

. . .

C. To the Transcript
(How many can be entering data to the record at one time? For example, one person may have the floor, and therefore be entering his comments into the record, and another person may be entering background data directly into the record -- not taking up "floor" time, but making the information to anyone reviewing the transcript.)

The "transcript" may be a series of storage devices (one for each sub-conference, as with the recording of private messages by considering each unique group of message passers to constitute a separate sub-conference) or the entry may not be entered until complete, in which case the "apparent" simultaneity (e.g., FORUM) is really arbitrated sequential entry.

[46] Anderson MON 24-MAR-75 12:50PM

Parts of a taxonomy of "CONFERENCING CONTROL STRUCTURE" by Anderson and Sutherland.

. . .

Types of leadership authority

a) All have equal authority except for times very much smaller than the conference duration, e.g., when the speaker "has the floor".)

b) One central authority (hereinafter called the chairperson)

c) Executive Committee

d) Hierarchical authority structure

e) Other arrangement of authority

. . .

What types of message can be sent? . . . In a face to face conference, for example, everyone is connected to everyone and all may transmit simultaneously by GESTURE, but by VOICE only one can transmit at a time. The nature and extent of "cueing" channels parallel to and simultaneously operating with the main channel can be very important.

. . .

b) Permission of authority required for making the transmission. Permission may be required to make the transmission, as in a radio net, usually because of limitations in the communication medium. Permission (i.e., approval) of the content of the transmission may also be required, as in the courtroom testimony of the witness (the jury will disregard the last comments of the witness).

. . .

c) A presumption that the addressee will accept the message is also sometimes made and sometimes not. The telephone, for example, somewhat lowers the usual presumption of attention associated with verbal transmissions. Broadcast transmissions usually carry no presumption of attention except, for example, for persons required to read certain bulletin boards daily and legal notices in the newspaper.

. . .

[47] Carlisle(Chrmn) MON 24-MAR-75 1:07PM

Note in previous entry there was joint authorship. This could be a serious problem in legal, bargaining, or political conferencing. In addition to the multiple authorship capability, there is the possibility of giving the floor to a group or coalition.

[48] Carlisle(Chrmn) MON 24-MAR-75 1:09PM

Another issue with CONTROL STRUCTURE is the authority to edit and revise or delete entries in the record. The conference facilities in PLATO are different from those of NCONFER in that in the PLATO conference authors can edit or delete their entries prior to a certain proportion of participants voting on the propositions. This is obviously a very complex aspect of Computer-Based Conferencing. I'm working on a set of conventions to deal with this. I would appreciate references to any known conventions for editing/revising/deleting entries in records. (Congressional Record, court records, minutes, bylaws, etc.)

[49] DCrocker MON 31-MAR-75 12:11PM

<Taxonomy, TC goals>
So as to not lose a point that was made at the last meeting: In establishing a teleconference, it is necessary to decide whether the goal is to try for the best possible emulation of a face-to-face conference or whether the mediating electronics are to be used to control the participants' environment.

In the case of controlling the environment, the control can (insidiously) be used to manipulate participants -- without their knowledge, such as perceived audience, presence/absence of authority-figures, and the particular information that is passed on the them (purposeful censorship -- refer to my entry on Bargaining, in [2.3] [see "REVIEWS OF LITERATURE"].

Alternatively, the electronics can be used to help the participant keep clear as to his role. As a simple example: use a portion of the participant's display screen to display his current role information (. . ."consultant on procedures in political lobbying; comments are off the record; . . .").

[52] Levin MON 31-MAR-75 5:10PM

<Further notes on our taxonomy>
. . .
One major distinction is between interactions that are essentially cooperative and those that are competitive. Of course, no interaction is purely one or the other, but many types fall along one end or the other (cooperative: seminars, information gathering meetings, problem solving groups (brainstorming); competitive: bargaining meetings, conflict resolution meetings, political caucuses).

[132] Carlstedt MON 12-MAY-75 12:58PM

<Categories of conference input>
1. Substantive, task/topic-oriented, that without which the conference presumably wouldn't exist. The "levels" discussed in [97,100,111,113-116] [see "FEEDBACK"] apply to this material.

2. Metaconference, discussion about the conference itself as a whole (not individual participants) or the supporting subsystem.

3. Social-emotional, interpersonal reactions.

4. Formalized responses, polling inputs, etc.

5. Formalized metadescriptive, used for structuring a transcript (classifying & relating entries, subentries, & sets of entries) to facilitate transit and retrieval.

Comments: (a) These seem to me to be mutually exclusive (but not necessarily exhaustive) except for conferences about conferencing, like this one. (b) The distinction between 1&2 and 3 is NOT made on the basis of fact vs. feeling.
. . .

[134] Bretz MON 12-MAY-75 4:25PM

<Key words: Taxonomy, situations>
I have encountered a useful taxonomy of purposes or goals for human interaction. It is from Argyle, "Social Interaction" p. 181:

1. Conveying knowledge, information or understanding (teaching)
2. Obtaining information (e.g. interviewing)
3. Changing attitudes, behavior or beliefs (e.g. salesmanship, canvassing, disciplinary action)
4. Changing the emotional state of another (telling jokes, dealing with a hostile person)
5. Changing another's personality (psychotherapy, child-rearing)

6. Working at a cooperative task (most ilndustrial work)
7. Supervising the activities of another. (nursing)
8. Supervising or coordinating a group (chairmanship, foremanship, arbitration)

Argyle calls these social skill goals. I suppose they could be called tasks. It seems that all but 6 and 7 are directly applicable to teleconferencing.

SUBCONFERENCES:

[3.5] DCrocker WED 5-MAR-75 3:47PM

. . .

Seems to me that a conference should potentially be many conferences, where the conference of ALL the members is only one instance. Each sub-group should be another potential "conference" (tho it would be best not to create a specific sub-conference until it is "used" by its members, thereby avoiding the horrendous overhead of automatically creating files, etc. for all the possible sub-groups -- I don't remember the formula but seem to recall that factorials are laced throughout it.)

. . .

[6.3] DCrocker FRI 11-APR-75 2:27PM

The first part of this entry (see "SITUATIONS") described a teleconferencing experience using TENEX/ARPANET message facilities.

. . .

Sub-interactions occasionally developed, in which two people (rarely more) "go off" and argue/consider a specific sub-issue. This usually is at the beginning of the collaboration effort, while we are still trying to get a handle on the problem. The intention, therefore, is to provide some conceptual framework so that the whole group does not have to work with "blank pages". (It is easier to criticize and modify than it is to create.)

It would have been much less painful if we could have simply started discussing things as they occurred to us and then extract the comments that would constitute that initial framework. Net Mail does not have the bandwidth or response time to support such an approach.

PARTICIPATION, COMPETITION, COHERENCE

[3.21] Press TUE 8-APR-75 11:05AM

COSTS OF AND INCENTIVES FOR PARTICIPATION.

AS WALLY RYDER POINTED OUT IN THE LAST FACE-TO-FACE MEETING, FEAR OF PLAGIARISM AND LACK OF "CREDIT" WORK AGAINST SINCERE PARTICIPATION IN A COLLABORATION SUPPORT SYSTEM. ONE COULD DESIGN VARIOUS SORTS OF ACCOUNTING AND CREDITING MECHANISMS INTO COLLABORATION SUPPORTING SYSTEMS (NUMBER OF CONTRIBUTIONS, NUMBER OF "CITATIONS", VOTING ON QUALITY, ETC.

THE 70-ODD CONTRIBUTIONS TO OUR PRESENT CONFERENCE ALSO INDICATE THAT SOME INCENTIVES MUST EXIST WITHOUT EXTERNAL CREDIT. WHY DO WE CONTRIBUTE? I THINK THAT I AM TAKING THE TIME TO TYPE THIS IN FOR TWO REASONS. FIRST I WOULD LIKE TO LEARN SOMETHING ABOUT TELECONFERENCING AND FEEL OBLIGATED TO CONTRIBUTE SOME THOUGHT (AN UNWRITTEN, UNENFORCEABLE CONTRACT). SECOND, I WANT TO ESTABLISH SOME "IDENTITY" AS A CONTRIBUTOR AND WILL GET SOME SORT OF "CREDIT" AMONG YOU 40 PEOPLE AS A RESULT OF CONTRIBUTING SINCERELY. (I WONDER IF WE WOULD GET AS HIGH A RATE OF PARTICIPATION AND AS HIGH QUALITY IF ALL INPUTS WERE ANONYMOUS). ANOTHER FACTOR THAT WOULD ENABLE FREER COLLABORATION WOULD BE A VALUE SHIFT AMONG SCIENTISTS AWAY FROM "WE ARE ALL COMPETING FOR SCARCE CREDIT AND GRANTS" TOWARD "WE ARE ALL UNSELFISH COLLABORATORS IN SEARCH OF KNOWLEDGE". THEODORE ROSZACK FEELS THAT WE ARE UNDERGOING SUCH A VALUE SHIFT NOW. I HAVE SOME DOUBTS. PERHAPS DIFFERENT VALUES IN SWEDEN HAD SOMETHING TO DO WITH THE VIABILITY OF COLLABORATION SUPPORTING PROCEDURES SUCH AS THE ONE I MENTIONED IN [3.20] **[SEE "COLLABORATION SUPPORT"]**.

AT ANY RATE IT MIGHT BE WORTHWHILE IF WE ALL LOOKED AT OUR PERSONAL REASONS FOR CONTRIBUTING AND NOT CONTRIBUTING. IF WE "OR" THEM ALL TOGETHER, WE MIGHT GET SOME BEHAVIORAL INSIGHTS.

[4.11] Press TUE 15-APR-75 5:26PM

COSTS OF AND INCENTIVES FOR SINCERE CONTRIBUTION

. . .

"CREDIT": RYDER ALSO POINTED OUT THAT PEOPLE NEED CREDIT FOR THEIR PARTICIPATION. PEOPLE COULD START PUTTING ITEMS SUCH AS "PARTICIPANT IN CONFERENCE X, N BITS CONTRIBUTED (Y PERCENT OF CONFERENCE)" ON THEIR RESUMES. THIS WAS CONCEIVED OF AS A HALF-JOKE, BUT MAYBE IT ISN'T.

[6.4] Press TUE 15-APR-75 6:15PM

<INSTRUMENTATION>
A CONFER-LIKE SYSTEM COULD BE INSTRUMENTED IN ORDER TO GATHER BEHAVIORAL DATA. FOR INSTANCE, FACTORS DESCRIBED IN [4.11] (FEEDBACK DEPREVATION) **[see "FEEDBACK"]** WOULD LEAD ONE TO HYPOTHESIZE THAT PARTICIPATION RATE WOULD PEAK EARLY AND DROP OFF THRU TIME. THE SYSTEM COULD AUTOMATICALLY KEEP RECORDS OF USER BEHAVIOR IN ORDER TO TEST SUCH HYPOTHESES. (I KNOW THAT THERE ARE PROBLEMS OF SPURIOUS CORRELANTS IN THIS EXAMPLE). OTHER QUESTIONS COME TO MIND: WHAT ARE THE EFFECTS OF VARYING ENTRY LENGTH? WHAT ARE THE EFFECTS OF CERTAIN SORTS OF FEEDBACK TO THE CONFEREES? ETC.

NOTE THAT ONE COULD EITHER "PASSIVELY" MONITOR THE BEHAVIOR OF CONFERENCES OR ONE COULD SET UP CONTROLLED SITUATIONS (E.G. FAKE FEEDBACK TO HALF OF THE CONFEREES AND OBSERVE THE EFFECTS ON THEIR BEHAVIOR OR CONSTRAIN THE FACILITIES AVAILABLE TO AN "EXPERIMENTAL GROUP").

[4.14] Carlisle(Chrmn) MON 28-APR-75 10:56PM

. . .

A third type of interaction **[see "FEEDBACK", entries [4.13-14]**] has to do with discussion on some

coherent topic as opposed to shifting topics and ill-defined topics. We already have a methodology for Observing Topics and Topic Change as a part of the Dialogue Analysis project. With a few modifications, it could be applied to an analysis of this transcript (what we call a MULTILOGUE).

[78] Press MON 5-MAY-75 5:16PM

. . .

A COUPLE OF CLASSIFYING CHARACTERISTICS THAT COME TO MIND ARE:

. . .

2. ECONOMIC OPPORTUNITY COST OF THE PARTICIPANT'S PARTICIPATION.
   THIS RANGES FROM VERY HIGH (E.G. TOP EXECUTIVES) TO
   NEGATIVE (E.G. IN THE CASE OF PAYING CLIENTS IN MARRIAGE
   COUNSELING OR PAYING LECTURE ATTENDEES).
3. CONFLICT TO COOPERATION (PERHAPS A CONTINUUM?). [SEE **LEVIN [52] above**].

[118] Carlstedt FRI 9-MAY-75 4:18PM

. . .

<Press[78]:>

I didn't understand the "economic opportunity cost of participation" classification for situations, or see exactly what it is that is high for executives and negative for marriage counselees.

. . .

[165] Press THU 15-MAY-75 11:29AM

<RE CARLSTEDT [118] "ECONOMIC OPPORTUNITY COST">

I WAS USING THIS ECONOMISTS' TERM LOOSELY. THE ECONOMIC ALTERNATIVE COST (EOC) OF EMPLOYING A RESOURCE IN MANNER X IS THE VALUE OF THE REVENUE FORSAKEN BY NOT EMPLOYING IT IN THE BEST ALTERNATIVE MANNER AVAILABLE. FOR EXAMPLE, THE EOC OF INVESTING $1000 IN BONDS IS THE FOREGONE DIVIDENDS WHICH WOULD HAVE ACCRUED TO THE $1000 IF INVESTED IN STOCKS (OR WHATEVER THE BEST ALTERNATIVE WAS).

WHAT TRIGGERED OFF ENTRY [78] WAS NOTING THE COMMON ASSUMPTION THAT IF A "TOP EXECUTIVE" WERE NOT PARTICIPATING IN A GIVEN TELECONFERENCE, HE COULD BE DOING SOMETHING ELSE OF GREAT VALUE (EOC) WITH HIS TIME; WHEREAS A "LOWLY" LECTURE ATTENDEE OR MARRIAGE COUNSELEE WOULD ACTUALLY BE PAYING TO USE THE SYSTEM. I REALISE THAT I'M USING THIS TERM SO SLOPPILY AS TO BE METAPHORICAL. FURTHERMORE, I AM A BIT SKEPTICAL OF THE GREAT VALUE WHICH EVERYONE SEEMS TO IMPUTE TO (FANFARE. . .) TOP EXECUTIVES' TIME.

[92] Bretz WED 7-MAY-75 2:27PM

Some time last year I attended a conference in Washington for the purpose of discussing Marshall Jamieson and Jim Bett's study of the cost of Satellite Educational systems. There were about 150 people at the conference, maybe more. Jim Bett gave a short introductory review of the project and then called for discussion. Dozens of hands went up. Everyone had read the report and had

suggestions to make. One after another people were heard and the number of hands raised didn't seem to diminish very much. I had the feeling that the number of unexpressed comments must have been ten times as great as those that were heard. This is point one.

Point two: Group thinking, around a conference table, for instance, is stimulating to the individual and broadening to the conference. Individual thinking, on the other hand, is faster, and deeper, provided that it starts at a sufficiently high level of stimulation, and has sufficient breadth. The two should be somehow combined.

[118] Carlstedt FRI 9-MAY-75 4:18PM

. . .

<Bretz[92]>

The phenomenon of unexpressed comments could stand more discussion. How best to balance their value vs their cost in listener/reader time and transcript volume.

. . .

[96] Carlstedt WED 7-MAY-75 3:35PM

. . .

One of the problems with conferencing in systems like CONFER is [**that**] the volume of material and the number of topics and subtopics can grow (probably even mushroom in conferences more active than this one has been until now) until it becomes difficult to tell where it is headed. Eventually, lacking a backbone sufficient to support its own mass, I suppose it just dies.

[97] Carlstedt WED 7-MAY-75 4:02PM

Maybe some other systems incorporate mechanisms addressed to these problems. A suggestion: Partition the transcript (there must be a better word for it) into levels, based on the degree of acceptance of the material in them. Entries would also probably vary across levels in editorial quality and maybe in length. Most important, the acceptance criteria would increase in strength with increasing level. The means used to measure acceptance might also vary.

Suggested levels:

1. Private. This isn't part of the transcript; I include it only for completeness. This consists of material that the participant is thinking about, formulating, and maybe composing and editing preparatory to being willing to have anyone read (or hear) it. I understand that some persons have no use for such a category and others rely on it quite heavily.

2. Interpersonal. This is almost like (1) except that this material will be shared with persons participants whom one trusts will be most charitable, and the formulation may be shared with them, possibly the whole authorship.

3. This is really level 1 of the transcript. This is material that one presents "just to get a quick reaction", "just to run it up the flagpole"; this is the level at which brainstorming occurs. It is also the level at which all material is first submitted.

4. This is the level at which material resides when it has been accepted for serious discussion.

5. Proposals. This consists of material which has crystallized as a result of the discussion of material at level 4. It differs from that material primarily in the manner in which it is presented and updated. "Propose" means "submit as a candidate for final acceptance by the conference as an "official" result." Levels 5 and above presuppose that the conference is directed toward some goal.

6. Approved material. This is still subject to later amendment and editing during and by the conference.

. . .

[100] Carlstedt WED 7-MAY-75 5:03PM

So how do levels of acceptance help solve the problems of focus? Because the level boundaries are filters through which pass only that material that is judged correspondingly well-suited to be considered "conference results." And corresponding measures of conference progress can be made, by looking at how much has gone how far. And the imposition of acceptance criteria right at the very beginning, between levels 3 & 4, might help keep the quality and relevance of entries higher at the outset, as well as keeping the "topic" tree pruned by allowing only those entries that are relevant to the "agenda" represented by levels 4-6, unless the participants feel like accepting new topics.

There is an obvious analog in meetings conducted under Robert's Rules of Order, with meeting agenda (level 4), motions on the floor, discussion on the motions, amendments, passed motions, rules for obtaining the floor, etc. It has worked pretty well in a lot of situations for a long time. But it is interesting to speculate about, and might be interesting to experiment with, different acceptance measures and criteria for the various levels.

[121] Levin FRI 9-MAY-75 6:31PM

<Re: Evaluation of Recurrent News Letter [105], [107], [118]> [see "SITUATIONS"]

. . .

The most interesting feature for this discussion is the filtering that takes place. Contrast it with 1) blackball filtering of a journal reviewer, who can decide what everyone else can or cannot see of someone's entry, 2) non filtering of CONFER or round robin, where everyone sees what everyone enters. By failing to send on someone's contribution, you only lower the probability that any other given member will see it, since there is at least one other copy of that entry in circulation. Complete deleting results only from a set of independently made decisions to delete it. In some sense, it takes advantage of the fact that each person bears some of the maintenence cost of the network (xerox & postage). Perhaps this notion of "cost" could be artificially introduced to a teleconferencing network: you get to send on only so many characters/unit time, and each copy sent to another member adds to this. Plus allowing one to spend his allotment on forwarding other worthy entries.

[133] Carlstedt MON 12-MAY-75 1:43PM

< Participation motivation; domination by few participants>

. . .

I have a feeling that a series like the 3-way exchange we've been having the past few days will not encourage anyone who might have some thought of contributing, just as in a face-to-face conference when a few individuals begin to carry those topics that interest them, at the expense of the interest of others physically present. If there really is noone else out there, I'm willing to continue this as a 3-way interactive dump of ideas, but assuming otherwise I'm feeling increasingly self-conscious and presumptious.

[138] Press MON 12-MAY-75 5:16PM

THIS IS A META-ENTRY ON THE CONFERENCE.

WHY HAS OUR ACTIVITY PICKED UP SO NOTICEABLY?? IS IT BECAUSE RUDY [Bretz] HAS LEARNED TO OPERATE HIS TERMINAL? BECAUSE THERE WERE RELATIVELY FEW PEOPLE AT THE LAST FACE-TO-FACE MEETING? BECAUSE WE DID SOMETHING UNUSUAL AT THE LAST FACE- TO-FACE MEETING? HAVE WE BEGUN TO GIVE EACH OTHER MORE POSITIVE FEEDBACK AND RESPOND DIRECTLY TO EACH OTHERS' INPUTS MORE FREQUENTLY? (SOMEONE COULD ANALYSE THE TRANSCRIPT FOR AN ANSWER TO THE LAST QUESTION).

ONLY PEOPLE WHO WERE AT THE LAST FACE TO FACE MEETING ARE INPUTTING ENTRIES. HAVE WE LOST ALL OF THE OTHERS? HAS OUR VOCABULARY BECOME SPECIALIZED AND IN-GROUPY?
. . .

