AD-767 438

SEMIANNUAL TECHNICAL REPORT 6 MARCH-6 SEPTEMBER 1973

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Institute for the Future

Prepared for:

Advanced Research Projects Agency

15 September 1973

ARPA POLICY-FORMULATION INTERROGATION NETWORK

Semiannual Technical Report

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Sponsored by
Advanced Research Projects Agency
ARPA Order No. 2005

INSTITUTE FOR THE FUTURE

Special Report

41
R

UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author)

Institute for the Future
2725 Sand Hill Road
Menlo Park, CA 94025

2a. REPORT SECURITY CLASSIFICATION

Unclassified

2b. GROUP

3 REPORT TITLE

ARPA POLICY-FORMULATION INTERROGATION NETWORK

4 DESCRIPTIVE NOTES (Type of report and inclusive dates)

Semiannual Technical Report (6 March 1973 - 6 September 1973)

5 AUTHOR(S) (First name, middle initial, last name)

Jacques Vallee, Robert Johansen, Hubert M. Lipinski, and Richard H. Miller

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
15 September 1973	38	

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
Contract No. DAHC 15 72 C 0165	SR-30
b. PROJECT NO. Program Code No. A74880	
c. ARPA Order No. 2005	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
d.	

10 DISTRIBUTION STATEMENT

Distribution of this document is unlimited.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	Advanced Research Projects Agency Architect Bldg., 1400 Wilson Blvd. Arlington, VA 22209

13 ABSTRACT

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The present document addresses itself more specifically to a review of practical experience in the use of FORUM both at the Institute and within the ARPANET community. It is divided into three sections describing: (1) the current program status; (2) user experience to date; and (3) implementation plans beyond Release 4. An analysis of user reaction at USC-ISI is described in the second section of the report, with background data as a special appendix to the report.

DD FORM 1 NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

UNCLASSIFIED
Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Augmentation system						
Computer hardware and associated software development						
Data-base system						
Expert judgment						
Group-via-computer interrogation network						
Forecasting technique						
Management information						
Management tool						
Policy formulation						
Remote conferencing						
Teleconferencing						
Text retrieval						

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Contract No. DAHC 15 72 C 0165

Sponsored by:

Advanced Research Projects Agency

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Contractor:	Institute for the Future 2725 Sand Hill Road Menlo Park, CA 94025
Effective date of contract:	6 March 1972
Contract expiration date:	5 May 1974
Amount of contract:	$280,000.00
ARPA order number:	2005
Program code number:	A 74880

CONTENTS

SUMMARY

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The present document addresses itself more specifically to a review of practical experience in the use of FORUM both at the Institute and within the ARPANET community. It is divided into three sections describing: (1) the current program status; (2) user experience to date; and (3) implementation plans beyond Release 4. An analysis of user reaction at USC-ISI is described in the second section of the report, with background data as a special appendix to the report.

ACKNOWLEDGEMENTS

Contributions made to this project by Roy Amara, Vicki Wilmeth, Paul Baran, Olaf Helmer, and Robert Randolph are gratefully acknowledged. In addition, we are indebted to Robert Balzer and his group at USC-ISI for their collaboration in the testing of FORUM.

I. PROJECT ACCOMPLISHMENTS

This is the third Semiannual Technical Report describing work in progress on a two-year project concerned with the development of a computer conferencing network. Initially thought of as a "policy-formulation" system, the software we are implementing has now evolved to the point where it smoothly supports other aspects of management interaction.

FORUM, RELEASE 4

Release 4 of FORUM is now resident on the PDP-10 computer at both USC-ISI and BBN as a working program. A major difference between Release 4 and the previous version, which was described in full detail in the second Semiannual Technical Report, is the fact that the file system is now fully paged. FORUM-4 is re-entrant and operates well interactively even during periods of very heavy usage of the computer.

From a user's viewpoint, several major changes have taken place since Release 3. It is now possible for an individual participant to gain a rapid view of all conferences in the system, both those in which he is a registered member and those which he may join as a guest. Within a given discussion, he can interact in real time with all active participants in the group; he can submit anonymous entries, send private messages, and follow changes in participant status. The numbering of entries provides an easy reference to previous comments in the discussion.

Considerable progress has been made in developing software to support a variety of CRT terminals; automatic pagination, scrolling, and cursor control in line editing are among the support features.

Release 4 follows the plan described in the previous Semiannual Technical Report. It contains the command language outlined in both the Chairman's and Respondent's Guides. Progress has been made, however, toward the integration of the command language within the conference structure rather than as a separate mode. This concept, which places the full

resources of the system at the disposal of the expert participant without forcing him to leave an on-line discussion even briefly, is described in more detail in Section II.