[167] Press THU 15-MAY-75 11:46AM

<RE: CARLSTEDT [133]--PARTICIPATION MOTIVATION AND DOMINATION BY A FEW PARTICIPANTS>

I APPEAR TO DROP OUT BECAUSE I ONLY INTERACT ONCE PER WEEK. "PERIOD OF INTERACTION CYCLE" IS ANOTHER PARTICIPANT CHARACTERISTIC. PARTICIPATION MAY RANGE FROM "ONE TIME DURING THE CONFERENCE" TO "CONTINUOUS ATTENDANCE THROUGHOUT THE CONFERENCE".

I WOULD HYPOTHESIZE THAT PEOPLE WITH SHORT PARTICIPATION CYCLES WILL TEND TO DOMINATE A CONFERENCE.

MY RELATIVELY LONG PERIOD BETWEEN INTERACTIONS IS DUE TO THE FACT THAT I HAVE A SLOW TERMINAL AND THEREFORE ONLY GENERATE RESPONSES WHEN I GET A LINE PRINTER COPY OF THE TRANSCRIPT.

[227] DCrocker SAT 31-MAY-75 5:29PM

REQUEST: A local professor has expressed interest in knowing the amount of time we have put into interacting with CONFER. This would include reading entries (but not outside articles), preparation of entries (offline or otherwise), and any other system hacking relevant to use of CONFER. That is a measure that we have not directly talked about very much, perhaps because we all agree that the amount of time required is so much more than we would like. (And if we don't think about it, it won't seem too bad.)

I started with estimates of 2 or 5 minutes per line entered, for myself, but am not sure a) how accurate either is and b) how portable the rule is -- probably not very, since I am verbose.

It would be nice to have such things metered. The fact that use of the system is so bursty makes it difficult to intuit an estimate of the average amount of time spent.

For the record, using the 2 minutes/line entered figure, I estimate 4 hours per week for me. While I have been making my entries, today, I decided that the 2 minutes per line probably only covers inputting (and I'm not sure even that) so that I would be inclined to use the 5 minutes/line figure, to account for creating/reading/leafing through hardcopies of the transcript.

[230] Carlstedt MON 2-JUN-75 12:02PM

<RE: Crocker [224-226,228-229] [see "SHORTYPE"]>

. . .

I personally am not very interested in the subject [shortype], because my conferencing interests lie more on the non-real-time side of the fence, where typing speed isn't critical.

[231] Carlstedt MON 2-JUN-75 12:51PM

<Feedback; response; participation; focus>
In the last entry I made what I thought was a daring remark about not currently being as interested in one major aspect of TC as another. It has been clear in both the face-to-face seminar and this conference, that our interests don't coincide. That probably makes for a more stimulating discussion. I'm glad to have learned something about the problems of trying to simulate face-to-face conferencing using limited channels, or the opportunities posed by various channel constraints even when used in real-time situations (the other point of view). But I would have liked to devote more time to considering the opportunities for non-real-time, "transcript"-centered conferencing or group collaboration.

. . .

[232] Carlstedt MON 2-JUN-75 1:14PM

Two attributes of a conference whose values tell something about how "successful" it is are "participation" and "focus". Maybe one could come up with some reasonable and feasible formulas for them. I think of participation as being positively correlated with number of participants, where a participant can be an "active listener" who maybe only offers the briefest of responses (but listeners who offer no response at all don't qualify), or an active contributor; and positively correlated with the volume of non-pure-response input; but negatively correlated with the standard deviation of the total amount of input per contributor, so that participation is defined to be better if a conference isn't dominated by a few long-winded or compulsive talkers.

Focus is a content-dependent thing; it is like one minus the number of "dangling threads" divided by the total number of threads [see "RETRIEVAL"] that have been introduced (ignoring thread relationships). A thread is dangling if it has been introduced by someone, and maybe mentioned or discussed by that same person at other times, but never picked up by anyone else, at least not explicitly; and it doesn't appear (to the observer? to the author?) to have been "resolved". I realize that this is a totally inadequate definition for whatever the concept is that I'm talking about, and I'm not quite sure what that is. The main point is that a conference loses its focus, becomes diffused, when people "go of on tangents" and talk more about their own things than common ones or each

other's, out of honest low interest (here's where this got triggered) or out of sinful selfishness. Also, one can envision the thread structure as a tree, that grows more horizontally or leafily like a bush or even a jungle when the introduction of new threads is heavy relative to the discussion of old ones (stem/trunk growth). Or as a set of thin trees, each nurtured by its own proprietor!

If participation and focus could be measured then they could be measured over any time period of a conference, so one could tell whether a conference was getting "better" or "worse".

I'm interested in constraint mechanisms that would encourage participation and focus and discourage over-participation and diffusion. This is where we get back to feedback and forced-response mechanisms, among other things.

. . .

Now, an active listener is one who responds to at least some of the standard questions, and is recognized for this by the system. Active listeners are just as valuable as contributors. If a participant does not enter first-level responses for some time, he can be assumed to have left the conference.

Would such a mechanism encourage participation? Would it discourage over-participation? Would it enhance the focus of a conference? Would it wreck a conference completely because participants would be afraid of the results? Are questions like those in the proposed questionnaire appropriate at all? Would others be better? What are some other things that might happen with such a mechanism?

[235] DCrocker MON 2-JUN-75 5:14PM

<Carlstedt [232], Trees vs. bushes, Weaving vs. Loose Threads>
An implication of the image is that the conference chairperson is a gardener. What happens when the conference is infested with aphids and the like?

[236] Levin TUE 3-JUN-75 10:35AM
Aphids?

[237] Carlstedt TUE 3-JUN-75 12:50AM
Aphids?

[251] Carlson FRI 6-JUN-75 1:18PM

It would be most interesting for someone to determine if the most verbose participants (discussions?) are those by people who are not located within walking distance of someone (or 2 or 3 or however many) who is participating in the discussion!

[123] Levin FRI 9-MAY-75 7:34PM

On decision making conferences

At UCSD, they are using an interesting idea for group decision making. They voted out the idea of an elected student government and instead, hold regular meetings to discuss student issues (including how to distribute some large sums of student activiity fee money, over $100,000 or so a year). The voting rule is "People who have attended the last two meetings get to vote". As you can imagine, this rewards attendance. I don't know the details, but so far it seems to work out (this is the first year it's been tried).

For our purposes, this could be transferred to teleconferencing where the "voting" on the status of entries could be contingent on recent participating. In fact, given a computer mediator, more complex rules incorporating amount of participating, or even better, the group evaluation of participation to a weighted vote on entries.

[130] DCrocker SAT 10-MAY-75 5:02PM

A student organization I was with once tried the same thing. As a rule for deciding who could VOTE it was pretty good. We still needed at least a chairperson, for management of the discussion process; and an agenda, to keep things from getting too confused and astray. Items went onto the entry pretty much as they were communicated to the chairperson (BEFORE the meeting) with some leeway for those things that everyone agreed had priority.

ANONYMITY:

[4.9] DCrocker MON 7-APR-75 1:13PM

<Ref: [4.2] ["REVIEWS OF LITERATURE"], Group Decision Making>
It is interesting that all of the group-process literature that has been reported in this conference leads one to believe that a very nice feature of a conference system would be the ability to make anonymous entries. (heh. heh.) I have not read any of the Delphi evaluations, so perhaps one of you can tell me whether a) [there has been] an evaluation of differences in group process (ability to make anonymous entries vs. no such ability) and b) whether that difference includes more "social risk taking" (individuals more often differing from the group). An assumption is that such risk-taking would be done as an anonymous entry, however just having the ability to make anonymous entries may make people more adventuresome. A possibly confounding factor is the effect of using terminals to interact, instead of being face-to-face, tho I doubt it would have much effect.

[112] Anonymous WED 7-MAY-75 8:30PM

This is to remind all you CONFER freaks of a possibly useful ability of Confer: to make anonymous entries (done by starting your entry with a !).

. . .

[113] Anonymous THU 8-MAY-75 11:54AM

Boo. Hiss. . . . The Anonymous feature is only a mechanism for limiting accountability.
. . .

[176] Anonymous THU 15-MAY-75 12:45PM

WHAT A TRAVESTY! HOW CAN ANYTHING I INPUT BE ANONYMOUS WHEN ALL I HAVE IS UPPER CASE CHARACTERS?? IN THE INTEREST OF JUSTICE, I PROPOSE THAT EVERYONE TYPE EVERYTHING IN CAPS FROM THIS POINT ON. -- THE HANDICAPPER GENERAL.

[177] Anonymous THU 15-MAY-75 12:54PM

How about if only Anonymous entries ARE ALL IN CAPS?

[178] Anonymous THU 15-MAY-75 1:53PM

I'll bet that entry [112] was made by DCrocker.

[179] Anonymous THU 15-MAY-75 1:57PM

YOU LOSE! (BY THE WAY, THIS IS NOT LARRY PRESS.)

[180] Anonymous THU 15-MAY-75 7:28PM

PERHAPS [113] WAS MADE BY DCROCKER? (DCROCKER)

[181] Anonymous THU 15-MAY-75 7:29PM

TAKE HEART, LARRY, NO ONE MISTYPES AS MUCH AS MEE, SO MY ENTRIES AREN'T VERY ANONYMOUS EITHER.

[214] Anonymous MON 26-MAY-75 4:29PM

<RE CARLSTEDT [211]. [See "SHORTYPE"]>

D YO CSE I RT O W IT NECESSARY G ER?? I KJ DRT! W UG ET AND FG T ECX B.

[215] Anonymous MON 26-MAY-75 7:35PM

*7& "7!!!! (AND YOU HAD BETTER BELIEVE IT.)

Comments relating to other behavioral topics are contained in the section titled "REVIEWS OF LITERATURE". These pertain to:

Personality conflicts: sub-group interaction; proximity of users:
[15] Casner MON 24-FEB-75

Feedback: anonymity; identification of agreement/disagreement; minimization of psychological effects; influence problems: [16,18,19] Raveling WED 26-FEB-75

Assigment of chairman; access to the "floor":
[23] DCrocker THU 27-FEB-75

Group interaction models; decision-making behavior; task-oriented versus social/emotional acts; volume-of-information effect on decision quality:
[2.2] Carlstedt MON 10-MAR-75

Decision making; group interaction; competition/conflict; bargaining; influence/group pressure/social conformity:
[2.3] DCrocker FRI 14-MAR-75

Problem solving in groups versus individually; group interaction; role of leader:
[4.2] Carlstedt TUE 1-APR-75

FEEDBACK
Edited by Jim Carlstedt

The subject of feedback--participants' explicit and implicit response to each other's entries--did not become a topic of discussion until about six weeks into the conference. Until this time, topics had clustered around the early concerns with the TC taxonomy and with the structure and tools of the conference itself as represented by NCONFER. The on-line conference had also been somewhat less than lively, and the subject of feedback had been treated only in reviews (see "REVIEWS OF LITERATURE"), in particular those by Raveling of Turoff's paper on Delphi [16,18] and Sheridan's paper on interactive polling techniques [19]. The lack of interaction early in the on-line conference was probably noticed or felt by most of the participants, both contributors and listeners, and may have been due to the fact that each participant was preoccupied with carrying out his own reading and taxonomy assignments. (Might this rather lackluster beginning have been a factor in discouraging wider participation?) The lack of interaction was briefly noted by Carlstedt [53] in connection with analysis of the first version of an index of keywords to the conference. The need for more feedback was expressed almost immediately by Press [3.23 and 28] on his joining the conference, together with some suggestions for enhancement mechanisms, but it took another month for the subject to "catch", apparently triggered by entry [80] by Bretz. During the next few days, there was a lively discussion of the subject, one thread dealing with the need for feedback in general, and suggesting mechanisms that could be incorporated into a system, and a smaller one toying with conventions for quick feedback in "live" teleconferencing. Entries concerned with the latter have been collected together at the end of this section.

. . .

[53] Carlstedt TUE 1-APR-75 12:26PM

. . .

The index of keywords gleaned from entries to this conference. . .reflects the fact that NCONFER. . .has not been used much for group interaction (excluding "bibliography", each keyword occurred in an average of about 1.1 entries).

. . .

[3.23] Press TUE 8-APR-75 11:30AM

FEATURES I'D ADD TO CONFER

WHILE TYPING IN THE ABOVE CONTRIBUTIONS, I FELT THE NEED FOR FOUR FACILITIES THAT ARE NOT AVAILABLE. NOTE THAT THESE ARE ESSENTIALLY DATA BASE STRUCTURING DEVICES--THEY INVOLVE OPERATIONS THAT ARE COMMON TO ALL CONFERENCES.

1. ADD SPECIFIC QUESTIONS TO A SYSTEM MAINTAINED LIST-OF-QUESTIONS. NOTE THAT I AM THINKING OF MORE SPECIFIC QUESTIONS THAN CARLSTEDT HAS IN MIND WHEN HE WOULD TAG AN ENTIRE CONTRIBUTION WITH THE METADESCRIPTOR "QUESTION". AN EXAMPLE MIGHT BE "CAN SOMEONE SUPPLY A REFERENCE ON THE X SYSTEM?"

2. CREATE PUBLIC OPINION POLLS. THIS COULD RANGE FROM "DO YOU AGREE WITH X" TO MULTI-RESPONSE ITEMS TO THE CREATION OF A "MINI-DELPHI".

3. CREATE ARBITRARY LISTS. FOR INSTANCE TO CREATE A LIST OF PERCEIVED REWARDS FOR

CONTRIBUTING TO CONFERENCES. THE LISTS WOULD BE OPEN ENDED AND IF SOMEONE ELSE HAD ALREADY PUT YOUR ITEMS ON THE LIST YOU COULD MERELY ADD **[your]** "VOTE".

4. ADD TERMS TO A CONFERENCE GLOSSARY. ONE SHOULD BE ABLE TO COMMENT ON DEFINITIONS AS WELL AS ADD NEW ONES.

[3.26] Press THU 10-APR-75 2:47PM

. . .

THE SYSTEM COULD FORCE PEOPLE TO OTHER'S INPUTS AS WELL AS THEIR OWN--BOTH AS AN ORGANIZATION DEVICE AND FOR FEEDBACK TO THE AUTHOR. ALL CLASSIFICATION OF ENTRIES SHOULD BE FED BACK TO THE AUTHOR (IN STATISTICAL SUMMARY) FOR "BEHAVIORAL" PURPOSES.

THE SYSTEM COULD FORCE RESPONSES TO ENTRIES WITH CERTAIN METADESCRIPTORS. FOR INSTANCE: "DISAGREEMENT WITH X" OR "THIS ENTRY SEEMS VERY IMPORTANT TO ME".

. . .

[4.11] Press TUE 15-APR-75 5:26PM

. . .

A LACK OF FEEDBACK WILL LEAD TO REDUCED PARTICIPATION. . ..I SUSPECT THAT THE FEELING THAT NO ONE IS REACTING TO ONE'S INPUT WILL ALSO DIMINISH PARTICIPATION. A SMALL PERCENTAGE OF THE ENTRIES IN OUR CONFERENCE REFER TO OTHERS.

A NUMBER OF MECHANISMS TO COMBAT THIS "COMMUNICATIONS SINK" FEELING COULD BE BUILT INTO A TC SYSTEM. THE SYSTEM COULD FORCE EXPLICIT RESPONSES TO CERTAIN ENTRIES, E.G. ONE'S WITH CERTAIN AUTHOR-ASSIGNED METADESCRIPTORS ("IMPORTANT TO ME", "FEEDBACK REQUESTED" OR "SPECIFIC SUGGESTION") OR ONES OVER A CERTAIN LENGTH. IF CONFEREES WERE ABLE OR FORCED TO ASSIGN METADESCRIPTORS TO EACH ENTRY, STATISTICAL SUMMARIES OF THE METADESCRIPTORS ASSIGNED COULD BE FED BACK TO AUTHORS. IF THE SYSTEM WERE PROPERLY INSTRUMENTED, DATA SUCH AS "NUMBER OF PEOPLE REQUESTING HARD COPY" COULD ALSO BE FED BACK.

. . .

[6.4] Press TUE 15-APR-75 6:15PM

A CONFER-LIKE SYSTEM COULD BE INSTRUMENTED IN ORDER TO GATHER BEHAVIORAL DATA. FOR INSTANCE, FACTORS DESCRIBED IN [4.11] (FEEDBACK DEPRIVATION) WOULD LEAD ONE TO HYPOTHESIZE THAT PARTICIPATION RATE WOULD PEAK EARLY AND DROP OFF THRU TIME. THE SYSTEM COULD AUTOMATICALLY KEEP RECORDS OF USER BEHAVIOR IN ORDER TO TEST SUCH HYPOTHESES. (I KNOW THAT THERE ARE PROBLEMS OF SPURIOUS CORRELANTS IN THIS EXAMPLE). OTHER QUESTIONS COME TO MIND: WHAT ARE THE EFFECTS OF VARYING ENTRY LENGTH? WHAT ARE THE EFFECTS OF CERTAIN SORTS OF FEEDBACK TO THE CONFEREES? ETC.

NOTE THAT ONE COULD EITHER "PASSIVELY" MONITOR THE BEHAVIOR OF CONFERENCES OR ONE COULD SET UP CONTROLLED SITUATIONS (E.G. FAKE FEEDBACK TO HALF OF THE CONFEREES AND OBSERVE THE EFFECTS ON THEIR BEHAVIOR OR CONSTRAIN THE FACILITIES AVAILABLE TO AN "EXPERIMENTAL GROUP").

[4.13] Carlisle(Chrmn) MON 28-APR-75 10:44PM

I want to acknowledge your concern for usage statistics and increasing the amount of true interaction among participants. One method of assessing the degree of interaction is to construct a social net, showing the frequency of cross references among participants. This would need to include implicit references as well as explicit ones. I might, for example, draw on the ideas in one entry to talk on a different topic and not mention the source of the ideas because the context of the conference should make it obvious to other participants. We could define a scoring method for assessing this type of interaction along the lines of the Observer Categories we are defining for the Dialogue Analysis project. I'll work on this in my spare time.

[4.14] Carlisle(Chrmn) MON 28-APR-75 10:56PM

A second type of interaction has to do with citation frequencies among entries, as distinct to among authors. A third type of interaction has to do with discussion on some coherent topic as opposed to shifting topics and ill-defined topics. We already have a methodology for Observing Topics and Topic Change as a part of the Dialogue Analysis project. With a few modifications, it could be applied to an analysis of this transcript (what we call a MULTILOGUE).

[4.15] Carlisle(Chrmn) MON 28-APR-75 11:00PM

Of course, you realize that time will turn out to be an important variable in this type of analysis. There will be more cross-referencing in this conference, I'll bet, as a function of Larry's comments and Jim Carlstedt's index than there would have been otherwise. This cross-referencing probably could be shown to have increased at certain times, but to have been generally low thoughout most of the TIME of the conference. Furthermore, it is reasonable to expect that cross-referencing increases as a function of the amount of previous activity in the conference, since there would be increasingly more to cross-reference. Finally, (for now), it would seem reasonable to expect that cross-references would tend to be to more recent entries in the same activity (a proximity effect). This last hypothesis is partly an artifact of the computer program and conference structure we are using.

[80] Bretz TUE 6-MAY-75 4:35PM

One of the most important elements of effective communication is feedback. This is most important when it is simultaneous with one's utterances, as in the case of face-to-face conversation where you can constantly read expressions as you talk and at least you can know whether you have anyone's attention or not. But even if feedback is not in real time, it can still be quite valuable. In the non-real time CONFER mode it might be valuable for a contributor to know how many people, and perhaps specifically who, had read each of his entries and in general what his response was. He would probably have to review his entry at the same time, since a few days would have gone by, so it should be possible for him to look at an up-to-date summary of responses at any point, and when ready, go back immediatly to where he just was. It would be interesting for him to be able to do the same for other people's entries as well as his own.

This relatively simple system (in terms of use) might result in a degree of interaction between a set of conferees that could not be obtained by any other means. If this were applied to a real-time

system, in which other participants are receiving and responding in the same line. . .then there might be some other problems. Simultaneous feedback of even a small amount of negative response could quickly cool a contributor's creative ardor. I wonder what the experience has been of lecturers who use a group response system in the mode where any student may signal "I am bored stiff" at any time. I wouldn't be surprised to find that no one has ever dared to use such a system in that manner. I know that the prohibition of negative responses is crucial to the "brainstorming" method. Perhaps there should not be any means for entering negative responses at all--at least not during the actual making of an entry.

These suggestions are going to sound awfully naive, and the reason, of course, is that they are awfully naive. I do not understand word 2 about computers - even though I have mastered word 1 and am now able to erase characters and words I don't like. What I am about to suggest out of my great store of ignorance, is applicable to the real-time mode of FORUM or CONFER, when other participants are simultaneously seated at terminals and interacting. Perhaps the simplified feedback could be worked out as follows: When the sender of a message makes a point and would like a little feedback, he informs the system and all attending terminals begin to beep, beep, beep until one of three buttons is pressed indicating "I am attending", (maybe a 0), "OK, I like it" (maybe a +), or I cant tell yet, give me more, elucidate" (maybe a). Possibly a third symbol might be used - ! - indicating applause! The first response could of course cover a multitude of sinful reactions. The responder might even be given the use of three numbers, 1 thru 3, to indicate the degree of his conviction or emotion concernling his response. Then a line of type would appear for the sender, in brackets or something, telling him how much of each kind of response he got.