A THEORETICAL FRAMEWORK

The analysis of the conference process under a computer system requires a formal description of several operating modes that are not identified as such in face-to-face discussion. In this section of the report we propose a characterization of the concept of conference structure and ask the following questions: How many parameters are required for the description of these various operating modes (or states)? Can a formalism be developed to show how these modes are related and what transitions are possible between them?

For the purpose of answering these questions it is of interest to consider a system such as FORUM as a finite-state machine. Given a set of N participants,

$$(P_i) \qquad i = 1 \text{ to } N$$

P_1 being the Chairman, we find that a FORUM conference can be characterized by the question: At a given instant, which participant may make an entry, on which topic, and in what format; and to whom can the entry be directed? This question leads to definitions of five parameters:

- ω the value of i such that P_i can originate an entry
- δ the value of i such that P_i can receive the entry
- θ the topic that the entry can address
- ϕ the format of the entry
- μ the number of active participants

These parameters can take the values listed in Table 1.

State Parameter	Range of Values
ω	1 to N
δ	0 = system 1 = chairman 2 = user 3 = subgroup 4 = whole group
θ	F (free) S (specific) C (command)
ϕ	D (discussion) R (restricted) c (command)
μ	1 to N

TABLE I

The ten states into which the FORUM program can currently be placed are as follows:

s_0 setup

s_1 feedback questionnaire

s_2 asynchronous directed

s_3 asynchronous free

s_4 synchronous directed

s_5 synchronous free

s_6 whisper mode

s_7 anonymous mode

s_8 whisper to FORUM

s_9 whisper to EXEC

Because the previous report described a program that exhibited a much more restricted range of possible states (mainly s_0 and s_1), it is necessary to briefly describe the new features we have introduced before proceeding with this model.

The concept of the FORUM whisper mode is an innovation in a system of this kind. By simply typing a left parenthesis, any conference participant can initiate the sending of a private message to another participant. The system prompts the user for the destination of the message and then provides a right parenthesis; it also prompts for the text itself. The user's terminal listing will show the entry as:

(to Smith)
- Should we remind the chairman of
- the change we suggested in the agenda?

We have extended this concept to the case in which a user requires a special service from the program itself. A typical example of such a situation would be a request for status display. To avoid the need for the participant to hit the ESCAPE key and go to the command language level, we make the system accept its own name as the recipient of a private message. Within a conference discussion, it becomes possible to say:

(to FORUM)
- status of participants

_____ _____
_____ _____
_____ _____

This same concept also applies to the case in which a participant wishes to use the resources of the executive (in the present case, TENEX system). The message would appear as follows:

(to EXEC)
ISI-TENEX
@ NETSTAT

_____
_____
_____

Given these definitions and the parameter values defined above, the states of FORUM can be characterized by the matrix in Table 2. The simplified state diagram in this matrix corresponds to Figure 1.

	ω	δ	θ	ϕ	μ
s_0	1	0	C	C	1
s_1	1 to N	1	S	R	any
s_2	any	any	S	D	1
s_3	any	any	any	D	1
s_4	any	any	R	D	> 1
s_5	any	any	any	D	> 1
s_6	any	3	any	D	any
s_7	any	4	any	D	any
s_8	any	0	C	C	any
s_9	any	0	C	C	any

TABLE 2

PARALLEL VOICE CIRCUIT

Our previous semiannual report mentioned that voice communication was under investigation as a possible adjunct to computer conferencing. We see this as useful in two major respects: for training of new users and for recovery instructions. In addition, we contemplate using the voice channel in the administration of interviews during some formal experiments.

The design of an experimental system along these lines (based upon "Model 5" in the special Institute report, *Voice-Conferencing Arrangement for an On-Line Interrogation System*, by Paul Baran) is now completed.