[82] DCrocker TUE 6-MAY-75 6:57PM

I seem to recall having heard of someone trying 'I am bored' signals. Don't remember specifics, tho. A (Harvard, I believe) psychology class did some operant conditioning on its professor once and the methodology may be appropriate for this context:

The class conspired to be very attentive (visually attend to the professor, diligently take notes, etc.) when the professor was standing on one side of the room, and be very INattentive (yawn, lean back, look around the room, etc.) when he was on the other side. By the end of the class session, the professor was pinned in the corner of the "attentive" side of the room.

In other words, I agree with Rudy that feedback of such a structured kind would likely have a VERY pronounced effect upon participants. However, positive feedback would be very useful. Unfortunately, as soon as you formalize its use, then a person can assume that its absence implies a negative evaluation, rather than zero evaluation. Since the evaluation is so formalized, it will become a goal.

There were some interesting subjective impressions about feedback voiced by participants toward the end of the blindfold session [see "BLINDFOLD SESSION"].

[83] DCrocker TUE 6-MAY-75 7:05PM

It seems reasonable to me to allow the person who makes a suggestion/comment to be the one to request evaluation of it. A VERY simple, short, structured interactive questionnaire could occur just after each p[illegible]n reads the entry. E.g.:

Amount of agreement: [1-10]
Willingness to participate: [1-10]

. . .

[96] Carlstedt WED 7-MAY-75 3:35PM

No doubt every conference participant would like more feedback, especially on his own entries. For example, I was feeling bad about having submitted the keyword index in [54] until Carlisle made a positive reference to it in entry [4.15] about a month later. Bretz[80] released **[in me]** a whole mess (literally) of feelings about possible feedback mechanisms, especially about integrating them with other kinds of control for the purposes of enhancing the focus of a conference and assessing the status of various elements in the transcript.

One of the problems with conferencing in systems like CONFER is first, there is no way to assess the impact or acceptance of one's own as well as others' entries, and second, the volume of material and the number of topics and subtopics can grow (probably even mushroom in conferences more active than this one has been until now) until it becomes difficult to tell where it is headed. Eventually, lacking a backbone sufficient to support its own mass, I suppose it just dies.

[97] Carlstedt WED 7-MAY-75 4:02PM

Maybe some other systems incorporate mechanisms addressed to these problems. A suggestion: Partition the transcript (there must be a better word for it) into levels, based on the degree of acceptance of the material in them. Entries would also probably vary across levels in editorial quality and maybe in length. Most important, the acceptance criteria would increase in strength with increasing level. The means used to measure acceptance might also vary.

Suggested levels:

. . .

The first two levels, included "for the sake of completeness", were (1) the personal and private formulation of entries, and (2) the sharing of entries and their formulation with certain others, still in private.

. . .

3. This is really level 1 of the transcript. This is material that one presents "just to get a quick reaction", "just to run it up the flagpole"; this is the level at which brainstorming occurs. It is also the level at which all material is first submitted.

4. This is the level at which material resides when it has been accepted for serious discussion.

5. Proposals. This consists of material which has crystallized as a result of the discussion of material at level 4. It differs from that material primarily in the manner in which it is presented and updated. "Propose" means "submit as a candidate for final acceptance by the conference as an "official" result." Levels 5 and above presuppose that the conference is directed toward some goal.

6. Approved material. This is still subject to later amendment and editing during and by the conference. . . .

[100] Carlstedt WED 7-MAY-75 5:03PM

So how do levels of acceptance help solve the problems of feedback and focus? Because the measures of acceptance required for, and represented by, residence at a certain level > 3, are very much the kind of feedback one is looking for. And because the level boundaries are filters through which pass only that material that is judged correspondingly well-suited to be considered "conference results." And corresponding measures of conference progress can be made, by looking at how much has gone how far. And the imposition of acceptance criteria right at the very beginning, between levels 3 and 4, might help keep the quality and relevance of entries higher at the outset, as well as keeping the "topic" tree pruned by allowing only those entries that are relevant to the "agenda" represented by levels 4-6, unless the participants feel like accepting new topics.

There is an obvious analog in meetings conducted under Robert's Rules of Order, with meeting agenda (level 4), motions on the floor, discussion on the motions, amendments, passed motions, rules for obtaining the floor, etc. It has worked pretty well in a lot of situations for a long time. But it is interesting to speculate about, and might be interesting to experiment with, different acceptance measures and criteria for the various levels.

[101] Carlstedt WED 7-MAY-75 5:34PM

<Afterthought to [96-97,100]>:
This material should be regarded as existing at level 3.

[111] DCrocker WED 7-MAY-75 7:43PM

. . .I very much like the idea of the levels (!!!Carlstedt). . . A hierarchy of levels can develop. For example:

Level 5: Taxonomy
Level 4: Systems vs. Situations
Level 2: [98] -- Levels. Hmm. It looks as if a person's entry may be either in response (i.e., made as part of a discussion) and therefore at Level 4, or may be a fresh idea and therefore at Level 3. Threads, on the other hand are at Level 4 or above.

A person always offers fresh ideas thru Level 3. If anybody finds any merit in the idea (so indicated by serious, positive response(s)) the idea automatically becomes a thread and is lifted to Level 4. When a sufficient number of people approve of the idea and have adequately refined it, it comes out of "committee" and is advanced to Level 5, as a formal discussion.

This implies that the ideas of individuals may be ignored, but those of groups cannot. (Level 5 combines the comparable Levels 3 and 4.) I suppose that one could carry the analogy on to Level 6, which is the point at which the Senate and the House have to compromise on their two versions.

[112] Anonymous WED 7-MAY-75 8:30PM

. . .
We may want to include **[anonymous entries]** in our "levels" of entry (for all the truly shy people in the world).

[113] Anonymous THU 8-MAY-75 11:54AM

. . .

An entry of any level may be anonymous. [112], which suggests the use of Anonymous is (perhaps) Level 3; while this entry is Level 4.

[114] Levin THU 8-MAY-75 1:50PM

How can entries [112] and [113] be anything but level 3? That is, until feedback comes from other participants. Otherwise I don't understand the notion of levels (as defined in [97] by Carlstedt).

[115] Carlstedt FRI 9-MAY-75 9:33AM

The idea was that nothing gets past 3 (or any other level) until accepted for the next level by the conferees. What does anonymity have to do with it?

[116] Carlstedt FRI 9-MAY-75 9:39AM

I think there was a simplifying assumption in Carlstedt [97] that entries could be divided into "response-only"--the kind used to measure acceptance the kind that might be "forced"; and "other", which contains some kind of new material which itself requires response. This is admittedly a pretty strong assumption, since "I didn't like [n] because..." might have to be split into its "response-only" and "idea" components. "Acceptance level" would apply only to the second category.

[118] Carlstedt FRI 9-MAY-75 1:18PM

. . .

<Crocker[111]>: You got it!

[121] Levin FRI 9-MAY-75 6:31PM

This entry was submitted in reponse to a request for an evaluation of the Recurrent News Letter described in [105, 107]. The evaluation is given in terms of the timeliness of feedback.

The first round was sent out in mid Feb. I've haven't gotten back any versions, but I have heard from various people that it is still circulating. This may be a major (and possibly fatal) drawback - the slowness of feedback (possibly on the 3-4 month period mentioned by Carlstedt for his family's round robin). [See [119].] That is, will people find feedback that is that old useful enough to keep participating. Of course, this is incredibly fast in comparison to journals, but still incredibly slower than face to face.

One interesting comment I got when explaining this to someone was: "You may never know if it succeeds or not!" - that I may walk down the street 10 years from now and see someone with an 80th generation xerox of the original instructions.

One advantage over the round robin is that it isn't completely dependent on cooperation by all

members. Our family has also been participating in a round robin letter (but only for about 10 years - Jim, I salute your family!), and failure by any of us to send on quickly would have a fatal effect (and periodically does - I've gotten "news" that was as much as 6 months out of date).

. . .

[123] Levin FRI 9-MAY-75 7:34PM

At UCSD, they are using an interesting idea for group decision making. They voted out the idea of an elected student government and instead, hold regular meetings to discuss student issues (including how to distribute some large sum of student activity fee money, over $100,000 or so a year). The voting rule is "People who have attended the last two meeting get to vote". As you can imagine, this rewards attendance. I dont know the details, but so far it seems to work out (this is the first year it's been tried).

For our purposes, this could be transferred to teleconferencing where the "voting" on the status of entries could be contingent on recent participating. In fact, given a computer mediator, more complex rules incorporating amount of participating, or even better, the group evaluation of participation to a weighted vote on entries.

[135] Press MON 12-MAY-75 4:28PM

YOU GUYS SURE HAVE BEEN BUSY! I AM GOING TO INPUT MARGINAL NOTES ON THE ENTRIES FROM 80 THRU 116. THAT IS THE EXTENT OF MY MOST RECENT LINE PRINTER OUTPUT AND TO DUMP THE REST ON MY TTY WOULD TAKE TOO LONG.

RE BRETZ(80). AS IN MOST EVERYTHING ELSE, IT IS IMPERATIVE TO DISTINGUISH BETWEEN REAL-TIME AND ASYNCHRONOUS CONFERENCES WHEN DISCUSSING FEEDBACK. IN AN ASYNCHRONOUS CONFERENCE, IT IS POSSIBLE TO EXPLAIN OR ANNOTATE YOUR FEEDBACK, RATHER THAN JUST SAYING GOOD, BAD, ASLEEP, OR AWAKE. AS LONG AS YOU ARE ABLE TO SAY WHAT IT IS YOU DISAGREE WITH, I DON'T FEEL THAT NEGATIVE FEEDBACK IS SO HARMFUL - E.G., THE DEBATES WHICH ARE CARRIED ON IN THE "FORUM" SECTION OF THE COMMUNICATIONS OF THE ACM.

. . .

RE CARLSTEDT(97). IT WOULD BE INTERESTING TO TRY A CONFERENCE ORGANIZED ALONG THESE LINES. SOME CHAIRPERSON WOULD HAVE A SUBSTANTIAL, TIME-CONSUMING TASK IN EDITING AND PARAPHRASING ENTRIES TO EVERYONE'S SATISFACTION PRIOR TO ADVANCING THEM TO THE NEXT LEVEL.

. . .

[136] Bretz MON 12-MAY-75 4:44PM

. . .

A conference, in my view, requires INTERcommunication. Messages originated by each participant must reach all other participants. This would eliminate such systems as CATV electronic-pulse polling, where digital pulse feedback from a large number of subscribers reaches only a central computer. Of course the computer then totals and manipulates and tabulates and it can feed the aggregated result to all subscribers. Maybe we need a further requirement in order to eliminate this kind of thing. Or do we want to eliminate it, or should it be included as teleconferencing?

[138] Press MON 12-MAY-75 5:16PM

THIS IS A META-ENTRY ON THE CONFERENCE.

WHY HAS OUR ACTIVITY PICKED UP SO NOTICEABLY?? IS IT BECAUSE RUDY HAS LEARNED TO OPERATE HIS TERMINAL? BECAUSE THERE WERE RELATIVELY FEW PEOPLE AT THE LAST FACE-TO-FACE MEETING? BECAUSE WE DID SOMETHING UNUSUAL AT THE LAST FACE- TO-FACE MEETING? HAVE WE BEGUN TO GIVE EACH OTHER MORE POSITIVE FEEDBACK AND RESPOND DIRECTLY TO EACH OTHER'S INPUTS MORE FREQUENTLY? (SOMEONE COULD ANALYSE THE TRANSCRIPT FOR AN ANSWER TO THE LAST QUESTION).

. . .

[160] Bretz TUE 13-MAY-75 5:08PM

I would like to propose that we accept Press's entry 76 **[dealing with terminology]** in which he very adroitly summarized what we had discussed in the last meeting, as at least level 4, possibly level 5 material. (I see that I have in the same damn sentence also suggested that we raise Carlstedt's proposed six levels to level 4 or 5. **[97]** My confusion as to which of these levels (see Carlstedt 97) indicates that I am not content to separate these two intermediate levels. Perhaps they should be combined, simplifying the hierarchy down to a set of five levels in all. All of which proves that unless we do this we better leave the level taxonomy in level 4 for the nonce. (Is this a meta-meta-comment?)

. . .

[207] Carlstedt FRI 23-MAY-75 2:37PM

. . .

Maybe a collaboration that requires a highly-structured representation of the object of collaboration ("project state" [3.17,56]) can be partitioned into the relatively informal part (conferencing) and the formal part (updating the project state). Levels 6 & 7 defined in [97] might be a formal representation of the project state.

. . .

[213] Press MON 26-MAY-75 4:08PM

. . .

examples 1 and 2 in my entry [3.17] postulate a structured project STATE **[together]** WITH FREER COMMENTS WHICH ARE ORGANIZED AROUND THE STRUCTURE OF THE PROJECT STATE. IN SUCH CASES, A PORTION OF THE "TRANSCRIPT" IS STILL UNSTRUCTURED (AS YOU POINT OUT).

. . .

[222] Carlstedt FRI 30-MAY-75 4:25PM

This is part of a response to a question regarding possible publication of the transcript.

How about collaborating on the first step via a poll regarding which entries (or parts of entries) you think should be retained. . . . What retention criteria should we use, both as individuals and as a body politic? Such a poll would actually constitute the kind of feedback needed to promote entries from "level 3" where most of them probably still reside, to "level 4" (see [97])! I suggest that after that, the author of each retained entry express himself on what editing changes he would like to see

made (including possible deletion), annotations he would like to include with it in the publication, or other afterthoughts.

. . .

[233] Carlstedt MON 2-JUN-75 2:08PM

In the previous entry, a rough attempt was made to define the conference attributes "participation" and "focus" (coherence).

I'm interested in constraint mechanisms that would encourage participation and focus and discourage over-participation and diffusion. This is where we get back to feedback and forced-response mechanisms, among other things. Suppose that the privilege of making a "new" entry were dependent on two criteria: that the person attempting the input has less than n entries currently residing at the "initial" level, and that he or she has submitted at least a first-level response to every entry at the initial level. A "first-level response" is a response to something like the following questionnaire:

On a scale of 0-5 (negative-to-positive), rate entry x in the following:

The extent to which you think you understood what the author was saying.

The extent to which you think you agree with what was being said.

How well you think the entry fits your own interests.

How relevant you think it is to the theme/goal of the conference.

How new and thought-provoking you found the ideas it contains.

First-level responses could be anonymous or not, but would be aggregated and the result possibly used to determine whether an entry is promoted to the next level.

Independently of such a standard questionnaire, it would be nice if participants could remember to include specific questions in their entries, e.g. points about which they are unclear or doubtful, that others could use as convenient handles. I don't do this much. Why don't we do this more??

Now, an active listener is one who responds to at least some of the standard questions, and is recognized for this by the system. Active listeners are just as valuable as contributors. If a participant does not enter first-level responses for some time, he can be assumed to have left the conference.

Would such a mechanism encourage participation? Would it discourage over-participation? Would it enhance the focus of a conference? Would it wreck a conference completely because participants would be afraid of the results? Are questions like those in the proposed questionnaire appropriate at all? Would others be better? What are some other things that might happen with such a mechanism?

I neglected to credit previous entries in which the subject of response/feedback is discussed, particularly Press[3.21-23, 3.26,4.11] and also Bretz[80] and the response to it by Crocker[83].

[238] Bretz TUE 3-JUN-75 4:48PM

I hasten to enter a first-level response to Carlstedt's last entry [233-34], not [237]. I find it thought-provoking, relevant, fitting to all our interests, I think I understood it, and I thoroughly agree. I think it is particularly relevant to entries [219-221] **[regarding publication of the transcript]** by Press. Had we encountered this idea earlier in the conference we would be in a far better position now to edit the transcript and make a publication of it.

It has occurred to me during this experience, that the contribution of the computer to management of the conference has been minimal. At least this is true of the uses I have made of the transcript. I think what has been missing is a kind of summarization or organization of what we have said and a weeding out of dead wood and dead leaves. I think Carlstedt's thinking in this entry should be integrated in some way with Levin's experience as related in entry [107].

It is also relevant to the thread that was started I believe by my entry [80] on the need for response. The suggestion that no one be allowed to enter anything until he has made some kind of first level response to all previous entries sounds excellent, albeit a bit drastic. But Jim said "Every entry on the initial level" which seems to me to mean, in effect, every thread.

I certainly think this would keep the conference coherent, cut down on the number of threads, and keep us all working together more. Would it be possible to reprogram NCONFER at this late stage to do some or all of these things, and see what difference it makes? It appears to me that we might be on the edge of a breakthrough.

[240] Bretz TUE 3-JUN-75 5:31PM

. . .

I would like to make an additional suggestion. The computer should not let participants forget to respond to questions by others concerning their inputs. Perhaps if we enter QUESTION before any such input sentence for which we would expect a reply, the computer could find it easily, and if we always reply by entry number, it can keep track of which questions have been answered. Thus a participant will not neglect any of the threads on which he is participating.

"LIVE" FEEDBACK CONVENTIONS

[84] Carlstedt WED 7-MAY-75 10:14AM
Here are strokes for everyone who has contributed to this activity since May 1: ! (levin) ! (press) ! (crocker) ! (bretz). I've just gotten caught up, and it's great stuff!

[102] DCrocker WED 7-MAY-75 6:54PM
!!!Carlstedt!!!Bretz!!!Levin

[108] DCrocker WED 7-MAY-75 7:16PM

While idly passing the time with my brother once, we started discussing the questions of providing feedback through links. Since we were linked **[via the TENEX "Link" facility]** at the time, it

seemed relevant. I suggested that a major problem would be to get people to remember to explicitly indicate feedback; I did not believe that people are generally aware of all of their reactions, much less able to remember to explicitly pass the reactions on. My brother's typed response to my point was: "Oh, really?!"

At which point I conceded and then offered a couple of symbols, which have been augmented by some peer review:

-U- Smile
-W- Smirk
-M- Frown.

[110] Levin WED 7-MAY-75 7:26PM

-U- -U-
-U- -U-

[118] Carlstedt FRI 9-MAY-75 4:18PM

This entry consisted of a list of a dozen miscellaneous one-line responses and questions--an obvious attempt at providing feedback.

. . .
<Crocker[108]>: I didn't get the impact of this.

<Levin[110]>: -M-
. . .

[120] Levin FRI 9-MAY-75 6:27PM

<Metacomment about [118]>:
. . .
An interesting entry (-M-) and hopefully we'll see more like it from us.
. . .

[122] Levin FRI 9-MAY-75 7:31PM

<Correction on [120]>: The -M- should be a -U- (I just reviewed Dave Crocker's original entry, and realized I mixed them up).
. . .

[128] DCrocker SAT 10-MAY-75 4:50PM

<Response to Carlstedt[118]>:
Partly, I was just hacking; and partly, I was sharing some thoughts about a) extracting emotional content from typescripts and b) the issue of conscious, convenient inclusion of such content into

typescripts. In review, I realized I left out a relevant part of the story: My brother and I did not get onto the topic randomly. He mentioned something on a somewhat sensistive subject and I shot back a caustic response; expect that I had a huge smirk on my face and was enjoying what was taking place. (I acknowledged some of my sensitivity to the subject but thought it humorous.) Obviously, my brother only had the typed communication and so thought I was extremely upset. I corrected his perception and that launched us into [108].

Most of the time, we use links and CONFER entries in very formal, business-like ways. This was a case of a much more natural and uninhibited interaction and, I think, does a good job of showing what we are up against. I think that a TC system, to be effective, has to have as little of this sort of limitation as possible. That whole idea of reading the other person's reactions.

[129] DCrocker SAT 10-MAY-75 5:00PM

<Cued by Levin [120,122]>:
Another example of what we are up against in trying to relay emotional content. I had thought my notation was pretty natural, but I'll have to work on it some more.

INFORMATION STRUCTURE AND RETRIEVAL Edited by Jim Carlstedt

The CONFER teleconferencing system, like its parent system, FORUM, requires that a conference be structured into "activities", each dealing with a separate topic. Activity 3 of the current conference was originally labelled "Problems with current and proposed systems." The very first entry (see below) complained about this type of structure, and in particular, the difficulty of retrieving for on-line review those entries related by topic. This complaint was echoed several times by other participants, and the problem of information retrieval from a conference "transcript", and the closely-related problem of transcript structure, became major topics of discussion. Several concrete proposals for retrieval and organizational features of future systems were offered.

Since this topic is relatively well-defined and cohesive, entries or parts of entries concerned with it are listed primarily in chronological order. An exception is made for the interaction occurring in activity 3 from late February to early April, a period during which relevant literature reviews and taxonomic proposals were being entered in activity 1.

[10] Carlstedt FRI 21-FEB-75 2:02PM

[Review] Murdock, John W. (Battelle Columbus Labs) Dynamic texts. Theory into Practice 12,3(73.6) 179-183

This is a proposal for making college course textbooks more flexible by collecting into one information bank "all the information that would be found in all of the textbooks needed for a college curriculum in a given field, plus the supporting fields. . ."texts" would be organized collections of subsets. . .[each] scoped exactly as a professor wanted it and at the academic level appropriate for his class. . .[and] interlocked by vocabulary control to the information bank. . .This ability to browse through the information bank would easily provide students with a method of getting information at the exact level needed."

The above pretty much captures the magical flavor and low technical content of this article. The rest is motivational (traditional textbooks aren't conducive to optimal learning) and economic (how the information would be bought and sold). The relationship to TC is marginal.

[24] Carlisle(Chrmn) SAT 1-MAR-75 5:05PM

Notes on Russell Ackoff and James Emery's "Third Version of an Idealized Design of a Scientific Communication and Technology Transfer System", October 1974:

. . .

The recommended "distribution process" [paragraphs 30-44] includes user profiles, periodic listings, profile revision, relevance rankings, document ordering, and document transmission. Each of the activities would utilize some forms of telecommunications, all of them could be carried out among some high proportion of the user, publisher local center community via TC.

. . .

[31] DCrocker MON 10-MAR-75 4:03PM

<Keys: Taxonomy, conference participation>

. . .
B. What is an ENTRY?

1) Stream of data entered and explicitly delimited by an individual participant (as with FORUM);
2) Any relatively continuously stream of data entered by a member;
3) A unit of thought.

"Continuous" implies the definition of a timeout, to serve as a delimeter between entries. If the member does "say" anything within that period, the entry is considered complete. (Voice-controlled systems would tend to follow this approach.)

Alternative 3 leads to the questions of what degree of resolution (sentence, paragraph, chapter, ?) is desired and how are the units detected (natural language understanding, simple syntax, variations in the pitch of the voice ...).
. . .

[33] Carlstedt WED 12-MAR-75 2:49PM

<TC Taxonomy. Storage>
. . .
B. Element types
  1. Primitive types supported
    . . .
    b. Transcript entries (facts, opinions, considerations, comments, decisions, policy statements, agreements, disagreements, criticisms, proposals, definitions, changes,...)
    . . .
  2. Extendible set of types?
. . .
C. Access structure
  1. Primitive
    a. (Unordered) sets of elements
    b. Ordered sets
      --Natural sequences
      --Other orderings
    c. Maximum lengths/sizes
  2. Complex
    a. Trees
      i. Sets of sequences
      ii. Sequences of sets
      iii. Maximum number of levels
    b. Networks
      i. Fixed set of relations

--Which ones?
ii. Extendible set of relations
. . .
E. Retrieval functions
. . .

Relatively early in the conference Carlstedt undertook to make an index of the keywords and terms already occurring in the transcript. The index was updated on 3-JUN-75 as entry [265]. The following entry introduced the first version.

[53] Carlstedt TUE 1-APR-75 12:26PM

<terminology; index>

The following entry is an index of terms gleaned from entries to this conference bearing dates from Feb 21 to Mar 24. It took about 2 hours to go thru 35 pages of transcript, identifying indexible terms and concepts, doing some minor editing for the sake of indexibility, and typing them in. I already had the sorting and compacting routines on hand. It doesn't really tell us anything about this conference that wasn't already obvious--it merely reflects the facts that NCONFER hasn't been used very much (only 40 "substantial" entries); that it most notably has not been used much for group interaction (excluding "bibliography", each term occurred in an average of about 1.1 entries); that we are new to the subject (lots of variation in terminology for the same or similar concepts); and that a large number of concepts have already at least been alluded to (the list contains about 240 "raw" terms, where "raw" means almost no attempt has been made to associate close ones). An index to the transcript probably isn't too useful at this point, and because of the size of the entry I have misgivings about submitting it, but thought those of you who like to read such things as telephone directories (as I do) might find it interesting. **[There followed a five-and-a-half-page list containing some 314 terms.]**

[56] Carlstedt TUE 8-APR-75 12:27PM

<taxonomy, storage>

This entry describes eleven different categories of storage. It may be found in its entirety in the Classification Schemes section.

[3.1] Raveling FRI 28-FEB-75 8:31PM

Comments (mostly gripes) about NCONFER

. . . 2. There appears to be no way to access (review, in particular) entries in multiple activities with a single command. Keyword retrieval for multiple activities would make it much easier to correlate information among related topics.
. . .

[31] DCrocker MON 10-MAR-75 4:03PM

<Keys: Taxonomy, conference participation>

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. . .

[33] Carlstedt WED 12-MAR-75 2:49PM

<TC Taxonomy. Storage>

. . .

B. Element types
  1. Primitive types supported
    . . .
    b. Transcript entries (facts, opinions, considerations, comments, decisions, policy statements, agreements, disagreements, criticisms, proposals, definitions, changes,...)
    . . .
  2. Extendible set of types?

. . .

C. Access structure
  1. Primitive
    a. (Unordered) sets of elements
    b. Ordered sets
      --Natural sequences
      --Other orderings
    c. Maximum lengths/sizes
  2. Complex
    a. Trees
      i. Sets of sequences
      ii. Sequences of sets
      iii. Maximum number of levels
    b. Networks
      i. Fixed set of relations

--Which ones?
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. . .

[3.7] Carlstedt MON 10-MAR-75

Here's a YES to almost all of Raveling's criticisms [3.1].

. . .

[3.8] Carlstedt MON 10-MAR-75 1:44PM

My other main dissatisfaction is due to the inadequacy of the retrieval function of CONFER. Even with only 30 messages in an activity, and even with a command as flexible as REVIEW, I'm already beginning to get lost and feel it necessary to resort to a printout so I can draw my usual frames around what seems relevant or exceptional and make my usual little comments in the margin--all to help me when I come back to it later. And especially so I won't be forced to screen through a long entry every time I want to find or recall something of interest in it! To be told that CONFER has been used successfully by one or more projects is almost beyond my comprehension. It doesn't seem to do much more than BANANARD **[a message program on the ISI-TENEX system]** already does so well.

[3.9] DCrocker MON 10-MAR-75 3:54PM

<Ref: Carlstedt's [3.8] -- Writing in the margins>
<Keys: Transcript review> I agree that the monolithic printout by Forum is irritating. I like the idea of "writing in the margin" but think it important that an entry not be subject to whimsical modification by members.

That reminds me of a feature in the NLS system: The Journal system, which allows the transmission and cataloguing of messages, does not allow messages to be permanently (or even "officially" modified, but it does allow use of a "Browse" mode that lets the user perform personal modifications to the message. Also, viewing of messages can be highly constrained, according to the viewing parameters in force.

[3.12] DCrocker MON 31-MAR-75 6:34PM

In our last meeting, there was discussion about selecting portions of the data-base as special "threads" of thought. In addition, we have been painfully discovering the need to be able to restructure conference organization, while the conference is underway. This means more than simply adding new conference topics. One must be able to "initialize" a new topic with previous entries appropriate to that topic.

In effect, we need to be able to have a group of people start talking, possibly without any predetermined structure to that discussion, and eventually -- after the discussion has had time to develop -- lay a structure on top of it.

These two requirements suggest that the conference should have only one file for ALL entries, each entry having a unique label (entry number) for the ENTIRE conference. Different "seminars" (or whatever) within the conference, become nothing more than dynamic tables, which are automatically added to, as people create entries which they believe are appropriate to that topic. "Threads" become nothing more than "static" tables, created by one person. (Or one could view a thread as

the initialization of a new agenda topic.) Presumably, a person making an entry can indicate that it is to be added to SEVERAL tables. (Whereas FORUM/CONFER constrain you to only one.)

For example, this agenda topic seemed the right place for this entry, but I could see reasons for putting it with the taxonomy stuff, too.

[3.13] Carlstedt TUE 1-APR-75 1:02PM

That same discussion about threads was partly what stimulated my experiment with indexing (see [53-54]). I now think I may have a misconception about what a thread is--I thought it was just a subject, concept or idea that runs through one or more entries or is touched on by them, i.e. something that might be more or less successfully denoted by a name or phrase serving as a keyword in the information retrieval sense.

Anyway, I agree with the need for both requirements--some kind of handles for retrieval as well as a more amorphous basic structure, as suggested in [3.12] above by DCrocker. Since this entry is already about optimum size for one, I'll respond to the structure thing next.

[3.14] Carlstedt TUE 1-APR-75 1:02PM

About transcript structure, and the need for flexibility both in classifying entries and in transiting from a given entry to related ones:

Obviously structure must be fixed at and below some level of abstraction, say L. What we want is for the structure at level L to be a basis appropriate for supporting "dynamic" structure above that level (whatever that means). The level L structure exhibited by NCONFER is that of a tree, and as mentioned in [3.12] both classification and transit are difficult. I imagine a more flexible L-structure to be that of a multi- relational network, where explicitly associated with each entry are two kinds of access information: (1) keywords and metadescriptors that classify the entry itself and thus indirectly (via indexes) relate it to others of those classes, and (2) relators that specify other entries directly. These can all be chosen from given sets, defined as needed for the particular conference. "Dynamic restructurability" might then be defined in terms of the extendibility of these sets together with the ability to update access information itself. An example of a crude keyword set are the terms of the list generated from this conference (entry [54]). Examples of metadescriptors are "fact," "reference to information residing elsewhere (outside this transcript)," "question," "comment," "agreement," "disagreement," "emotional response," or whatever; some of these might be used as mediation decision variables along with other properties of the entry, submitter, conference, etc. I guess relators are like metadescriptors with one or more other entries attached as arguments, as "question/comment/agreement/emotionalresponse/criticism/
suggestedchange/update/revision/addition. . . (about/on/with/to/of. . .) <specified entries>."

The problem is how to get the access information made explicit, with whatever assistance the system can provide along this line, in such a way that the requirement for it doesn't become a burden to the user (and of course to design a system access mechanism that utilizes it efficiently).

Sample access information for this entry: <METADESCRIPTORS: proposal; definitions. KEYWORDS: transcript structure; entry classification; transit among entries; access information; keywords; metadescriptors; relators; NCONFER. RELATORS: stimulated by [3.12]; cites [3.12, 54]>

[3.15] DCrocker MON 7-APR-75 12:46PM

In trying to retrieve the "thread" of the discussion about threads, I kept having to read one entry, bounce to another, then go back to the first ... This system needs the concept of contexts, several (e.g., 5?) layers deep. The myriad of arguments against NLS notwithstanding, that is another feature it has implemented.

[3.18] DCrocker MON 7-APR-75 6:56PM

Ref: [3.12] [3.14]; Keys: Conference data-base, tools, structure, keywords, organization

The requirement that (virtually) all relevant data be modifiable looks like a killer, unless the "conference" program sits on top of a structured-data-base editor (e.g., NLS). (Side note: NLS conveniently has the ability to reference other entries (by what they call "links") so that keeping lots of different tables is not much of a programming task). Not only is it necessary to be able to add (e.g.) more keywords, to describe an entry, but many keywords will be similar and will need to be converted to a common word.

[3.23] Press TUE 8-APR-75 11:30AM

FEATURES I'D ADD TO CONFER.

WHILE TYPING IN THE ABOVE CONTRIBUTIONS, I FELT THE NEED FOR FOUR FACILITIES THAT ARE NOT AVAILABLE. NOTE THAT THESE ARE ESSENTIALLY DATA BASE STRUCTURING DEVICES - THEY INVOLVE OPERATIONS THAT ARE COMMON TO ALL CONFERENCES.

1. ADD SPECIFIC QUESTIONS TO A SYSTEM MAINTAINED LIST-OF-QUESTIONS. NOTE THAT I AM THINKING OF MORE SPECIFIC QUESTIONS THAN CARLSTEDT HAS IN MIND WHEN HE WOULD TAG AN ENTIRE CONTRIBUTION WITH THE METADESCRIPTOR "QUESTION". AN EXAMPLE MIGHT BE "CAN SOMEONE SUPPLY A REFERENCE ON THE X SYSTEM?"

2. CREATE PUBLIC OPINION POLLS. THIS COULD RANGE FROM "DO YOU AGREE WITH X?" TO MULTI RESPONSE ITEMS TO THE CREATION OF A "MINI-DELPHI".

3. CREATE ARBITRARY LISTS. FOR INSTANCE TO CREATE A LIST OF PERCEIVED REWARDS FOR CONTRIBUTING TO CONFERENCES. THE LISTS WOULD BE OPEN ENDED AND IF SOMEONE ELSE HAD ALLREADY PUT YOUR ITEMS ON THE LIST YOU COULD MERELY ADD **[your]** "VOTE".

4. ADD TERMS TO A CONFERENCE GLOSSARY. ONE SHOULD BE ABLE TO COMMENT ON DEFINITIONS AS WELL AS ADD NEW ONES.

[3.25] Press THU 10-APR-75 2:40PM

COMMENTS ON [3.12-14] ON STRUCTURES, THREADS, KEYWORDS, METADESCRIPTORS, ETC. ("TAGS").

1. WHO ASSIGNS "TAGS"--AN EDITOR, THE AUTHOR, EACH INDIVIDUAL CONFEREE AND/OR A GROUP VOTE? CLASSIFICATION SCHEMES ARE UNRELIABLE IN THAT DIFFERENT PEOPLE MIGHT TAG THE SAME

ENTRY DIFFERENTLY. THIS IS OK -- EACH PERSON COULD HAVE HIS OWN CUSTOM-BUILT ORGANIZATION SCHEME AND THE CONFERENCE AS A WHOLE HAVE AN INDEPENDENT SCHEME (PERHAPS BASED UPON CONSENSUS AMONG THE INDIVIDUALS, AN EDITOR, OR AUTHOR PREFERENCE).

2. WOULD PEOPLE TAKE THE TIME TO TAG ENTRIES? MOST OF THE ENTRIES IN THE SYSTEM NOW ARE WITHOUT KEYWORD LISTS. THE SYSTEM COULD FORCE YOU TO TAG YOUR ENTRIES (OR AT LEAST SAY "NONE APPLICABLE" EXPLICITLY). A MENU OF TAGS WOULD PROBABLY HELP. THE SYSTEM COULD FORCE PEOPLE TO [tag] OTHERS' INPUTS AS WELL AS THEIR OWN--BOTH AS AN ORGANIZATION DEVICE AND FOR FEEDBACK TO THE AUTHOR. ALL CLASSIFICATION OF ENTRIES SHOULD BE FED BACK TO THE AUTHOR (IN STATISTICAL SUMMARY) FOR "BEHAVIORAL" PURPOSES.
. . .

5. ONE WOULD OFTEN WANT TO ASSIGN DIFFERENT TAGS TO DIFFERENT PARTS OF AN ENTRY.

[3.27] Press THU 10-APR-75 3:02PM

MORE NITPICKING WITH CONFER. I WISH THE SYSTEM WOULD TELL ME IN WHICH ACTIVITIES THERE ARE UNSEEN ENTRIES WHEN I LOG ON. IN GENERAL, THE "BARRIERS" BETWEEN ACTIVITIES SEEM A BIT HIGH. [. . .] ALSO MANY ENTRIES "FIT" IN SEVERAL ACTIVITIES. (DOES "REVIEW" CROSS ACTIVITIES?)

2. I DONT WANT TO BE REMINDED OF THE NAMES OF EACH ACTIVITY WHENEVER I LOG IN.
. . .

5. IT MIGHT BE USEFUL TO BE ABLE TO ADD "AFTERTHOUGHTS" TO PRIOR ENTRIES. THIS ENTRY IS REALLY A CONTINUATION OF ONE I MADE THE OTHER DAY. "AFTERTHOUGHT OF" IS ANOTHER RELATIONAL METADESCRIPTOR.

[4.16] Carlisle(Chrmn) MON 28-APR-75 11:08PM

I just realized that in trying to keep my entries short by breaking them into topical chunks, I have neglected to keyword them individually with descriptors. A capability to do this retrospectively would be marvelous. A poor substitute is to put the descriptors at the end of the message, but the repitition for successive entries on the same topics is still a problem. Suggestions anyone?

<indexing, descriptors, length of entries, related entries>

[75] Carlstedt FRI 2-MAY-75 4:22PM

There is a new version of an index to this transcript. It's in the <comguest> directory, called index.may1;1.

[83] DCrocker TUE 6-MAY-75 7:05PM

<continuing [82] -- feedback/judgment> [see "FEEDBACK"]

It seems reasonable to me to allow the person who makes a suggestion/comment to be the one to request evaluation of it, a VERY simple, short, structured interactive questionnaire could occur just after each person reads the entry. E.g.:

. . .

Terms to be used [such as when contructing an index, explicitly require each reader to offer some terms.]

Forum goes in this direction with some of its Topic types, but it does not have the different entry types occur selectively and interactively. That damn rigidity again!

[103] DCrocker WED 7-MAY-75 6:55PM

You guys have been busy today. Almost looks like true, real-time interaction. It is interesting, tho, to see how intrusive the (necessary) CONT, CUED, KEYS, REFS, etc. notations were. It convinced me of the need for Threads, to free the reader and submitter of having to make the notations. Also, I frequently wanted to stop reading and make a comment; but CONFER just grinds away until it has printed everything.

[111] DCrocker WED 7-MAY-75 7:43PM

<ref: [97] -- "transcript" levels> [see "BEHAVIORAL TOPICS"]

I agree that "transcript" does not feel like the correct term. . . I am not entirely convinced that the term "threads" is adequate, either. Perhaps threads and entries.

. . .

Threads. . .are at level 4 or above.

A person always offers fresh ideas thru Level 3. If anybody finds any merit in the idea (so indicated by serious, positive response(s), the idea automatically becomes a thread and is lifted to Level 4.

. . .

[3.32] DCrocker WED 7-MAY-75 7:58PM

<Confer, terminals, entry size>

Just to record a major request: We have acknowledged the severe limitations inherent in having only a (slow-speed) CRT terminal for using Confer. Keeping entries small will greatly help circumvent the handicap. Most terminals have at least 24 lines, so that seems like a nice size.

The problem is really similar to the structured programming concern for keeping sections of code small enough to fit on one page. "If you can not see all of it at one glance, you will miss some implication of the code."

[117] DCrocker FRI 9-MAY-75 2:12PM

<NLS,Journal,Implementations,Mail, TC Systems>

The SRI-ARC Journal system is built upon the NLS text manipulation system. When preparing messages to be sent, the user has all the facilities of NLS available. The Journal system allows cataloging and distribution of messages (of arbitrary length).

Various attributes (e.g., title) can be specified and special distribution lists (with their OWN catalogs) are available. [. . .] The Journal keeps all the recorded mail in one location. Catalogs are merely machine-readable citations, with some descriptor information.

. . .

The Journal is able to send mail to a) regular NLS mailboxes, b) Arpanet mailboxes, c) U.S. Post Office mailboxes. Currently, the Journal does not use these alternatives properly (U.S. mail is disabled and Network mail only send citations, so you need NLS access to read the contents). Policy decision.

[118] Carlstedt FRI 9-MAY-75 4:18PM

<Miscellaneous responses _questions>

. . .

Crocker[103,111]: How about a little more on "threads"--I don't have a clear image of them yet. In particular, how do they free the conferee of having to make notations (add keywords & descriptors)?

. . .

[120] Levin FRI 9-MAY-75 6:27PM

Metacomment about [118]: this made the shortcomings of using a CONFERlike device on a soft copy terminal very apparent! Even with a H-P, I couldn't hold all the pointers while going off to see what they were pointing to. However, with a printout it wasn't bad . . . Maybe it would work better if broken up into smaller units.

[124] Crocker SAT 10-MAY-75 4:19PM

REF: Carlstedt [118]

I agree that breaking the comments into individual entries would have been better.

. . .

[126] DCrocker SAT 10-MAY-75 4:21PM

<Response to Carlstedt [118]: Threads>
Your question about "freeing" the participant from making notations is well taken. I do not really envision complete elimination of explicit keywording, but rather see some mechanisms that can facilitate the process. In addition, it moves keywords and such up into the metadescriptor level, rather than as part of the body of an entry.

I see a thread as being any cohesive "topic". A major topic such as Teleconferencing will have many minor topics which in turn will have many more minor topics. Worse, I suspect that the flow of threads will be very much like sewing threads in a pile, which weave amongst each other. Comments, even relatively "atomically" formed entries (as compared against Carlstedt's [118]) will often apply to several threads. This suggests the need for mechanisms to periodically clean up the bundle, such as the Dialogue Project currently does by arbitrarily restarting conferences; if a thread is sufficiently important, it will survive.