We will soon have a voice conferencing arrangement with thirty-two voice lines and six simultaneous conferencing circuits. It will have the

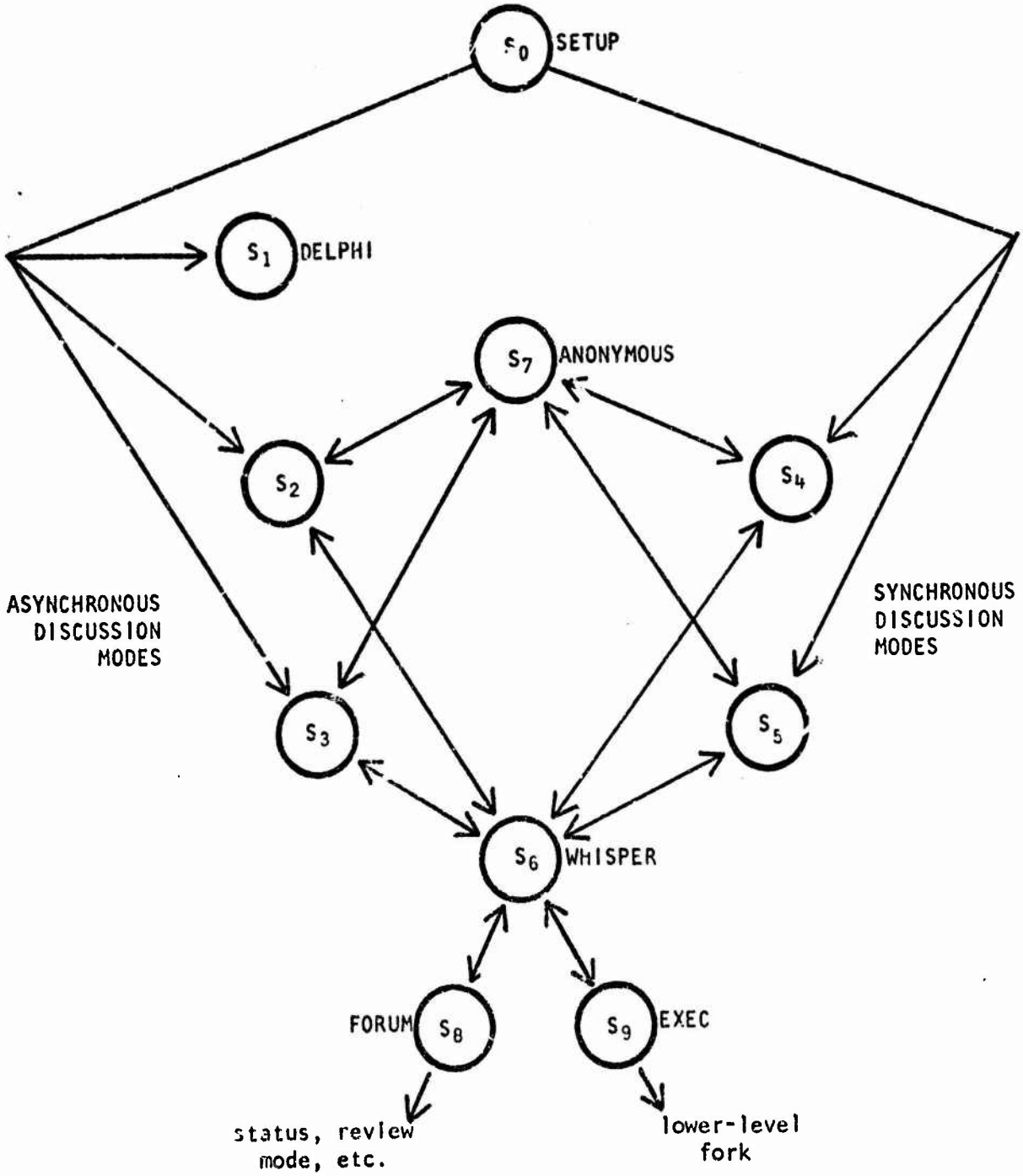
S_0 SETUP
S_1 DELPHI
S_7 ANONYMOUS
S_2
S_4
ASYNCHRONOUS DISCUSSION MODES
SYNCHRONOUS DISCUSSION MODES
S_3
S_5
S_6 WHISPER
FORUM S_8
S_9 EXEC
status, review mode, etc.
lower-level fork

FIGURE 1

ability to place lines in the following states:

- Monitor only
- Talk and monitor
- Talk only (can be used for general broadcast, in which case a line may be connected to all conference paths)

A connector will be supplied to the system for external connection to a general purpose computer. The design of the system shall allow the MCS and/or the general purpose machine to control the system.

The switching technology will be analog, although we may, during the design and development, go to digital. In any case, care will be taken to allow for upgrading of the switch to handle digital traffic if necessary.

The initial design will not support Touch-Tone from the telephones for system control. We will look at this problem and attempt to add the feature, or at least lay the groundwork for adding the feature.

A telephone modification will be engineered to allow the system to detect hang-ups, etc. without special trunk circuits.

We will examine the possibility of supplying auto-dial, but will not incorporate it into the Model 1 system.