I don't have a clear opinion on how thread should be implemented. Simply having a keyword phrase define a thread my be the best approach. Anything more sophisticated may be too complex to make work. Of course, synonyms will have to be known, and it must be possible to get a list of current threads. More on mechanisms in my next entry:

[127] DCrocker SAT 10-MAY-75 4:33PM

Thread Mechanisms: (last entry was about a screen full)

a) A Content Analyzer could automatically catch many threads, completely freeing the submitter from concern with that;

b) A query could be made AFTER an entry is submitted, allowing the submitter to explicitly categorize the entry. It would also be useful to have him class the entry (response, flag-pole idea...) and state what specific entry, if any, the new entry is tied to. Unless the new entry goes off in a new direction, knowing what entry triggered it will automatically add it to a thread.

c) Review of entries must allow one (submitters, editors, chairperson?) to change what thread(s) an entry is part of. This includes creating new threads.

FREEDOM? (b) adds to the submitter's burden, rather than lightening it; so it must be possible for the submitter to easily specify standard queues, such as MORE (of my previous entry) and RESPONSE to ENTRY) so that the system will do the rest of the bookkeeping. In NLS (I really feel guilty about using it as a refernce), you can say 'I am done entering text' (with a control-D) or 'I am done with this "paragraph" and wish to continue on to the next paragraph' (with control-B). It is therefore easy to delimit meaningful units of text. I guess I am in favor of a similar mechanism for Forum-like TC systems.

And I very much like having the threads/keywords as metadescriptors, to facilitate manipulation and classification of entries (and threads).

[135] Press MON 12-MAY-75 4:28PM

. . .

I AM GOING TO INPUT MARGINAL NOTES ON THE ENTRIES FROM [80] THRU [116]. THAT IS THE EXTENT OF MY MOST RECENT LINE PRINTER OUTPUT AND TO DUMP THE REST ON MY TTY WOULD TAKE TOO LONG. [!]

. . .

[138] Press MON 12-MAY-75 5:16PM

. . . .

NOTE THAT THIS ENTRY AND SEVERAL OTHERS SEEM TO BELONG TO ACTIVITY 4. HAVE WE REBELLED AGAINST THE ACTIVITY SYSTEM?

COLLABORATION SUPPORT
Edited by Larry Press

The term "collaboration support" was introduced by Iseli in three entries during the first week of the conference. From his tone it is clear that he was enthusiastic. However, there was no response to his entries when they were made.

The topic was picked up by Press, who gave several examples of potential forms of collaboration support, and Carlstedt who discussed collaborative design and problem-solving as well as collaborative transcript editing. These topics were not pursued by the conference in general so Press and Carlstedt began discussion of them outside the conference.

The following were Iseli's original entries. They were amongst the earliest substantive inputs to the conference.

[6.1] Iseli FRI 28-FEB-75 10:19PM

How about defining the user community requirements for distributed collaboration support capabilities and the role of teleconferencing therein. What are the attributes of a teleconferencing system adequate for collaborative support. Much has been thought of and reasearched relative to teleconferencing, let's raise our objectives to collaboration support - that's where the REAL action lies!!!!

[5.1] Iseli FRI 28-FEB-75 10:17PM

How about a discussion of multi-media teleconferencing within the domain of collaboration support. What projections can be made for developments like the SPS-41, and forthcomming local user intelligent terminal capabilities?

[3.2] Iseli FRI 28-FEB-75 10:05PM

Having just read [6.1], I would like to add that TC, by itself, is a slight area of REAL user interest - the name of the more relevant activity is Collaboration Support; of which teleconferencing is only a small, although integral, part. I would very much like to participate in a discussion of the tools and services that make up a reasonable collaboration support capability, the degree of user control in selecting his environment and specifying relevant attributes of his work environment - the degree of user adaptiveness in the selectible environment, monitoring functions to augment the user, the control of multiple asynchronous activities [processes], and the like. Teleconferencing, without the ability to really share information, to collaborate on meaningful activities, etc., is not much better than a surrogate for "ham radio". Raveling's comments on the Human Interface of this capability are well taken - isn't it time to consider what the relevant attributes of an adequate and graceful human interface, for assorted user communities are? I am intentionally attempting to solicit interest in teleconferencing in a broader context - namely, as one of many capabilities required to enable distributed folk to collaborate on the achievement of shared objectives and on a methodology to accurately evolve a "tool, service, etc.".

Iseli made these entries under three different activities (problems with current and proposed systems, technology, and proposals respectively) but no one responded. Press joined the conference several weeks after it began and offered the following response to Iseli: to that goal.

[3.17] Press MON 7-APR-75 5:16PM

I HAVE JUST JOINED THE CONFERENCE AND WOULD LIKE TO BEGIN BY RESPONDING TO ISELI'S COMMENTS REGARDING COLLABORATION SUPPORT. (I HOPE THAT HE (SHE?) IS STILL WITH US). I'VE ONLY BEEN TO TWO MEETINGS, BUT THE DISCUSSION SEEMS TO FOCUS ON TWO CLASSES OF APPLICATION: REAL TIME SIMULATION OF FACE TO FACE CONFERENCES AND THE CREATION OF ELECTRONIC NOTEBOOKS SUCH AS THIS. THE KEY PROBLEM WITH USING CONFER FOR THE FIRST SORT OF CONFERENCE SEEMS TO BE ONE OF SPEED, OF BANDWIDTH. THE MAJOR PROBLEM WITH ELECTRONIC NOTEBOOKS SEEMS TO BE ORGANIZING AND RETRIEVING TRANSCRIPT TEXT ONCE IT HAS BEEN GENERATED. IF WE FOLLOW ISELI'S SUGGESTION OF EXPLORING WAYS IN WHICH A CONFER-LIKE SYSTEM COULD BE USED FOR COLLABORATION SUPPORT, WE MAY COME UP WITH MODES OF OPERATION WHERE THESE PROBLEMS ARE MITIGATED OR DISAPPEAR. THE FOLLOWING ARE A FEW BRAINSTORMS ALONG THESE LINES:

1. JOINT WORK ON A SPECIFIC DESIGN TASK.

EXAMPLES MIGHT INCLUDE THE DESIGN OF A QUESTIONNAIRE, CIRCUIT, STRUCTURE OR A PROGRAM SPEC. A PORTION OF THE DATA BASE BECOMES THE EVOLVING DESIGN ITSELF AND THE "NOTEBOOK" PORTION OF THE DATA BASE WOULD BE ORGANIZED AROUND REFERENCE TO THE EVOLVING DESIGN.

FOR INSTANCE IN A PROGRAMMING PROJECT, THE NOTEBOOK PORTION WOULD CONTAIN ENTRIES SUCH AS "I THINK WE SHOULD USE ALGORITHM X IN PROCEDURE Y BECAUSE..." OR "I JUST ADDED ARGUMENT X TO PROCEDURE Y BECAUSE...". IF A QUESTIONNAIRE WERE BEING DESIGNED, WE WOULD SEE NOTEBOOK ENTRIES SUCH AS "LET'S ADD QUESTION X IN ORDER TO TEST HYPOTHESIS Y" OR "I HAVE JUST ADDED RESPONSE X TO QUESTION Y BECAUSE..."

THERE MUST BE SOME PROGRAMMING PROJECTS AROUND WITH EXPERIENCE DOING THIS SORT OF THING. ANY REFERENCES? WHAT SORT OF FILES ARE MAINTAINED BY THE "PROGRAMMING SECRETARY" IN THE IBM CHIEF PROGRAMMER TEAM PROJECTS?

2. JOINT ANALYSIS OF RAW DATA.

DATA BASES OF SURVEY RESEARCH, MEDICAL RECORDS, DIGITIZED SPEECH, EKGS WITH EXEMPLARS AND NON-EXEMPLARS OF VARIOUS DISEASES, ETC. COULD BE KEPT IN THE SYSTEM (ONLY ABSTRACTS NEED BE ON-LINE). IN THIS CASE NOTEBOOK ENTRIES WOULD BE THE RESULTS OF PRIOR ANALYSIS AND SUGGESTIONS FOR FURTHER EXPLORATION AND ANALYSIS.

3. ELECTRONIC BULLETIN BOARD.

MESSAGES WOULD BE "POSTED" IN ORDER TO LOCATE PEOPLE AND OTHER RESOURCES. ONCE THEY WERE LOCATED, THE BULK OF THE COMMUNICATION MIGHT TAKE PLACE OUTSIDE OF THE SYSTEM. MESSAGES COULD BE SELECTIVELY DISSEMINATED AND A BOOLEAN SEARCH FACILITY COULD BE PROVIDED. THE "BULLETIN BOARD" WOULD BE PURGED AS FUNCTION OF MESSAGE AGE, FREQUENCY OF REFERENCE, ETC.

EXAMPLES OF MESSAGES MIGHT INCLUDE: A PRECIS OF AN IDEA FOR A RESEARCH QUESTION OR HYPOTHESIS (SEEKING COLLABORATORS, COMMENTS, REFERENCES, ETC. - PARTICULARLY IF IT WERE IN A SUBJECT OUTSIDE OF ONE'S OWN SPECIALTY), A REQUEST FOR SPECIFIC INFORMATION OR SERVICES, AN OFFER OF SPECIFIC INFORMATION OR SERVICES, DISCUSSION OF A PARTICULAR BOOK OR PAPER, ETC. NOTE THAT THE RESULT OF A RESPONSE TO A BULLETIN BOARD MESSAGE MIGHT BE THE CREATION OF A CONFERENCE.

THIS IS THE SORT OF THING THAT IVAN ILLICH DISCUSSES IN HIS WRITING ON "CONVIVIAL TOOLS". PROJECT ONE IN SAN FRANCISCO AND SIMON FRASIER UNIVERSITY (VANCOUVER B.C.) HAVE EXPERIMENTED WITH THIS SORT OF SERVICE FOR THE GENERAL PUBLIC IN THEIR COMMUNITIES.

4. OPEN WORKING MEMOS.

I SPENT 18 MONTHS AT AN INSTITUTE IN SWEDEN, WHERE WE HAD A NUMBER OF PROCEDURES DESIGNED TO FACILITATE COLLABORATION. ONE WAS THE PRACTICE OF FREQUENTLY PREPARING MEMOS (TYPICALLY 1 OR 2 PAGES LONG) ON WHAT WE WERE READING, THINKING ABOUT AND WORKING ON. THESE INFORMAL MEMOS WERE FILED IN BINDERS ON A COMMON SHELF AND WE ALL BROWSED THRU EACH OTHER'S WHEN WE FELT LIKE IT. IF SUCH "MEMOS" WERE KEPT IN THE SYSTEM, YOU COULD KEEP TABS ON THE THINKING OF PEOPLE YOU WERE INTERESTED IN RATHER THAN SUBJECTS.

I'D LIKE TO HEAR MORE FROM ISELI AND OTHERS ON COLLABORATION SUPPORT AND OTHER SORTS OF APPLICATIONS IN WHICH SOME A PRIORI STRUCTURE CAN BE ASSUMED IN THE DATA BASE.

[3.22] Press TUE 8-APR-75 11:13AM

. . .

ANOTHER FACTOR THAT WOULD ENABLE FREER COLLABORATION WOULD BE A VALUE SHIFT AMONG SCIENTISTS AWAY FROM "WE ARE ALL COMPETING FOR SCARCE CREDIT AND GRANTS" TOWARD "WE ARE ALL UNSELFISH COLLABORATORS IN SEARCH OF KNOWLEDGE". THEODORE ROZSACK FEELS THAT WE ARE UNDERGOING SUCH A VALUE SHIFT NOW. I HAVE SOME DOUBTS. PERHAPS DIFFERENT VALUES IN SWEDEN HAD SOMETHING TO DO WITH THE VIABILITY OF COLLABORATION SUPPORTING PROCEDURES SUCH AS THE ONE I MENTIONED IN 3.20.

AT ANY RATE IT MIGHT BE WORTHWHILE IF WE ALL LOOKED AT OUR PERSONAL REASONS FOR CONTRIBUTING AND NOT CONTRIBUTING. IF WE "OR" THEM ALL TOGETHER, WE MIGHT GET SOME BEHAVIORAL INSIGHTS.

[56] Carlstedt TUE 8-APR-75 12:27PM

. . .

7. If a conference has a specific decision-making or problem-solving goal, then approved or adopted results might be distinguished from other material for purposes of easier identification and reference, and a special information structure, the PROJECT STATE, provided for this purpose. For example, if the conference is engaged in interactive design, the project state would consist of specifications of the design object (e.g. a system of computer software) at various levels of detail/ abstraction.

8. Because it is sometimes necessary to change decisions after they have been made, and because it is also sometimes useful to know what the former decisions were, a system might provide for the maintenance of a PROJECT HISTORY consisting of since-changed, -replaced and -updated decisions, specifications, or versions.

9. The project state and history are the sources of information composing REPORTS to the outside world--reports that might be retained in the system for future reference by participants but that might best be regarded and accessed neither as part of the project state nor project history.

[97] Carlstedt WED 7-MAY-75 4:02PM

Suggested levels:

1. Private. This isn't part of the transcript; I include it only for completeness. This consists of material that the participant is thinking about, formulating, and maybe composing and editing preparatory to being willing to have anyone read (or hear) it. I understand that some persons have no use for such a category and others rely on it quite heavily.

2. Interpersonal. This is almost like (1) except that this material will be shared with persons and participants whom one trusts will be most charitable, and the formulation may be shared with them, possibly the whole authorship.

3. This is really level 1 of the transcript. This is material that one presents "just to get an quick reaction", "just to run it up the flagpole;" this is the level at which brainstorming occurs. It is also the level at which all material is first submitted.

4. This is the level at which material resides when it has been accepted for serious discussion.

5. Proposals. This consists of material which has crystallized as a result of the discussion of material at level 4. It differs from that material primarily in the manner in which it is presented and updated. "Propose" means "submit as a candidate for final acceptance by the conference as an "official" result." Levels 5 and above presuppose that the conference is directed toward some goal.

6. Approved material. This is still subject to later amendment and editing during and by the conference.

7. Final reports. The only difference between this and (6) is that it is read-only.

[135] Press MON 12-MAY-75 4:28PM

<RE CARLSTEDT [97]>
IT WOULD BE INTERESTING TO TRY A CONFERENCE ORGANIZED ALONG THESE LINES. SOME CHAIRPERSON WOULD HAVE A SUBSTANTIAL, TIME CONSUMING TASK IN EDITING AND PARAPHRASING ENTRIES TO EVERYONE'S SATISFACTION PRIOR TO ADVANCING THEM TO THE NEXT LEVEL.

[160] Bretz TUE 13-MAY-75 5:08PM

<Keys: Taxonomy, Situations, Systems>.
I would like to propose that we accept Press's entry [76] in which he very adroitly summarized what we had discussed in the last meeting, as at least level 4, possibly level 5 material. (I see that I have in the same damn sentence also suggested that we raise Carlstedt's six levels to level 4 or 5. My confusion as to which of these levels (see Carlstedt [97]) indicates that I am not content to separate

these two intermediate levels. Perhaps they should be combined, simplifying the hierarchy down to a set of five levels in all. All of which proves that unless we do this we better leave the level taxonomy in level 4 for the nonce. Is this a meta-meta-comment?)

[207] Carlstedt FRI 23-MAY-75 2:37PM

. . .

Maybe a collaboration that requires a highly-structured representation of the object of collaboration ("project state") can be partitioned into the relatively informal part (conferencing) and the formal part (updating the project state). Levels 6 & 7 defined in [97] might be a formal representation of the project state. Collaboration then, as via a shared data base, does not imply any (levels of) conferencing.

Two other entries conclude this section.

[47] Carlisle(Chrmn) MON 24-MAR-75 1:07PM

Note in previous entry there was joint authorship. This could be a serious problem in legal, bargaining, or political conferencing. In addition to the multiple authorship capability, there is the possibility of giving the floor to a group or coalition.

[6.2] Press TUE 8-APR-75 11:01AM

HOW ABOUT CONDUCTING A SURVEY TO COMPILE A CATALOG OF THE WAYS IN WHICH PEOPLE HAVE USED THE ARPA NETWORK TO FACILITATE THEIR COLLABORATION.

SHORTYPE
Edited by Rudy Bretz

[143] Bretz TUE 13-MAY-75 2:11PM

<Cued by reading Mann: "Why are things so bad for the computer-naive user">
Computers will not become widely usable until ordinary people are able to send messages to them in ordinary language. This is undeniable, but will surely cost a lot of R&D before it is accomplished. In the meanwhile I think I have an idea of how communication via teletype, and FORUM or CONFER kinds of systems may be speeded up. Voice, the ideal, the "one significant factor" in the Chapanis-Ochsman experiments described in the Sci. Am. article, can carry words at the rate of 175 or so per minute. What would you think of a system that could input close to twice as many words as this per minute, directly in digital form? Baloney? Maybe it is. Maybe it isn't. Give it a good long jaundiced look and tell me the worst. One of the courses being taught by MRC-TV during the last year was a subject called "STENOSCRIPT - ABC Shorthand" This is an alternative to the Gregg system, and I guess several other shorthand systems, but Stenoscript uses almost entirely alphabetical characters. Only a few shorthand symbols are used. The time that it generally takes to learn Stenoscript is only 7 hours for the theory, plus another twenty or so of practice to build up speed and accuracy. This is a skill that anyone could put to very good use. I was sold on it and proceeded to spend the requisite 7 hours, but then, well, you know how those things are. Somehow I never did get to the other 20. Smhw i n di gt t - -r 20. (Those dashes indicate certain shorthand symbols) But I am getting ahead of myself.

Instead of the usual writing speed, (longhand), of 35-40 words per minute, a competent stenoscript writer can knock off the words at more like 100 to 120 wpm. It's a difference of about 3 to 1.

I looked in my Stenoscript book and found that the national headquarters of STENOSCRIPT ABC Shorthand is right here in West Los Angeles, so I stopped by. Did anybody ever work out a way to TYPE stenoscript, says I. Well, sometimes we type it but we have to fill in the shorthand symbols by hand. And nobody ever tried to work out an adaptation so these symbols could be indicated by other typewriter symbols? No, but I suppose it could be done.

Now I have to ask you guys a question. Stenoscript operates by a strict series of rules. There are many cases in Stenoscript when the same symbol or set of symbols mean different things. small letter i for example, stands for I, it, is, in and maybe a few other things. It's a long time since I studied those 7 hours. However, there is never any problem in transcribing this stuff, even they say as long as six months or a year after it was first recorded, since the context of the sentence makes it perfectly clear what the symbol stands for in each case. NOW - wouldn't it be possible - possible I say, to program a computer with the requisite rules and contextual relationships whatever they are called, so that the computer could transcribe your shorthand back for anybody to read.? If all this is possible, and IF there is as great a saving in time over typing as there is over handwriting, i.e., if an input rate of 300 or so wpm could be achieved, and IF a computer could be programmed to transcribe the stuff, maybe this is good for two purposes : 1) A transitional method of speeding up man-machine interface, and interactive systems such as confer, while we are waiting for the R and D fellows to work something out for regular voice, and 2) A method to use even after computers can transcribe voice, when voice is too slow.

It would be interesting to determine what kind of a typing system could be devised for Stenoscript, how long it would take different types of people to learn it, such as touch-typists vs hunt-and-peck specialists, vs totally inexperienced typists.

Would print-outs always have to be in full English, or could Stenoscript typists read each other's stuff without difficulty ? How fast could a good stenotyper read back his own shorthand ? Someone else's?

QUESTION : do people who write shorthand find they use it freely for draft writing of reports, notes to themselves, etc, - uses which are not the transcribing of english words that someone gives them, but the direct expression of their own thoughts? I have a feeling the answer to this is yes. If not, it would be interesting to find out why not.

FINAL CONCLUDING CAVEAT : Stenoscript ABC Shorthand is a proprietary system. Anyone can buy the book and anyone can teach the system with the book, but adapting the system to electronic reproduction brings up the legal question of proprietary rights and copyrights. All I can say, the man says, is write me up a proposal of what you want to do, when you get ready to do it, and I will show it to our legal beagles and see what they say.

[149] Levin TUE 13-MAY-75 3:10PM

<RE Bretz [143]>:
Depends on the complexity of the contextual rules. (Not a very useful answer). We should look at this system to see what the possibilities are - if it can be done it might be very nice, especially when combined with "word completion" (are all the abbreviations initial letters? If so, and if we could build a system to figure out which was meant from context, then the system could echo back the full word, so that even the typer's screen would look like real English. Also, consider that a person could "ease" into this system, starting out typing all the words, and "discovering" the abbreviations as he goes (analogous to the way we discover abbreviations to TENEX commands). With the word completion, the user would get immediate feedback on whether he was correct and could immediately correct a misinterpretation.

One more thought. Many computer systems have ways to enter special symbols (TENEX has control characters that can be interpreted by the program in any way you want. So the use of special symbols need not be a barrier, especially with the word completion (my previous comment), these would be echoed back as the word they are supposed to stand for.