The system, which is currently being built under a subcontract with Dr. David Farber of the University of California at Irvine, is depicted in Figure 2.

FORUM LABORATORY

The facilities available at the Institute for the development and testing of FORUM have been expanded from four to eight leased terminals. One of these is a Terminet printer, and another is a CRT display which operates at the 1200 baud rate (this has been made possible by hardware improvements at the NASA/Ames TIP). Two more CRT displays have been ordered for use in connection with the software monitor which we are designing (see Section III of this report).

Additional floor space has been made available to the FORUM project, with the allocation of a three-room complex as a laboratory. One of these rooms is used by the conference chairman, and a second one by the voice controller; the third one serves as a meeting room and terminal station. The controller uses a Texas Instruments terminal with tape cassettes; we

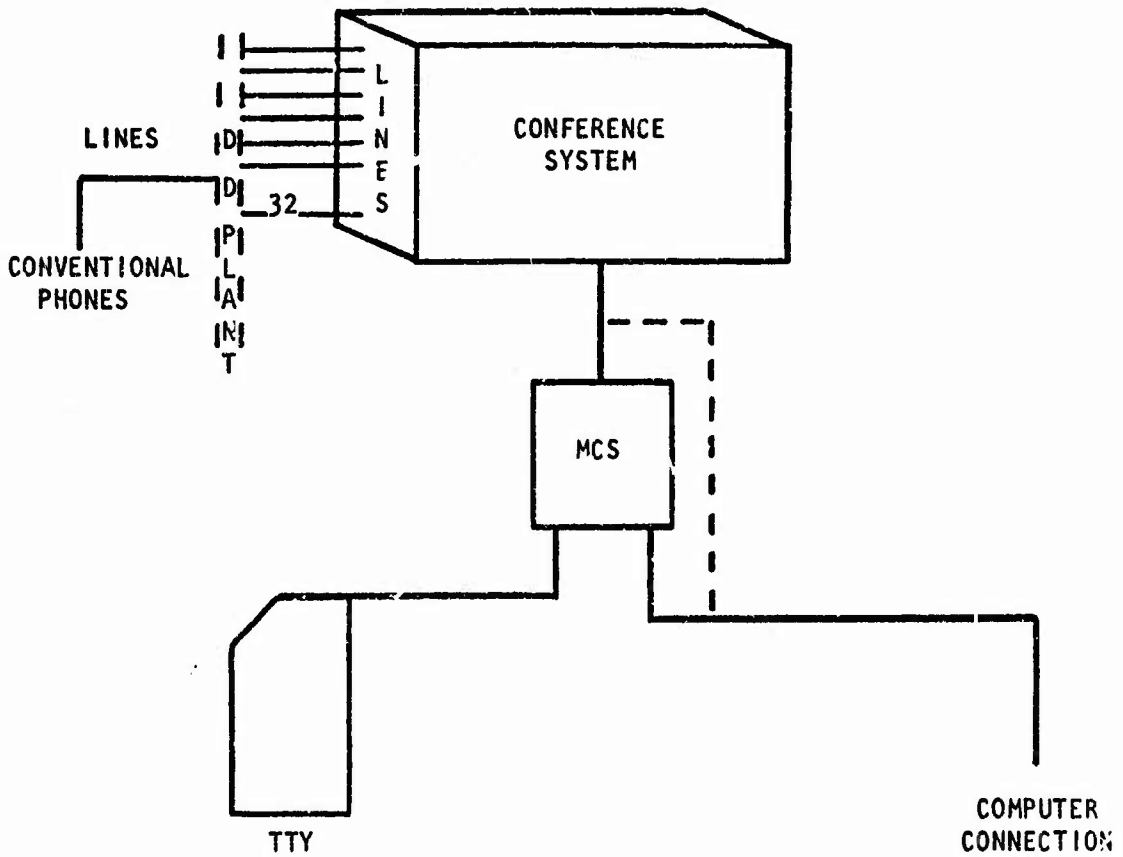
LINES
CONVENTIONAL PHONES
D
D
32
PLANT
LINES
CONFERENCE SYSTEM
MCS
TTY
COMPUTER CONNECTION

FIGURE 2

have found this device extremely useful in archiving conference text in tape form.

In anticipation of the addition of the equipment described above, we have installed ten telephone lines on a rotary switch with an auto-dialer to permit the holding of conference calls. Headsets and speakerphones are used in this configuration so that participants may be free to work at the terminal while speaking. In this design the chairman and the controller will be linked by a special intercom (see Figure 3).

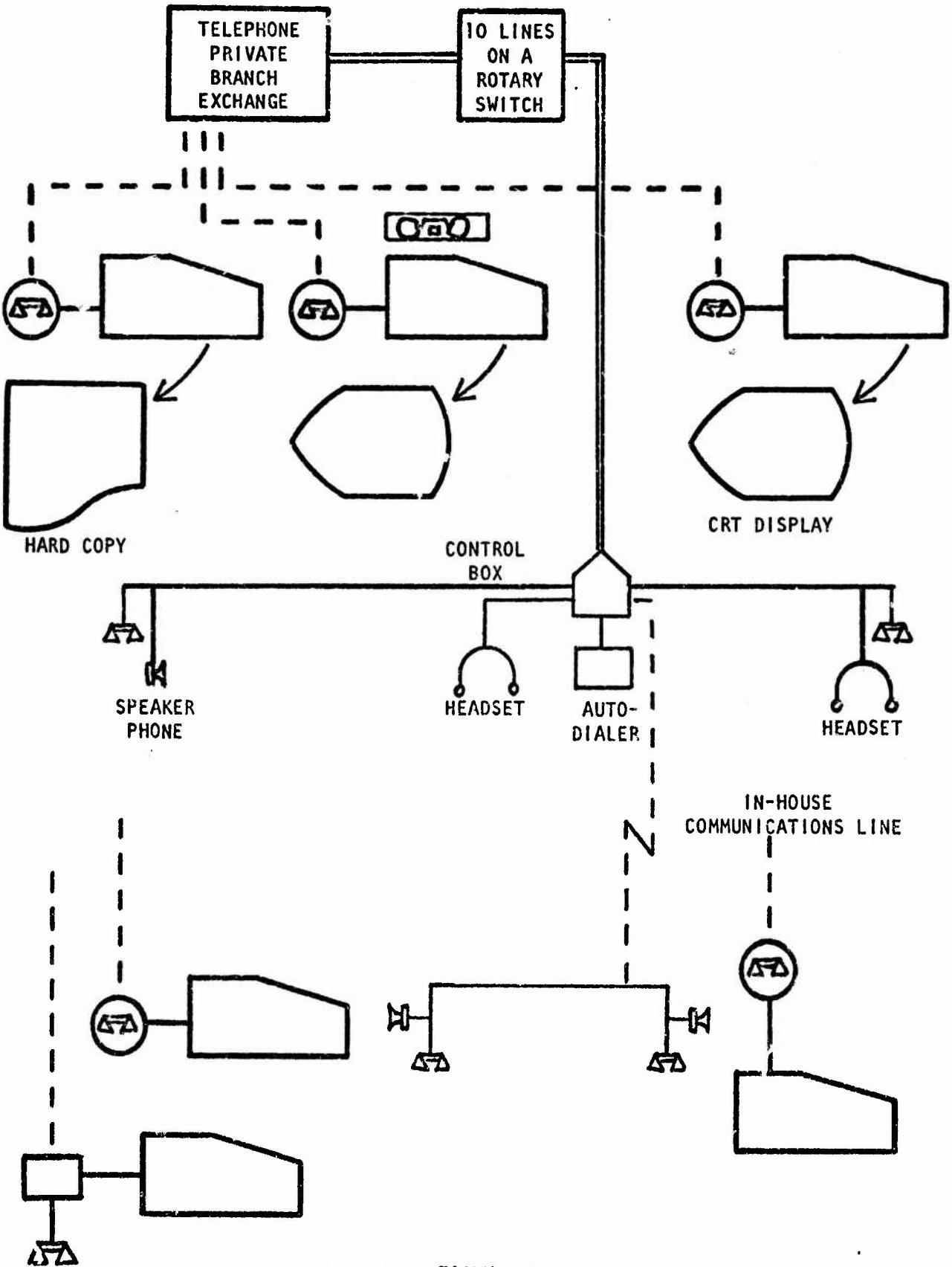

FIGURE 3. *FORUM* LABORATORY

II. USER EXPERIENCE

The FORUM system is now at a stage of development where user experience can be reviewed and analyzed. At this point the three main sources of user information are in-house applications, collaborative experiments, and the 6-week experience of the Automatic Programming Group at ISI.