[168] Levin THU 15-MAY-75 11:52AM

<RE:Shorthand input notion (Bretz [143], Levin [149,150]>
Acquisition of it by users: The users would always have the free alternative to use the shorthand or not. Jim Moore suggested a neat way to lead users into this system without any formal training. When each word is typed in to the system, the system checks to see if there are any shorthand abbreviations for the word or some part. If there are, then this abbreviation appears after the word (in brackets). However, if the user later types only the abbreviation, only the full word appears.

Define capability: this system should also allow the user to define his own abbreviations for words he commonly uses that have no abbreviations.

[182] Crocker THU 15-MAY-75 7:30PM

<Shorthand: Comments on [168]>
Calvin's TCTALK has a shorthand facility. A variant of XED also has a facility, intended to generate BLISS reserved words. The system is designed to allow the user to hit function keys on the HP2640 and have BLISS reserved words inserted into the input stream.

[171] Press THU 15-MAY-75 12:16PM

<RE: BRETZ (143), LEVIN (149) SHORTHAND.>
THIS REALLY SOUNDS INTERESTING! NOT ONLY RE TELECONFERENCING BUT AS AN INPUT MODE ON ANY TEXT EDITING OR OTHER WORD PROCESSING SYSTEM. IF STENOSCRIPT ISN'T IDEAL FOR COMPUTER PROCESSING, WHY NOT INVENT A NEW SET OF UNAMBIGUOUS TEXT-COMPRESSION RULES THAT IS?

IN ADDITION TO (OR INSTEAD OF) A STANDARD SET OF TEXT COMPRESSION RULES, A SYSTEM COULD MAINTAIN A PERSONAL FILE OF TEXT-COMPRESSION RULES AS PART OF EACH USER'S "PROFILE". THE USER WOULD NEED A LANGUAGE (BNF-LIKE) IN WHICH TO SPECIFY NEW TEXT-COMPRESSION RULES.

WHAT DOES THE LANGUAGE (AND MACHINE) OF COURT REPORTERS LOOK LIKE? TO WHAT EXTENT ARE TEXT-COMPRESSION AIDS AVAILABLE IN CURRENT WORD-PROCESSING SYSTEMS? I VOTE TO PUT THIS TOPIC ON THE NEXT FACE-TO-FACE AGENDA.

[175] Levin THU 15-MAY-75 12:44PM

<RE: Shorthand text input responding to Press [171]>
I agree that a totally new system should be designed for the following reasons:

1) Context-sensitive abbreviation won't go with present systems

2) The abbreviations in Stenoscript are designed to be phonetic (capture the dominant sounds of the words). What we want are mnemonic abbreviations that are easy to remember.

[199] Levin TUE 20-MAY-75 3:57PM

Use of Abbreviations in Man-Machine Interaction
A Proposal for an ABBR SYSTEM

by J.A. Levin and J.A. Moore
with suggestions from R. Bretz

One of the major complaints about using computers by non-expert typists is the slowness involved. There are a number of shorthand systems that speed up writing by factors of three or more. These systems work by assigning single symbols to sets of characters, and by leaving out characters. Our studies of dialogues conducted through text input to computer terminals indicate that people generally do a similar kind of thing. They use lots of abbreviations in their inputs.

A third consideration is the usefulness of the TENEX mechanism of Command Completion. After entering a minimal portion of a command, the user can type the escape key to get the system to complete the command.

All of these considerations support the concept of a text input system that increases the user's speed by handling abbreviations. Following is a proposal of how such a system might look.

1. This system (called ABBR) could serve as a "smart" window between the user and the normal computer system. It would take the users input character by character, but would pass it on only a word at a time (word boundaries to be space, tab, cr, esc,). (Characters would be displayed to the user one at a time.) The system should be designed so that if the user doesn't use abbreviations, he can be unaware of the existence of the system.

2. There would be some set of predefined abbreviations available to the user. There are at least three levels for these: 1) general abbreviations 2) topic-specific abbreviations 3) user-specific abbreviations

3. When the user types in an abbreviation, he terminates it by hitting the SLASH key (/). The ABBR system takes the characters back to a word delimiter (space, tab, cr) and checks to see if it knows about this abbreviation. If not, it rings the bell and waits for further action. Otherwise, it augments and/or modifies the abbreviation to the full word for which it is an abbreviation. If the abbr is composed of the first letters of the word, then the system just completes it. Otherwise, the system indicates a deletion of the abbreviation and retypes the whole word (slightly messy on hard copy).

4. The word is then sent to the system as if it had been typed in. The user can now modify it in any ways that he could if he had inputted it. In particular, he can delete the ending and add a suffix. If the wrong word were substituted, the user could delete it with the word-delete command.

5. The user should be able to define his own abbreviations. With this in mind, all the single letters should be left for user definition. (An argument for this is also the fact that many single letters act as abbreviations for many different words). Also, user-defined abbreviations should override topic-specific ones, which should override general ones. The user should be able to define "on-line". That is, after using an abbreviation that the system doesn't know (as indicated by a bell), the user should at this point be able to give it a definition. (For example, by typing "[= word]".

6. As a way for users to learn the available abbreviations, there should be a mode which takes each normal word input and checks whether there is an abbreviation for it. If so, the system should display this abbreviation following the word in square brackets. (Note: this may interface nicely with a real time spelling checker and corrector.)

   Example abbreviations

   General

abs	absolute
ack	acknowledge
conf	conference

dup	duplicate
doz	dozen
fwd	forward
intl	international
govt	government
msg	message
ref	reference
qt	quiet
secy	secretary
thou	thousand
supt	superintendent
vocab	vocabulary
wo	without
xfer	transfer
xmpl	example
1st	first
122nd	one hundred twenty second

(note: conversion of any numerics written as numbers to written as words could be handled)

Topic-specific (TENEX)

conn	connect
del	delete
exp	expunge
GA	go ahead
mess	message
msg	The MSG Message Handling System
ref	refuse
und	undelete
wh	where
10	PDP-10
10x	TENEX

User-specific (JAL)

BC	Natural Language Seminar, Cambridge, Mass, June, 1975
HP	Hewlett-Packard 2640A Terminal
ISI	Information Sciences Institute
JAM	James A. Moore
N&S	Newell & Simon, 1972
p	proposal
ref	referential
s	system
tc	teleconferencing
TS	Teleconferencing Seminar

General notes: There will prob not be abbreviations for the most common words, because these are so short that there is little gain. (Of the twenty most frequent English words, two are 1 letter, eleven are 2 letter, five are 3 letter, and two are four).

Note that "ref" has a different meaning in each category. Replacement by "referential" (the most specific meaning) should occur.

The user should be able to specify when to change the set of topic specific abbreviations to use. This should also be specifiable programatically (running a program can change the set of topic specific abbreviations).

[203] Press THU 22-MAY-75 3:00PM

<RE: LEVIN (199)>
HOW ABOUT BEING ABLE TO EVOKE AN "ABBREVIATION SUGGESTER" WHICH SCANS A FILE (EG THE CURRENT CONFERENCE TEXT) AND SUGGESTS STRINGS FOR ABBREVIATION. CRITERIA FOR SUGGESTING WOULD BE A. FREQUENCY OF OCCURRENCE AND B. LENGTH. ONE COULD ALSO USE THE ABBREVIATION-SUGGESTER ON A SUBSET OF A TEXT FILE (EG JUST HIS OWN ENTRIES IN THIS CONFER (BY TYING IT TO "REVIEW")) IN ORDER TO ASSIST IN THE PREPARATION OF SPECIFIC ABBREVIATION SETS. HOW ABOUT DESIGNING AN EXPERIMENT AROUND AN ABBREVIATION FACILITY SUCH AS THIS?

WHILE I THINK THAT ABBREVIATION SYSTEMS SUCH AS ARE DISCUSSED ABOVE ARE INTERESTING AND MIGHT BE FUN TO EXPERIMENT WITH AND EVALUATE, I AM BOTHERED BY THE SPECIFICITY OF SIMPLE STRING REWRITING RULES SUCH AS [COM=COMMUNICATION]. IT WOULD BE MORE POWERFUL IF WE COULD COME UP WITH COMPRESSION RULES WHICH COULD APPLY TO CLASSES OF STRINGS, PERHAPS BASED ON SOUND OR LETTER PATTERNS. IT SEEMS THAT CURRENT WRITTEN SHORTHAND SYSTEMS OR COURT REPORTING MACHINES MIGHT OFFER SOME CLUES. EVEN IF IT REQUIRED 20 HOURS TO ACQUIRE SKILL WITH SUCH A SYSTEM, IT WOULD BE JUSTIFIED FOR THE FREQUENT USER OF TEXT PROCESSING SYSTEMS.

[208] Carlstedt FRI 23-MAY-75 2:50PM

<Shorthand input; Text compression/expansion; Abbreviations>
1. Abbreviations a la Levin & Moore [199] vs. shorthand/compression (Press [171,204]): The latter is a level above the former in terms of complexity and reduction factor. They probably shouldn't even be compared. It is more than just a matter of representing the mapping as data (glossaries of abbreviations) vs. procedure (compression rules), that's for sure. (Standard word-compression rules, i.e. algorithm abbreviation, is not a consideration, since it lacks an inverse and we are primarily interested in expansion of reduced input rather than the converse.) Interpretation of true shorthand such as Gregg or Stenoscript or whatever else they use nowadays would, I am betting, require a good bit of built-in linguistic knowledge and encounter complex problems of context-dependent ambiguity such as the natural-language translation people face, or am I exaggerating. That doesn't imply that secretaries or court reporters can't easily and accurately read each other's stuff. Compression is trivial by almost any rules you can imagine, but not its inverse.

By the way, Linda Tisnado and Debe Hays said about Shorthand that (1) it is much harder to read one's own than to write it; (2) it becomes increasingly difficult with time, because one forgets what the letter was about!; and (3) it is impossible for secretaries to read each other's, because it is so sensitive to individual style of hand. This comment only because someone was wondering, and because it's a dandy example of high expansion/ reduction complexity ratio.

2. Defining abbreviations; contexts; etc.: Like choice of words or terminology itself, choice of abbreviations changes with context, as noted by Levin & Moore[199]. One could conceive of a raft of contexts, each defined and represented by a glossary of abbrevs particular to it, and with some defined statisticially as subsets of others. Dynamically, one might specify his abbreviation "environment" by giving a list of such contexts in, say, general-to-particular order, to be searched in opposite order, just as identifiers are bound in a block-structured programming language. Examples of contexts are limitless. Right now we're in <USA common,TC, TENEX,Jim Carlstedt>, or would be if a good ABBR system were interposed here. Since it seems easy to implement (e.g. as a TENEX ephemeron?) I assume you guys are working on it!

On the oth hnd, mbe we dnt evn nd an ABBR sys at all. To beg wth, I can let my inpts go in unprcsd & hope the sys is implid by the tm anyn gts arnd to rdg thm. But if not, mbe they'll get so usd to rdg this stff I wnt evn nd the sys evr! In fct, my Aunt Nancy usd to writ vry mch in ths styl, & evryn cld rd it ok. Ths brngs up th qstn: why dnt ppl abbrv mor? why arnt thr abbrevs fr mr cmn wrds? Cld it be tht th svngs tim & spc arnt wrth th sml efft reqd to lrn th abbrvs? Or is th prblm mr dffclt, hvng to do wth sch thngs as optml redndcy, etc.?

[214] Anonymous MON 26-MAY-75 4:29PM

<RE CARLSTEDT 211.>
D YO CSE I RT O W IT NECESSARY G ER?? I KJ DRT! W UG ET AND FG T ECX B.

[215] Anonymous MON 26-MAY-75 7:35PM

@*7&#"7!!!! (AND YOU HAD BETTER BELIEVE IT.)

[216] Anonymous TUE 27-MAY-75 4:09PM

?

[217] Bretz WED 28-MAY-75 5:32PM

< This is re: recent entries by Levin, Carlstedt, Press concerning ABBR>. The gist of my entry is contained in the cryptic form below, which I suggest that we call "NANCY" after Jim Carlstedt's aunt. It follows no rules. th frmltn f a dknry f abbrs su s LVN + MR bgn a th nd f thr ntry f M 20cd b gtly fclttd, i sms t m, f sm f th mthds f stnskrp wr adpd (eg us f sngl cnsnts t rprsnt hi frqncy wds) At Lst i cd sv th trbl f frmltg a list f thsnds f wds + thr abbrs f th cmptr t ck. i wd smply b nsry t ck a fw rls + cnstk ea abbr o th spt. Ths wd mk th sstm adpb t a wdr rng f jrgn, chnjg slng, frn trms + w adpttn, frn lngjs.

The trouble with Nancy is that however readable it may be, it contains more characters than necessary and may be full of ambiguities. Furthermore, the computr wd need a lng lst of wrds n thr abbrs - mybe 1000s in order to transcribe it. A system that works by a set of rules could do without this list.

The example of Nancy above reduced the character count for the entire thing written out in full,

from 510 down to 285, about 56% as many. (exclusive of punctuation in each case.) The same paragraph written in Stenoscript requires 231 characters and symbols, about 45% of full English. However, Stenoscript is designed to be handwritten; to adapt it to typing I have made some changes, and these brought the count up again to 250, still only 49% of full English.

The character count is not the primary consideration, however, primary is typing time. There doesn't seem to be a good way of testing that, even roughly, without first learning the system.

In adapting Stenoscript to shorthand typing, only those characters that are most quickly typed by most typists are used. This means that a shorthand typing system should, as far as possible, use only the lower case letters. I am assuming that the extra step of shifting will slow down many people, and many have not learned to strike numbers and other symbols by touch. Certainly most people who have learned touch-typing at all are best on the letters. Therefore two lower-case letters have been used to replace capital letters in Stenoscript whenever possible. Thus 8 of the 11 capital letters used in stenoscript are eliminated. Capitals I, K and O have been retained because there seemed to be no satisfactory one- or two-letter alternate. Experimentation may prove, however, that a capital letter is actually faster to produce than two lower-case letters, although I tend to doubt it.

There are only two shorthand symbols used in Stenoscript : the dash, and the slash. Both of these can be made on the ASCII keyboard without going off the basic thirty keys, but the dash requires a shift to upper case. To reduce ambiguity as much as possible at the outset, the dash, which represents a large number of letter combinations in Stenoscript, was divided up in shorthand typing between several two-letter combos. The slash, representing the rt and rd sounds, was replaced by the typed slash. The alternative is to use rd or rt or both to reduce ambiguity. I am guessing right now that typing the slash would be fastest, at least after a little practice. Certainly it would be faster than typing "rt", both of which characters have to be hit by the same finger. In general, I am guessing that 2-letter combinations struck by two different fingers would be faster than combos struck by the same finger.

AMBIGUITIES IN THE SUGGESTED SHORTHAND TYPING LEXICON

Since the main problem in adapting Stenoscript to shorthand typing is handling the ambiguities of meaning, I have tried to list all of these together as an indication of the extent of the problem. The presence (or absence) of a space on one or both sides of a letter is indicated in the list below by space symbols ( ). A space on each side of a letter indicates that it occurs alone; before it, that it starts an abbreviation, after, that it ends one; no spaces, that it occurs in the middle of an abbreviation.

Abbreviation	Words or syllables represented
a	a, an
	a-, an-, ad-
	-a, -an, -ad
b	be, being, been, buy, by, bye, but
	be-, by-
	-be, -by, -bye
c	see, seen, seeing
d	do, dew, due, did, done, doing, dear (as in

business letters)

	dis-, des-
e	he, me
g	go, goes, gone, going
	-ong, -ing, -ang
h	had, have, having
i	it, is, if, I
j	-tion, -sion
k	can, come, came, coming
	com-, con-
K	contr-, counter-
l	well, will, all
m	my, am, many, him
n	in, no, know, neither, nor, not, none, and
o	or, so, on, owe
q	-ank, -inc, -ink
t	at, to
v	of, very
w	we, were, who, whom
x	-ous, -ial, -ious
y	you, your, yours
	-oi, -ry
z	as, was, his, she
/	-rt, -rd
ac	accompany, accomplish
ag	again, against
bg	begin, began, begun, beginning
bl	-ible, -able
ev	every, even, ever
md	mand-, mend-
	-mand, -mend, -mond
	-mand-, -mend-, -mond-
of	off, often

In addition to these one- and two-letter combinations, there are ten 2-letter brief forms of common complex words that are memorized in learning Stenoscript. These are ambiguous in that in Stenoscript they represent all forms of a word: noun, verb, adj., adv. etc. It might be easiest at first to forget these ambiguities, using the abbreviations to represent only the forms given in a list, and expecting the user to indicate the other forms by the appropriate abbreviations for the suffixes.

There are 136 phrases of 2, 3 and 4 words that can be run together in Stenoscript for added speed. The following two of these are ambiguous:

tm	to my, to meet
tpa	to pay, to place

[224] Crocker SAT 31-MAY-75 4:54PM

<Shorthand, Abbreviation, Input facilitation>
After reading the entries on the topic, I began to conclude that any system worth using would be too complex to learn. If I am going to go to the trouble of learning it, I might as well just learn how to type quickly. The system(s) that are being suggested do not reduce to a (very) few simple rules and I doubt that they could be used without their first becoming "habits." That implies a huge start-up cost.

Unfortunately, I very much agree with the goal of facilitating the process of making entries, so I can't simply stop with the above concern. The following is an attempt at describing an alternative mechanism.

The mechanism I have in mind is primarily a spelling corrector. It needs to be more sophisticated than SPELL, but probably does not have to have natural language processing capabilities.

(A side point: one of the descriptions of the shorthand facility implied that the facility would evaluate every word and respond immediately. This would interrupt the continuity of typing and probably limit the input bandwidth considerably. I therefore suggest that any such facility postprocess the entry, after it is typed and before it is submitted.)

In addition to being able to perform normal spelling correction, this facility could know about a special character which flags a word as abbreviated. In such a case, it will give precedence to word expansion, rather than to contraction, or to character transposition. It would also allow MORE character deletions than it otherwise might. I suppose we had best have it understand word completion too. ("sug" would hopefully then lead to the alternatives "suggest" and "suggestions".)

We would have to be careful about designing the interface to this facility so that interacting with it does not take too much time. For example, an improvement to SPELL would be to have a numbered list of words packed onto one line, rather than print one word at a time, pausing for a user go-ahead/accept.

The Corrector would need to know about probabilities of particular misspellings/abbreviations and hopefully would learn individual user's idiosyncrasies, over time. It is important, tho, that the user NOT have to wait before being able to make entries and NOT have to learn what abbreviations are best. (This will probably happen, but the Corrector should work to limit the need for such learning.)

I sent Bill Mann a number of suggestions for changes to SPELL and will try to retrieve the note to see what other ideas would be useful for this situation.

[228] Crocker SUN 1-JUN-75 3:00PM

Following is the entry concerning a suggestion I made to Bill Mann, for modifying SPELL. A point in the note that may not be clear concerns how SPELL asks you about what correct word it should use, out of a list of possibles. If the list contains only one entry, Spell simply types it, along with the error indication. If the list has multiple entries, Spell prompts you one entry at a time (yuch!) and the list is not very cleverly ordered. All of the one-character replacements, and then all of the character transpositions, and then all of the one-character deletions, etc. (I may have the particular sequence of sets wrong, but you get the idea. The suggestion was as follows:

Have 2 dictionaries. The smaller one is of frequently occurring words that are automatically accepted when encountered (as with the current dictionary). The larger one has virtually all the words in the world (well, sort of). (Yet) a third list would be of all the common typos we can come up with. This list would be formatted to include the correct spelling for the word.

The smaller dictionary could be augmented by a personal dictionary of the words commonly used by the particular typist. It could be trained over time. The typo list could be expanded to include "typos" that were common abbreviations, I also envision a personal extension for this list.

When a word is encountered that is not on the small list, SPELL first looks to see if the source word is a common typo. It then checks to see if it is on the extended dictionary. It then goes through its permutation rules, checking possibles against the short and the long dictionaries. The result is a list of possibles, as happens now, which would hopefully be ordered in a more reasonable way (e.g., 'the' would be first on the list when 'te' is encountered, since it is a common typo).

[230] Carlstedt MON 2-JUN-75 12:02PM

<RE: Crocker[224-226,228-229]; Shorthand; Abbreviations; Spelling corrector; Typing speed>
It's clear that any scheme requiring much learning on the part of its human users isn't feasible unless the payoff seems sufficiently high. The questions originally raised by Bretz [143] were, "How hard would something like Stenoscript be to learn?" and "How much would one's typing speed likely be increased?" The motivation was to allow the use of keyboard for realtime conference input, which seems to mean that typing speed must approximate the word rate of speech. It is doubtful to me also, that either at the relatively heavy-learning, potentially high-payoff end of the spectrum represented by shorthand schemes, or the relatively low-learning, relatively low payoff end represented by abbreviations, that we're making much economic sense. As for a spelling corrector, I can see the use for it in an editorial role, but not as an assist to typing speed at all.

Maybe we'll learn how to teach the machine how to understand what we're trying to say in spite of many spelling & grammatical mistakes and personal abbreviations and other idiosyncrasies we introduce in our haste, so it can pass on our messages to others in more understandable form. And maybe not. And maybe there are long-term conferencing situations justifying the learning of some kind of speedtyping language. I personally am not very interested in the subject, because my conferencing interests lie more on the non-real-time side of the fence, where typing speed isn't critical.

It's quite irrelevant, but I still wonder why people, including myself, haven't come to adopt and use more common abbreviations in written communications, and accept them as legitimate forms. Why do editors feel compelled, for example, to replace "27" with "twenty-seven", "Nov" with "November", etc.? I suspect that the reason has something to do with the reason that the white shirt and tie is still required dress in some establishments. Too much informality is to be shunned.

EPILOGUE (Bretz 23-JUN-76)

At the time of editing, Dave Crocker called my attention to the fact that even as our discussion was going on, two researchers at the IBM Research Center at Yorktown Heights N Y had already conducted an experiment to determine how practical such an input method might be. A report appeared in the April 1975 issue of Human Factors entitled "Short-type: A Behavioral Analysis of Typing and Text Entry" by James W. Schoonard and Stephen J. Boies. Their abstract at the start of the article reads as follows:

> "This study evaluated a typing task which incorporated an encoding operation. This technique, called 'short-type', takes advantage of word repetition to reduce the number of keystrokes required to transcribe documents. Four typists were taught a list of abbreviations for frequently occurring words. Their subsequent task was to enter documents into a computer via a standard keyboard. Each time a word from the training list was detected, the corresponding abbreviation was to be typed in its place. It was found that: (1) over 93% of the to-be-abbreviated words were detected by the typists; (2) the error rate in selecting and typing abbreviations was no greater than the error rate in typing words which were not abbreviated; and (3) the substitution process did not adversely affect the keystroke rate. It was concluded that short-type is a practical technique in improving typing performance".

Only 130 different words were abbreviated, using a somewhat more arbitrary abbreviation method than STENOSCRIPT. Only those words having the largest product of word length and word frequency were selected from an analysis of three scientific papers. Computer assisted drill was used in training the four typists, who came from a temporary employment agency. The typists each worked approximately 100 hours, although another experiment was also involved at the same time, and the time also included evaluations of subject performance. Unfortunately the time required for training was not reported as a separate figure. Since the unit of abbreviation was exclusively the word, it might be guessed that additional vocabulary would require additional training time in rough proportion, while a system in which the unit is the phoneme would have a limited set of abbreviations to learn; skill in recall and application of these being the major learning task. If the IBM typists studied for (say) 30 hours to learn to apply only 130 abbreviations, this compares unfavorably with the STENOSCRIPT claim of 30 hours to learn to apply abbreviations to ALL commonly used words. The following two paragraphs (Figure 1 of the Human Factors article) give an example of a short paragraph as entered with short forms and the corresponding text after computer substitution of long forms.

> " This study investigated h relationship between y-m parameters (h drn,

> n, u sq of y fns), rd while #Os determined whether two ps were h same or dft, u h judged similarity of these ps.
>
> This study investigated the relationship between eye-movement parameters (the duration, number and sequence of eye fixations), recorded while Os determined whether two patterns were the same or different, and the judged similarity of these patterns".

It will be noted that in this system h is the short form for "the", u for "and" and y for "eye", which seem more arbitrary to me than t, a and i. Even n as a short form for "and" would seem more natural and thus easier to learn. The abbreviation of "number" with n and "fixations" with fns are further examples of this. Each abbreviation must be learned by rote memory; it is not possible to abbreviate a new word in entering, or for the computer to expand an abbreviation that is not in its dictionary. (STENOSCRIPT short form for number would be nmbr or simply #, and for fixation would be fxj).

The article stated twice that "The unit of abbreviation probably should never be smaller than a word", although why this assumption was made was not explained.

In their review of relevant literature the authors report that studies by Tirrell and Klemmer (IBM RC-775, 1962) showed that: "In a task similar to key-punching... subjects using abbreviations transcribed input at about 160% of the normal rate". In a typing task the improvement was only about 12 to 15 percent. Presumably this was "word rate", not "keystroke rate"; word rate would be expected to rise if keystrokes per word are reduced.

The Schoonard and Boies study concluded only that there were no negative consequences for performance due to the use of abbreviations. Particularly significant, as far as our own thinking is concerned, is that there was no slowing of the keystroke rate. Thus it could be implied, if other factors remain the same, that a reduction in character count to 49% of normal English (as suggested in entry [217])would result in a similar reduction in keystrokes, and any typist, whether touch expert, hunt-and-peck specialist, or hunt-and-hunt-and peck beginner, after 30 or 40 hours of training, would be able to input shortype twice as fast as ordinary English. Further studies are needed, however, to determine what other factors might enter the equation to either increase or reduce the advantage of shortype. If the basic unit for abbreviation is to be the phoneme or the syllable rather than the word, some elaborate development work must be done to reduce or remove the ambiguities listed in entry [217]. Since this may require reference to contextual elements, it may depend in large part on the same kinds of logic as speech recognition.

REVIEWS OF LITERATURE ON TELECONFERENCING

Edited by Jim Carlisle

The literature on teleconferencing is substantial. Prior to this seminar, a bibliography of over 100 relevant items was compiled. In order to minimize the amount of reading for each student taking the seminar, we used the online conference as an electronic book review repository. Participants were encouraged to select, study and report on two papers or books every two weeks. Like many great ideas, this one met with immediate enthusiasm and acceptance. Eleven reviews were added to the conference within the first week. Only five more were submitted in the following month, and three trickled in during the last two months of the seminar. Several of the reviews brought to participants' attention new papers which appeared in professional journals during the seminar.

There was apparently little motivation for most of the participants to report on readings at the rate of one per week. Had the participants all been graduate students, instead of full-time employed professionals, it is likely that more reporting would have been done. Over one-third of the literature reviews were submitted by the one participant who was taking the seminar as a student, for credit. The volume of the conference transcript alone required more reading and led to more written contribution than many participants had anticipated. Surprisingly, there was little interaction with respect to the literature reviews. In some cases, several people reviewed the same article, but there was seldom a reaction to someone's review per se.

Papers and books reviewed fell, for the most part, under the first topic of the seminar, "How is teleconferencing currently being used and by whom?" Of the 100 or so items in the original bibliography, seventeen were reviewed in the conference transcript.

[8] DCrocker FRI 21-FEB-75 12:41PM

Delaney, Douglas "A Nerve Centre for Canadian Telecommunications," TELESIS, Bell Northern Research, June 1974.

<Keys: Network Control, Data Communications>
Brief description of trans-Canada communications capabilities and of their control facilities.

Facilities: microwave and satellite. Functional networks are voice, "Multicom" data, Message-switched data (MSDS) for low speed, and "Dataroute" digital transmission. The latter is touted as the world's only commercial digital network.

Control: Provincial Service Coordination Centres oversee operation for each province and report to the national Service Coordination Centre, which oversees and apparently can control the entire system. The SCC performs typical network control functions; it has a spiffy display board, along with teletype interconnection of the various centres.

[9] DCrocker FRI 21-FEB-75 12:41PM

Davies, Mark and Bill Shore, "Computer mediated interaction - computer conferencing and beyond"

<Keys: Computer Conferencing, Conferencing Mode(s) Issues>
Overview of factors involved in conferencing through different media. Considers computer-mediation as the primary mechanism for future "wired cities".

Describes Bell Canada TV conference system: Total of 9 people, split between 2 locations. 9-seat conference table at each. One full-view, 3 one-third view and one overhead (for graphics display) cameras at each; one TV display. Cameras are voice switched (like the British Post Office system) so that the speaker's sub-group is displayed. If no one is talking, the wide-angle full-view camera switches in. Manual over-ride is provided. Poor video and audio.

Reference to computer-based systems include Forum, NLS (at SRI), and Party Line (Turoff). Bell-Northern is currently using Turoff's system. (Tho I understand they also have been using an NLS slot at Office-1).

[10] Carlstedt FRI 21-FEB-75 2:02PM

Murdock, John W. (Battelle Columbus Labs) "Dynamic texts," Theory Into Practice 12,3(73.6) 179-183

This is a proposal for making college course textbooks more flexible by collecting into one information bank "all the information that would be found in all of the textbooks needed for a college curriculum in a given field, plus the supporting fields... "texts" would be organized collections of subsets...[each] scoped exactly as a professor wanted it and at the academic level appropriate for his class...[and] interlocked by vocabulary control to the information bank... This ability to browse through the information bank would easily provide students with a method of getting information at the exact level needed."

The above pretty much captures the magical flavor and low technical content of this article. The rest is motivational (traditional textbooks aren't conducive to optimal learning) and economic (how the information would be bought and sold). The relationship to TC is marginal.

[11] Carlstedt FRI 21-FEB-75 2:19PM

Renner, Rod L.; Bechtold, Robert M.; Clark, Charles W.; Marbray, David O.; Wynn, Ronald L.; Goldstein, Nancy H. (OEP) "EMISARI: A management information system designed to aid and involve people," Executive Office of the President, Office of Emergency Preparedness TM-230 73.2 42p NTIS: PB-224 852 Also, Proc. COINS 72.

Because of its designers' view of it I thought this description of EMISARI might be worth including in our bibliography.

The overall approach may be viewed as a greatly modernized version of the classic telephone party line, using a computer to organize, selectively sort, and store-and-forward a constant flow

of statistics, messages, estimates, reference materials, guidelines, notices, and other informational accoutrements of a modern management operation." (From author abstract) First designed by Turoff, this system was developed in a hurry (to share wage & price freeze information) and is small (7000 lines of XBASIC) but it has some interesting features.

[12] Levin FRI 21-FEB-75 8:32PM

Kupperman, R.H., Wilcox, R.H., ← Smith, H. A. "Crisis Management: Some Opportunities," SCIENCE, vol. 187, 404-410 (Feb. 1975)

Overview: Teleconferencing systems with embedded computer models of the problem domain may provide crisis managers with more effective ways to cope with today's problems.

Features of a crisis: Urgency: "...concern that problems will become worse in the absence of action." Uncertainty: lack of relevant accurate information Conflict: need to set priorities among ill specified goals

They select international relations as their particular crisis domain of interest (Kupperman & Wilcox are with the US Arms Control and Disarmament Agency).

Proposed system: FORUM like conferencing framework with embedded dynamic models of the problem domain.

-- Oriented toward direct use by "non computer people":
let the policy makers themselves run the models,
within the teleconferencing system

-- "Menu" approach: users presented with a sequence of
option lists from which they can select. (two from
column A and two from column B).
-- Use of dynamic models 1) to express one's position (both values
and proposed actions), 2) to convey one's position
to others, and 3) to determine the effect of one's proposed actions.

Possible uses: economic negotiations, political crisis handling

Proposed project: famine relief planning
They go into detail how this project could be started as a regular conference using teleconferencing as a convenience, developing the system until it can be used as a central medium for the management of famine relief.

Important references: Kupperman & Wilcox, Proc. 2nd ICCC, pp. 469-471, (Aug. 1974)
Macon & McKendree, Proc. 2nd ICCC, pp. 89-92. (We're currently trying to get a copy of these Proceedings.)

Issues raised by the paper:
How effective is it to use a FORUM (CONFER) like medium under pressure? (as opposed to audio links - typing is slow!)
What if the parties in the conference are fundamentally disruptive, uncooperative, subversive to the conference, not oriented toward tension reduction, etc? Does this destroy the conference?

Is the "menu" approach flexible enough for crisis use? Or will unforseen aspects of new crises make the menu options unusable? (Could a convenient capability for the users to modify the system itself be provided?)

[14] Williams MON 24-FEB-75 5:18PM

Rudy Bretz, A TAXONOMY OF COMMUNICATION MEDIA, Educational Technology Publications; Englewoods Cliffs, N.J., 1971.
This is a highly analytic description of media principally used in information and instruction systems, but potentially useful for suggesting teleconferencing media. A glossary which opens the book will aid media planners in using consistent terminology. A classification system is proposed which distinguishes between "telemedia" (transmission capability) and"recording" meida (as the label implies), and further, as this distinction relates to 7 ways of presenting information (audio-motion-visual,audio-still-visual, audio--semimotion, motion- visual, still-visual, audio, and print). This taxonomy is potentially useful as it could be a basis for systematic consideration of media alternatives in terms of their transmission, recording, and information handling properties. Practically speaking, it could serve to counter static thinking bound to traditional ways of using media. One potential problem is that "communication" media are only considered as those which are programable and stand-alone rather than only supplementary ("instructional" media). Description of media and proposed studies are helpful for forecasting new applications. Verdict: nothing profound, but the results of a laborious analysis are a useful reference.

<Key words: Media types, Communication taxomony>

[15] Casner MON 24-FEB-75 10:35PM

Robert Johansen and Richard H. Miller, "Commentary on one use of FORUM in a research environment", Institute for the Future, 1974.

Comments based on interviews of the Automatic Programming Group at ISI about the use of FORUM as a communication medium.

FORUM was used as a secondary medium: as a "notepad" to record the results of face-to-face meetings, and to a lesser extent to instigate comments on ideas. Comments were sometimes entered on-line, but usually discussion was in meetings, and the results were entered. FORUM was used in an asynchronous, non-interactive mode primarily because users frequently met face-to-face.

Advantages: Allowed newcomers to catch up; could avoid personality conflicts which happen at meetings; asynch mode allowed sub-groups to interact when they wanted, yet inform the whole group without restricting to a meeting schedule.

Problems: Typing requirements; more editing features desired (for entry and possibly to change previous entries); to slow for "brainstorming".

Conclusion: Usefulness depends upon relationship and proximity of users, and the topic under discussion; more investigation into uses required.

[16] Raveling WED 26-FEB-75 8:53AM

Turoff, Murray, "Delphi and its potential impact on information systems" FJCC Proceedings, 1971

<Keywords: Delphi, feedback, forecasting, cross impact, information systems>

Delphi techniques are a category of non-real-time conferencing methods. They may be implemented by either an automated information system or by paper and pencil media, and they are distinguished by two important characteristics: feedback and anonymity.

Delphi is broadly applicable to situations requiring group communication. This paper emphasizes forecasting and planning applications, as would be involved in a management information system. Other uses are in the nature of consolidating a body of information -- use of NCONFER by this seminar would seem to be a classic example.

Delphi processes tend to involve four phases:

1. Exploration of their subject & information gathering
2. Achieving mutual understanding of the basic information and the issues involved; this identifies areas of agreement and disagreement.
3. Exploration of disagreements.
4. Final evaluation.

One of the tools often used in forecasting applications is a cross impact formalism, which involves a matrix formulation of causal effects using estimated probabilities which depend on the particular details involved in the problem.

Delphi forecasting typically involves four conferences linked by feedback loops:

1. General discussion -- generates information on factors which can be controlled, such as organization resources, and on factors which can only be predicted.
2. Resource allocation conference -- deals with planning based on the controllable factors
3. Forecasting conference -- gathers information on uncontrollable factors, such as potential environments, & estimates probabilities
4. Cross impact conference -- Correlates info from resource allocation and forecasting conferences, feeds disagreements back to general discussion.

Information systems which implement the Delphi method should, according to the author, be alterable to suit individual problems.

[18] Raveling WED 26-FEB-75 9:14AM

Another note about Delphi and a gripe about Confer:

Delphi is designed to minimize human psychological effects in communication and narrows consideration of human factors to interaction with the information system or conferencing aid which implements it. The question of minimizing or maximizing human factors in communication seems to me to be taxonomically in the neighborhood of a phylum. (Confer comments reserved for a relevant activity)

[19] Raveling WED 26-FEB-75 10:57AM

Sheridan, Thomas B., "Technology for group dialogue and social choice" FJCC Proceedings, 1971

<Keywords: Voting, polling, feedback>

Deals with interactive polling techniques. Interaction is controlled by a leader with good media (such as radio, television, or a meeting hall) for communication to the group being polled. Each member of the group reacts to questions through a simple (i.e., cheap) response box with a set of switches for choosing alternative replies. Response controls can include a knob or dial for continuously variable information.

Limited response capability requires that the leader be adept in phrasing questions in unambiguous and meaningful terms. Respondents need voting options such as "Don't understand", "Available answers aren't meaningful", and "Question isn't meaningful". Interaction depends on the leader's interpretation of vote summary info as a guide for succeeding questions.

Human factors issues include:

-- Need for anonymity among respondents in many situations
-- Demands on leader & automated vote analysis aids due to limited feedback
-- Influence problems (vote info must be withheld from voters until tabulation ends to avoid bandwagon effect, measure of "intensity of opinion" associated with each vote is abused unless rationed)

[20] Stotz WED 26-FEB-75 11:40AM

<keywords: planning>

Sackman and Citrenbaum, "ONLINE PLANNING towards creative problem-solving",

I have only read the first chapter of 10 in this book and have scanned the rest of the book for content. The book seems to be only peripherally related to Teleconferencing, which is mentioned only as a tool to be exploited in On-line Planning.

The first chapter deals with advanced research in on-line planning. It tries hard to make the case for a scientific theory of planning, and defines planning to fit. The benefits of on-line planning are expected to be in the quality of the results rather than in speed or cost of producing the results. Research in the field is "urgently needed at the ... creative stages ... in problem formulation". Sackman argues for "Participatory Online Planning" (POP) which involves

"consensus that leads to social creation of a plan". He says it needs four novel design features; "natural I/O, adversary information systems, distributed computer services, and educational monitoring".

From what I can make of it, POP is sort of a mixture of Gaming, Simulation and Delphi all rolled into one. It sounds much like what is advocated in the Kupperman, Wilcox, Smith paper, only without a specific task definition. The discussion is rather abstract in Chapter 1. Perhaps it will get more specific in later chapters. There is nothing said about teleconferencing per se.

[23] DCrocker THU 27-FEB-75 5:21PM

Calvin, James O., "Design and Implementation of an Interactive Teleconferencing Environment", Undergraduate Thesis, Case Western Reserve, 1974

The system allows real-time terminal interaction through arbitrated access to the "floor". In effect, everyone shares a Tenex-like link and either the Chairman or the system (in informal mode) assigns to "floor" to the next speaker. A transcript is saved and a simple mechanism is provided for retrieving entries. The system is network oriented.

The TC environment consists of one or more servers and one or more user processes. The server actually provides the conference (including recording the transcript and sending the speaker's input out to all the users) and the user process provides access to the conference; and of course, they all may reside on different machines. A person can start up his local user process (usually under the name of TALK) and specify what host has the server (a default is provided), dynamically moving between machines.

Though basically oriented towards real-time interaction, some asynchrony is possible by leaving the server running all the time (as it currently does at SRI-AI) thereby allowing users to review old entries and add new ones.

Other features: The "chair" can be passed to a different person. As indicated above, the conference can operate in "formal" or "informal" mode. In the former, the chairman arbitrates access to the floor and in the latter, access is assigned on a first-come first-served basis. (Currently, no stack of requests is kept in the latter condition, so there is sometimes a mad scramble when a speaker finishes.) Some user query functions (e.g., who are the members of this conference) are provided. Also, the user can define shorthand terms that, when typed, are replaced by longer strings (e.g., type "hi" and have "howdy, how ya' doing?" actually entered into the transcript (and appear to all the other members).

Comments: I particularly like the network orientation of the system, since it offers the potential of extreme reliability, as well as permitting design of user interfaces to match different user's preferences. Keys: Implementations, Computer-based systems, Text systems

[24] Carlisle(Chrmn) SAT 1-MAR-75 5:05PM

Ackoff, Russell and James Emery, "Third Version of an Idealized Design of a Scientific Communication and Technology Transfer System", Bush Center, Wharton School, University of PA, October 1974.

<KEYWORDS: system design, scientific communication, information analysis>

EXCERPTS FROM THE TEXT:

An "idealized system design" is constrained in only two ways:

- It may employ only those technologies that are currently known to be feasible. However, the technologies which it does incorporate need not be generally available at the present time. [1a]

- The system must be viable; that is, capable of being operated and sustaining itself. [1b]

- Where they do not have answers we have tried to incorporate into the system the capability of finding them experimentally. [4]

- The current system has been criticized for serving producers and disseminators of information better than its users. Therefore, the effort here is to produce a design which is primarily, but not exclusively, concerned with serving the user, with providing him with maximum control over the service he receives, and with enabling him to evaluate the system's performance, and to make his evaluations affect that performance. [11]

COMMENTS ON THE PAPER:

This design is not "idealistic", but rather "idealized". It attempts to incorporate the primary needs of the user of scientific information; somewhat at the disconvenience of the frivolous, redundant, and prolific producers of that information.