FORUM APPLICATIONS AT THE INSTITUTE

Figure 4 shows the current trends in the use of FORUM by the Institute. It reflects neither the conferences which were set up for the testing of FORUM nor those which are used in training new users. We have established procedures for holding both synchronous and asynchronous discussions over FORUM on the following subjects:

- Staff meeting. An on-going discussion of our activities and goals
- Experiments design. A collective note pad for the definition and criticism of planned experiments and the review of on-going applications
- Education. A discussion of the applicability of computer conferencing in training and education

In addition, we have set up a conference that is available to all ARPANET users who wish to express opinions on or reactions to FORUM. This conference is quite heavily used and an effort has been made to respond to all suggestions.

Although an evaluation of FORUM impact on our work patterns would be premature, it is already apparent that the medium makes it possible to spend less time in meetings and to remain better informed of project developments. The availability of an accurate permanent record as a reference for future discussions is invaluable in a management sense.

COLLABORATIVE EXPERIMENTS

We have had an opportunity to conduct joint experiments with other organizations interested in computer conferencing. Among these organizations are the U. S. Geological Survey and Bell Northern Research. In both cases we have created conferences under FORUM to provide a link among participants.

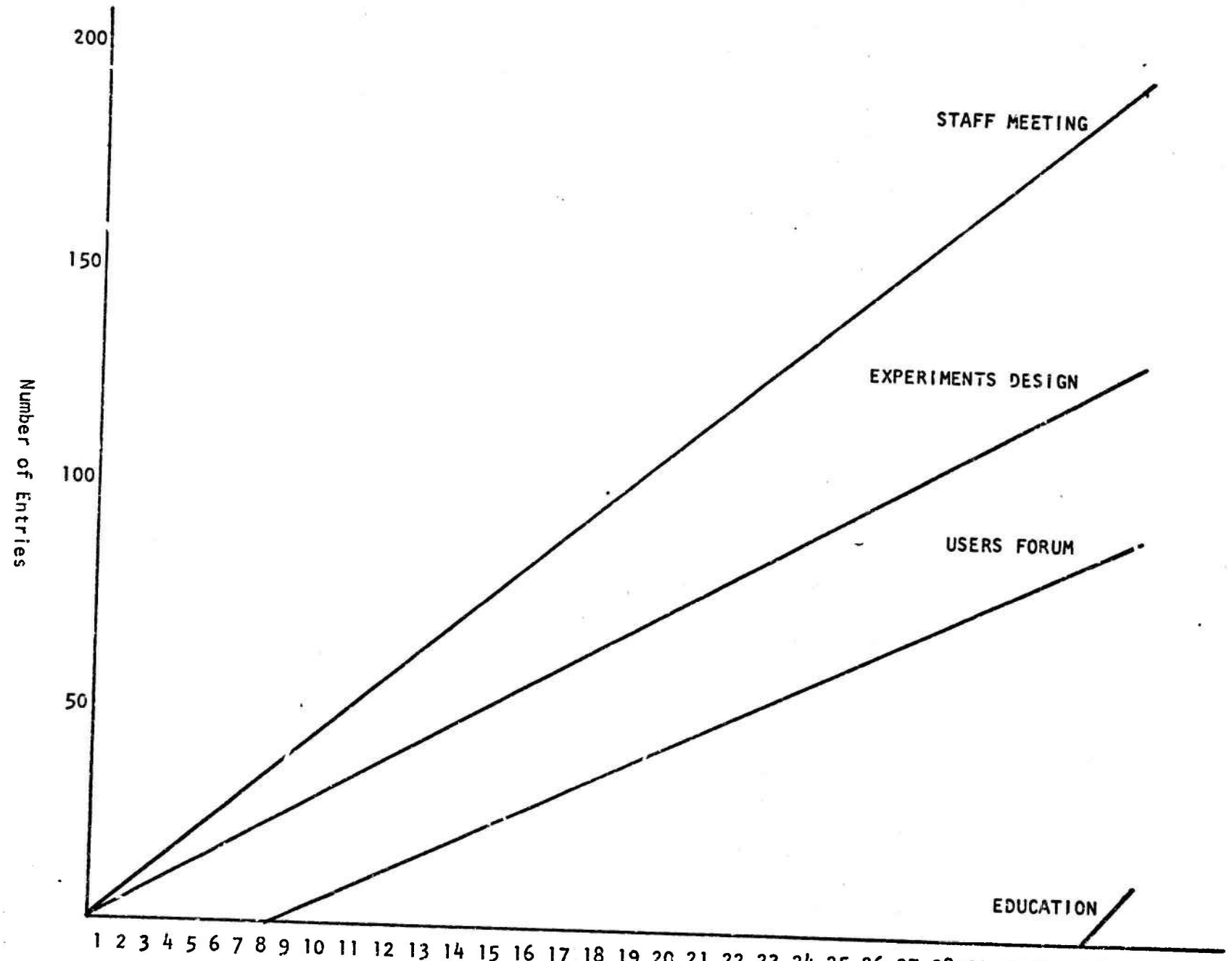

FIGURE 4. IN-HOUSE USE OF *FORUM-4*

The collaboration with the U. S. Geological Survey led to a series of computer sessions, lasting from one to two hours and involving a test of data-base retrieval through information systems available to the users outside the ARPANET. This particular test demonstrated to us the potential of an approach where data-base software would be interfaced to computer conferencing. This collaborative program involving other organizations will be expanded to the point where a significant spectrum of user experience will be available. Conclusions will then be drawn concerning the possible extension of the range of conferencing styles available under FORUM.

We feel that our most significant collaborative effort in this period has been conducted with the Automatic Programming Group at USC-ISI. It has been reviewed in detail and our conclusions follow.

EXPERIENCE IN THE ISI AUTOMATIC PROGRAMMING GROUP

The Automatic Programming Group at the Information Science Institute (ISI) of University of Southern California wanted to hold asynchronous conference sessions in order to facilitate communications within the project. This was the first group to use FORUM seriously and we appreciate their patience and willingness to experiment with a developing communications medium.

Strategy for FORUM usage

During July and August of 1973, FORUM was used as one medium of communication for the Automatic Programming Group at ISI. The research being done during this period involved advanced work in the area of automatic computer programming. The style of FORUM usage which developed focused on its ability to serve as a kind of collective note pad for the research team. In this application, then, the role of FORUM was quite specific and somewhat limited.

There were nine active participants in the research group using FORUM, and they were divided into small topic-oriented groups. Each of these small groups had individual concentrations, but there was also a strong need to keep in touch with the activities of the other small groups.

FORUM, still in the early testing stages, was introduced as a possible communications aid by the project leader. A demonstration of FORUM was given to the research staff at ISI during early June. This demonstration involved a synchronous conference of twelve persons, with no specific topic area to be discussed.

This was probably a rather poor introduction to computer conferencing (it was the first experience for everyone in the group). Several key factors contributed to a general disappointment in this initial exposure to FORUM in a synchronous mode: the organization problems of having twelve persons on-line, the newness of the research group itself (they had just come together as a group), and the undeveloped state of FORUM at that time. An unfortunate by-product of this initial test was a tendency to generalize from this single negative experience to synchronous computer conferencing in general. (Most of the group never tried another synchronous conference--even with a smaller group.) The noninteractive use of FORUM which developed in this group can perhaps be traced in part to this initial experience.

The use of FORUM as a tool in the actual research began without any detailed strategy about the role it would have in the group. The project leader simply began leaving messages in the FORUM program. Gradually, an agreement was made for each of the staff to check FORUM each day for new information and add their own comments. From this point, they quickly developed the habit of entering summaries of their face-to-face meetings.

Over the period of time described here, FORUM became an important part of the group process. The style of usage which evolved made interaction between groups efficient and provided transcripts as an important written record of the collective thought process.

Tactics (techniques) of FORUM usage

During the time when FORUM was being used by the Automatic Programming Group, other media of communication were also being used. The media that can be identified as important are:

1. Face-to-face meetings of small topic groups (usually held daily) and of the entire research group.
2. FORUM in an off-line mode, using hard-copy transcripts of the information entered into the system.
3. Informal meetings among staff (e.g., those with adjoining offices).
4. Other computer-based media such as messages sent through SNDMSG, copies of documents stored in TENEX files, etc. (These cannot presently be accessed from FORUM, though this will soon be possible.)
5. FORUM in an on-line environment using Cathode Ray Tube terminals (used mostly for skimming the text of other conferences and inputting reactions to hard-copy transcripts).

The FORUM discussions were used primarily to store and distribute working notes. These notes consisted primarily of summarized thoughts, notes of meetings, synopses, and the additions, corrections, and comments which referred to the summaries. The notes were not of a particularly polished nature, but were generally the "filtered" results of longer, more intense face-to-face meetings. Occasionally a new or rather unrefined idea was put into FORUM discussions in an attempt to receive feedback and reactions. This feedback, however, was rarely entered into a FORUM discussion.

The responses that were put into FORUM were generally triggered on a hard-copy transcript of the discussions which were created as special computer files (in TENEX), edited, run off in multiple copies, and distributed daily. This organization and distribution of hard-copy transcripts was done by a very competent editor-secretary, and was not done within FORUM. It is our plan, however, that FORUM will gradually adopt much more of this editorial function in the future.