The system they propose includes both local and national "clearinghouses" which assume the responsibilities of information analysis centers with on-line NSF Fellows, who answer queries and prepare annual reviews of the fields in which they are prominent.

The style of this paper is similar to that of an NCONFER transcript, with 61 numbered, short paragraphs. From the title, it is obvious that this is the third iteration of this set of statements. We might consider editing one of our topic discussions for this sort of iterative publication and discussion.

While the paper does not discuss teleconferencing explicitly, it provides a context in which TC can obviously be considered. Those scientific and technical communications which will at some point be in machine readable form might just as well be submitted to the local center electronically to facilitate notation, routing and revisions.

The recommended "distribution process" [paragraphs 30-44] includes user profiles, periodic listings, profile revision, relevance rankings, document ordering, and document transmission. Each of the activities would utilize some forms of telecommunications, all of them could be carried out among some high proportion of the user, publisher local center community via TC.

This proposal is consistent with Ackoff's classic paper on "Management Misinformation Systems", in which he advocated REDUCTION of the amount of information given to decision-makers. We should be conscious of whether the systems we study and/or propose contribute to or help to reduce the information overload faced by many of us.

[2.2] Carlstedt MON 10-MAR-75 11:46AM

Hedberg, Bo. (Gothenburg School of Economics and Business Administration) On man-computer interaction in organizational decision-making. Business Administration Studies, Gothenburg, Sweden, 1970. 260p

<KEYS: bibliography; review; group interaction; displays; management information systems>

The stated primary goal of the study reported by this thesis was to examine the impact of new information technology on management decision- making in a given organizational setting. The book is only marginally related to TC, except for a scant half-dozen pages on group interaction models.

The first 100 pages are background, plodding past elements of various theories of organizational and decision-making behavior and a few old ideas on man-computer interaction. The rest reports an experiment consisting of a series of runs of a bank management computer simulation game, played both by groups of students and groups of bankers. The independent variable was the use of hardcopy versus the use of CRT terminals for interacting with the data base. Dependent variables were such things as the total numbers and average proportions of "intelligence" (I), "design" (D) and "choice" (C) acts, frequencies of the D-I, D-C, C-I, and C-D transitions, and total number of decisions (after Simon's IDC decision model); and the frequencies of group acts of various task-oriented and social-emotional categories (after a group interaction model of Bales). The only clearly indicated effect was that the number and proportion of intelligence (-gathering) activities was greater with the CRT than with hardcopy, especially with the students, supporting the proposition that more information doesn't necessarily lead to better decisions.

[2.3] DCrocker FRI 14-MAR-75 3:41PM

P. Lindsay & D. Norman; "Decisions in a Social Context," Chapter 16 in "Human Information Processing"; Academic (1972).

<Keys: Decision making, Group interaction, Competition/Conflict, Bargaining>

(some of the following is drawn from "Foundations of Social Psychology," by Jones and Gerard.)

BYSTANDER BEHAVIOR
Presence of a group: Refers to Kitty Genovese, who was murdered over a 30 minute period, in front of LOTS of witnesses, none of whom aided her. Led to Delaney & Latane' doing a series of studies that suggest that the presence of a group can cause an individual to dissipate his own felt responsibility, e.g., by taking the cues for "appropriate" behavior from others. (Hence the value of anonymous teleconferencing, with individuals isolated from each other.) Going contrary

to a clear group decision (the classic example is of judging the relative lengths of two lines in which the group, stooges, unanimously claim that the shorter line is longer, creating a very heavy pressure on the real subject to conform) is psychologically VERY expensive. Independence is more likely the more competent the person feels. If he has a great deal of confidence in his own ability to judge, the unanimity within the rest of the group is less persuasive.

INTERACTIVE DECISION MAKING
Bargaining: Importance of "level of aspiration" (LA). They describe a bargaining game used by Siegal & Fouraker (1960) to study competitive decision making. Varied whether one side had complete information about second side's payoff table (of profits). Second side never had information about the first side. A fair person with complete information tends to have a lower LA and competes less intensely (and therefore performs more poorly). A ruthless person with complete information can skillfully manipulate the situation by varying between attractive and unattractive offers made to the other person. This can be looked at as rewarding/punishing the person, to manipulate their final LA. That way, the poor victim not only will settle for less, but will be glad to get it.

[The Jones and Gerard book cites a Trucking Game study by Deutch and Krauss in which one or both parties could veto the other's use of a necessary resource. When only one party had the veto (unilateral threat), they of course did better than the party without a veto. What is interesting is that in this situation, the side without a veto did BETTER than when both parties had a veto (bilateral threat).]

Tactics of Conflict (drawn from Schelling, "The Strategy of Conflict"): Rationality can be a handicap (see above). Threats are taken more seriously if the person making them appears to be irrational. A poor communications channel can have highly strategic value (to create threats -- if I don't speak your language, your verbal threats are worthless). In general, it appears that any factor "external" to the participants which lessens (or appears to lessen) a participant's control over the bargaining situation can be used to increase the other side's tolerance for that participant's rigidity. The fact that you cause the decrease in your control is not as important as your ability to then increase it. For example, if you are a protestor, it is not important whether you are responsible for handcuffing yourself to a train track. But do you have the key?

Games: continued discussion of payoff matrices. The effect of limiting communications between players decreases trust and understanding.

The net implications of this information concern a conference participant's perception of group pressure vs. support of individual autonomy and his perception of the locus of responsibility. The data suggests that a person will be most useful in problem solving if he believes himself competent and responsible (valuable). The amount of information made available to an individual often should be carefully matched to their temperament.

[2.4] DCrocker FRI 14-MAR-75 3:42PM

Chapanis, Alphonse, "Interactive Human Communication", Scientific American, Vol. 232, No. 3, March 1975.

Came out this month and seemed appropriate to the seminar:

<Keys: Communications Channels, Interaction, Communications Modes>
Problem Solving between Two People. One as primary source of information and one as primary seeker of it.

Chapanis varied:

1) communications channels -- one or more of voice, visual, handwriting, typewriting;
2) 10 problem tasks, including equipment assembly (similar to SOPHIE?), straight information retrieval, and geographic orientation.

He then studied the resulting protocols.

Interesting results:

Minor -- typing ability did not really affect time to completion. Approximately 1/8 of total time was spend communicating. Typing style/quality was of the telegraphic sort we do with Tenex terminal linking.

Most significant factor affecting time to completion: Presence of a voice channel. Time to completion averaged almost 1/2 less than when voice channel not present.

Linguistic performance characteristics: High bandwidth channels also bring more wordiness, "messages" and redundancy. The ability to interrupt the other person leads to more and shorter messages.

[2.5] Levin TUE 18-MAR-75 10:42AM

Some general comments on the Chapanis article: It was both short in length and low in information density (ie. he didn't have much to say). For all the effort the article indicated they did, the conclusions are almost completely limited to those listed in [4] above. Perhaps this can be attributed to his limited view of man/machine interaction - he addresses his experiments to only a few of the issues that we have raised so far in our tentative taxonomy.

[152] Bretz TUE 13-MAY-75 3:34PM

<CUED by Sci. Am. article of Alphonse Chapanis. KEYS: media, multimedia, taxonomy, systems.>
The part of this article that I found most provocative is his brief review of a study made by a student, Ochsman, in which ten different "modes" of communication were compared. I obtained the references at the back of the magazine but none referred to Ochsman's studies, only those of Chapanis from which the body of the article was adapted. I have written Chapanis for more information on the matter. Meanwhile here is what I made from the data given however sketchily in the article.

Four or five of the "modes" are single media, the others are combinations of media,, or what I

might call multimedia. (The doubtful one is "Voice and Video" which sounds a hell of a lot like just plain old television to me. Maybe he meant to imply that the voice came via the air rather than over the air, if you follow me.

[153] Bretz TUE 13-MAY-75 3:46PM It is very interesting to notice that in all cases where two media are combined, the multimedia mode allows the subjects to solve their problems faster. Sometimes this is a significant saving in time. Adding handwriting to voice, for example, reduced the time 25% over voice alone. (It only took them 75% as long). Adding typewriting to voice reduced the time by 20%.

Adding voice to handwriting reduced the time by 63% over handwriting alone, and adding voice to typewriting reduced the time by 60%.

What I want to know is HOW these media were used in combination- just WHY there were such time savings. Had they each been used in some other way might the savings have been less, or greater still?

These are all verbal media. What kind of results can be obtained by combining media of a visual nature, or maybe a digital pulse nature (touchtone phone pad output, if that can be considered digital)

More important yet, what about conveying or obtaining information, changing emotional state or attitudes. Chapanis' experiment concerned only one of Argyle's social skill goals : working at a cooperative task. The others are far more common in teleconferencing. Sorry I ran over the page. Got carried away.

[2.6] Carlstedt THU 20-MAR-75 3:37PM

Baran, Paul, et al, "ARPA policy-formulation interrogation network," Inst. for the Future, 73.4 NTIS: AD-758 716

<bibliography; FORUM; interrogation network>
I have seen only parts of this progress report, which includes some description of release 3 of the "interrogation program" (which I assume in my ignorance to be FORUM) and discussion of problems and plans for release 4, as well as the programmer's guide for release 3 as an appendix. I'm including this entry only because of some misguided drive to increase the number of entries in our bibliography, assuming there are better descriptions and discussions of FORUM in existence somewhere.

[4.2] Carlstedt TUE 1-APR-75 5:25PM

Maier, Norman R.F. "Assets and liabilities in group problem solving," Psychological Review, 4(67.7), 1974, pp 239-249.

<bibliography; group problem solving, assets/liabilities>
This is interesting as an annotated partial list of the advantages and disadvantages of problem solving/decision making in groups versus individuals. Adv: more information, more approaches,

greater acceptance of decision because of wider participation, better communication and understanding of the decision. Disadv: social pressure and conformity, individual domination, competition. In addition, some factors can be either, depending largely (he says) on the skill of the leader: disagreement vs. innovation, conflict vs. exploration of differences, risk taking (groups are said to be more adventurous), longer time vs. higher quality results, who influences whom. The leader's role is to facilitate problem solving processes and inhibit persuasion processes. The former are characterized by searching, trying out ideas, listening for understanding, short speeches, and wide participation and involvement; the latter by selling, defending, not listening or listening for refutation, long speeches, talking dominated by a few, unfavorable reactions to disagreement, individual agendas, concern for credit. The leader must not influence, but must serve to facilitate and integrate. An interesting claim: a solution or proposal has a 50?(?) chance of being adopted by a group if its "valence" (the algebraic sum of positive and negative comments on it) reaches 15. (Maybe this should be called the Sore Head Constant or something.)

[5.4] DCrocker THU 1-MAY-75 4:59PM

Bernstein, G; "A Fifteen-year Forecast of Information-Processing Technology," Naval Supply Systems Command, Washington DC, 1969.

This was a study done for the Research and development Division of the Naval Supply Systems Command, using a modified DELPHI technique to collect the predictions of assorted experts. My next entry will describe their findings and the entry after that will summarize the implications. The entry after that will describe their modifications to DELPHI (called SEER).

[5.5] DCrocker THU 1-MAY-75 4:59PM

<Fifteen-year forecast, cont'd> RESULTS

The most interesting output from the study is a list of probability assessments for various technological developments. The study was done in 1969 and the short-term predictions were fairly accurate. Below, I am including some of the notable long-term predictions.

Each prediction consists of five elements: desirability and feasibility (scale of 1 to 10, with 10 being highly desirable/feasible), year of a .2 probability of attainment, year of .5 probability, and year of .9 probability. Almost as interesting as the predicted dates are some of the assigned desirability values.

. . .

Software

User-specific languages (e.g., for physicists): 5,5 69,75,80
Natural lang. file query & updating: 8,4 74,76,85
Universal computer language (thru
automated communications): 2,3 85,95,2050
Assembly language virtually obsolete for "users": 8,6 70,72,75
"Verifying compilers" making formal

proofs of each program: 8,5 71,74,77

Systems and Applications

Artificial intelligence -- learning, etc.: 5,3 78,85,90
Man-connected computer systems: 2,4 75,84,90
Online color tv for monitoring computation: 5,5 75,80,85
Library data avail. thru home TV: 5,5 80,90,2000
Information usually stored machine-readable: 8,5 68,75,85
Microfilm replace all readings for courses: 5,7 72,75,80
Real-time interpretation of hand-written equations: 5,5 70,73,76
Current style laboratories (except for some verification work) replaced by computer simulation: 1,1 85,2000,2100
Complete interlocking of man & machine: 5,3 84,87,95
Terminals allow work at home, thereby limiting person-to-person contact: 1,1 80,90,2000

Standards

Programs for standard creation/transmission of messages: 8,8 70,75,80
Acceptance of Universal Person Identifier Code: 4,6 72,80,85

Long Distance Communications

Visible light transmission of 3*10**6 megabits: 5,6 75,80,88
All digital public phone network 5,5 80,85,90

[5.6] DCrocker THU 1-MAY-75 5:00PM

<Fifteen-year forecast, cont'd> COMMENTS

It appears that we can look forward to significant improvements in data transmission, display and recording. Bernstein suggests that we are sorely in need of research into man-machine issues (yet another vote), systems organization, and learning what FUNCTIONS are needed, rather than focusing on creating the procedures that perform the functions.

The reports indicates that there will be significant improvement in software technology, but the predictions appeared too ambitious to me. Bernstein does agree that we can look forward to refinement more than revolution.

[5.7] DCrocker THU 1-MAY-75 5:01PM

<Fifteen-year forecast cont'd> DELPHI/SEER

SEER (it stands for System for Event Evaluation and Review) was intended to respond to some drawbacks of DELPHI. The revised methodology had a group of experts provide an initial data base of predictions, including estimates of event desirability and feasibility. A second group

then interacted with the data, to allow a normative evaluation of the predictions -- revisions to the estimates were made as appropriate. The second group additionally outlined relationships between events, to indicate what events were critical to the occurrence of other events. Experts only participated in the area of specialization.

Development of a Topical Bibliography

During the summer, a state of the art literature review was commissioned by ARPA. The bibliography was significantly expanded and organized into the following categories:

C. Computer-based Teleconferencing Systems in Operation
   1. System Design
   2. System Applications

R. Research Relevant to Computer-based Teleconferencing
   1. Human Computer Interface Design
   2. Organizational Communication
   3. Non-computer-based Teleconferencing
   4. Communication Substitution for Transportation
   5. Psychology and Communications Theory
   6. Decision-making Theory and Techniques
   7. New Technologies
   8. Social and Behavioral Issues

G. General Discussion about Computer-based Teleconferencing
   1. Introductory and Survey Articles
   2. Proposals for Systems and Potential Applications

Since the literature is growing rapidly, by the time the bibliography was published, it seemed useful to include a list of resources from which updated information could be obtained. Resources were organized into conferences, journals and research institutes and organizations doing teleconferencing.

SOURCES

(S1) Periodicals:

The primary periodicals in which papers on Computer- based Teleconferencing and related fields of research and application are published are listed below.

American Psychologist Annual Review of Information Science and Technology Bulletin of the American Society for Information Sciences Communications of the ACM Computer Decisions Computer Networks Communications User Datamation Educational Technology Ekistics The Futurist Harvard Business Review Human Factors IBM Systems Journal IEEE

Proceedings IEEE Transactions on Communication IEEE Transactions on Systems, Man and Cybernetics International Journal of Computer and Information Sciences International Journal of Man-Machine Studies Journal of the American Society for Information Sciences Journal of Communications MIT Technology Review Phillips Telecommunication Review Policy Sciences Proceedings of the IEEE on Man-Machine Systems Science Scientific American Technological Forecasting and Social Change Telecommunications Telecommunications Policy Telesis

(S2) Conferences:

A small number of major conferences in recent years contained sessions on Computer-based Teleconferencing. It is reasonable to expect continued discussion at future meetings of these same groups.

Fall Joint Computer Conference of 1971 Proceedings are published by AFIPS Press, Montvale, NJ. This is now the National Computer Conference.

International Conference on Computer Communications Proceedings of the First ICCC, which was held in Washington, DC in October 1972, were edited by Stanley Winkler and are published by the ACM, Washington, DC

The Second ICCC, which was held in Stockholm, SWEDEN, in August 1974 is being reported in a forthcoming book by N. Macon

National Computer Conference of 1973 Proceedings are published by AFIPS Press, Montvale, NJ. Formerly the Spring Joint and Fall Joint Computer Conferences.

IFIPS Congress 1974 Theme was "Information Processing 74, Systems for Management and Administration." Proceedings were issued to participants in five volumes. These may be available from American Elsiver.

Special Rome Conference on Futures Research 1974 Proceedings are published by Instituto Ricerche Applicate Documentazione e Studi, Rome, Italy

Airlie House Conference on Telecommunications Policy Research Summaries of the conference sessions, held in Airlie, VA, in April 1975, were edited by Bruce M. Owen into Telecommunication Policy Research -- Report on the 1975 Conference Proceedings, ASPEN Institute, Palo Alto, CA, 1975.

World Future Society Second General Assembly Papers based on conference talks will appear in future issues of The Futurist. This conference was held in Washington, D.C. in June 1975.

Teleconferencing Systems -- Applications and Potential This course is being taught by Larry Day, Paul Polishuk, Roger Hough and Martin Nelton from October 15-17, 1975, as part of the Continuing Engineering Education Division, George Washington University, Washington, D.C.

(S3) Research Institutes:

The following is a list of research institutes and organizations at which Computer- based Teleconferencing system development is currently being or has been carried out. Along with each institute, there is an alphabetical listing of some of the people who have been active in design and use of Computer-based Teleconferencing. Despite, or perhaps due to, the easy access to teleconferencing facilities, some of these people travel among organizations. Consequently, this list may not be entirely accurate and is surely not complete.

Annenberg School of Communication, University of Southern California, Los Angeles, CA (Jim Carlisle, Rick Carlson, Dave Crocker, Herb Dordick, Skip Eastman, Ted Schwalbe, Bob Filep, Ron Goldman, Jerry Hanneman, Bob Jacobson, Tom Martin, Fred Williams,Jim Danowski, Marilyn Mantei)

Augmentation Research Center, Stanford Research Institute, Menlo Park, CA (Jim Bair, Doug Engelbart, Jim Norton, Ray Panko, Dick Watson)

Battelle Columbus Laboratories, Columbus, OHIO (Dave Penniman)

Bell Canada, Montreal, QUEBEC (Mike Bedford, Larry Day, Gwen

Edwards, Phil Feldman, Jim Kollen, Anand Kumar, Bill McClain, Gordon Millard)

Bell Northern Research, Palo Alto, CA (Alex Curran)

Bell Northern Research, Ottawa, Canada (Gordon Thompson, Barry Williams)

Bolt, Beranek and Newman, Maynard, MA (Jim Calvin, John Vittal)

British Post Office, London, England (Alex Reid, Mike Tyler)

Center for Futures Research, University of Southern California, Los Angeles, CA (Paul Gray)

Communication Studies Group, London, England (Martin Elton, Roger Pye)

Computer-based Education Research Laboratory, University of Illinois, Urbana, IL (Valerie Lamont, Stu Umpleby [?])

Computers and Teaching Project, Northwestern University, Evanston, IL (Jim Schuyler)

George Washington University, Washington, D.C. (Nat Macon)

Institute for the Future, Menlo Park, CA (Roy Amara, Robert Johansen, Hubert Lipinski, Ann McCown, Richard Miller, Kathleen Spangler, Jacques Vallee, Thad Wilson)

Information Sciences Division, Stanford Research Institute, Menlo Park, CA (Roger Hough)

Information Sciences Institute, University of Southern California, Marina del Rey, CA (Bob Balzer, Jim Carlisle, Jim Carlstedt, Jim Levin, Bill Mann, Lee Richardson)

Mitre Corporation, Bedford, MA (Nancy Goodwin)

Network Information Center, Stanford Research Institute, Menlo Park, CA (Jake Feinler)

Network Management Associates (Einar Stefferud)

New Jersey Institute of Technology, Newark, NJ (Roxanne Hiltz, Murray Turoff)

Office of Preparedness, General Services Administration, Washington, DC (John McKendry)

Rand Corporation (Bob Anderson, Ivan Sutherland, Ray Pyles)

Stockholm University, Stockholm, SWEDEN (Kjell Samuelson)

Telenet Corporation, Washiongton, D.C. (Larry Roberts)

United States Arms Control and Disarmament Agency, Washington, DC (Robert Kupperman, Richard Wilcox)

U C Irvine (Dave Farber)

University of Waterloo, Ontario, Canada (Dave Conrath)

Xerox Corporation (Stu Card, Bill English, Ralph Kimball, Tom Moran, Jeff Rulifson)

INDEX OF ENTRIES

Note: Entries referred to in the text that don't appear in this index were not included in any of the edited sections. An entire entry will not necessarily be found on each referenced page.