In keeping these running summaries and synopses, the records were detailed enough to: (1) allow communication between groups; (2) allow a newcomer to the group to read a history and catch up on the research status of the entire group; and (3) allow the various groups to create reports, papers, and more polished summaries of the work conducted during the period which FORUM was used.

General reactions to computer conferencing

The general reactions to computer conferencing tended to be positive, but limited to structured asynchronous applications. Most participants felt that this was an appropriate limitation and that computer conferencing would in fact be most beneficial in highly structured situations. (It should be noted that synchronous conferencing was not attempted by the group, or small groups, after the initial demonstration, in which there was general disappointment.)

There was generally a negative reaction to the necessary reliance on typing ability. This was a problem for five of the nine members of the group and may have affected the usage of FORUM which developed.

The comments regarding specific characteristics of FORUM seemed particularly thoughtful and sometimes imaginative. Since the participants were all highly skilled computer users, it is perhaps not surprising that much of their

attention was focused at this level. In general, the group was impressed with the simplicity and general friendliness of FORUM. However, this basically positive reaction was tempered by numerous suggestions for modifications of the structure of the system. Apparently the present structure was alluring enough to whet their appetites for computer conferencing, but left them frustrated at certain points.

The most obvious weak point was the unanimous feeling of a pressing need for at least basic abilities in text editing and review of conference proceedings. Suggestions for improvement include adding the ability to input directly from a text editor outside of FORUM, allowing persons to rewrite and/or add postscripts to their own earlier comments, allowing comments to be inserted into previous text, abilities to search the text according to various criteria, and other suggestions of this sort.

One of the more provocative suggestions dealt with the ability to alter existing text (specifically to change one's earlier comments). In its present form, FORUM has an implicit reverence for comments entered by an individual. These entries are indiscriminantly frozen in the form in which they are entered. Certainly this practice has a real value if one wants to review the chronological development of a conference. However, in other cases, this might place unnecessary pressures on each user. (What you say had better be good, because its going to stay there!) The ISI people suggest that some flexibility should be considered in this regard.

Group dynamics and FORUM usage

The research group at ISI was formed just before the use of FORUM was begun. Six of the nine active participants were graduate students, and half of those graduate students were there for only one summer. Only basic user profile data is available, though, and there was no attempt to do any formal group analyses as either pre- or post-tests. Thus, we can only relay information on the subjective assessment of the group members as they attempted to sort out the effects which FORUM had on their research team.

Most of the group members had adjoining offices and they saw each other daily--usually in face-to-face meetings involving the research. The basic relationship between FORUM and these face-to-face meetings is discussed in the following comments:

"The main issues in the group were not really discussed in FORUM. FORUM was sort of the key that started the interaction. (It showed where ideas were coming together or diverging.) It kept people out of everybody else's hair. We were able to work independently. I think we got about three times as much work done because of this. But it's so hard to know what the effect of FORUM was because we were interacting in so many different ways at once."

"In general, when we talked, we talked face-to-face."

"I have this feeling that it has cut the face-to-face communication (at least for me). And the communication is still quite adequate."

"Having this feature [FORUM] really was a nice addition to the group and I think it kept them moving pretty well."

Since FORUM was rarely used as an interactive medium, its effects on group dynamics were necessarily indirect. Distribution of the hard-copy transcripts encouraged this noninteractive style. FORUM still had an effect, but it came in such areas as the following:

"I can't think of any effects on the group which actually came from FORUM usage, except that we have a good transcript. It makes writing the report much easier."

"One of the uses for the thing [FORUM] is in the ability to catch up with the progress of the group for newcomers."

"FORUM structured things much more explicitly."

"You don't get the personality conflicts in FORUM that you do in face-to-face meetings."

"I didn't see too many individual things going into FORUM which hadn't been tested out in face-to-face meetings. A lot of what went into FORUM was well filtered by individual group meetings. Occasionally somebody would put in a response, but the things which were put in were usually hashed out in group meetings.

The style of FORUM usage will always affect the kind of group process which develops. In this case, the note pad style seemed to limit the direct effect of FORUM on the group process. Since very little direct communication was done via FORUM, the effects were revealed more in the area of group performance than group dynamics. The group generally felt that FORUM had increased their productivity, though they also did not perceive any strong impact on group interaction. The one exception to this observation involved effective communication between groups, which all felt was enhanced by FORUM.

III. CURRENT PLANS

WHISPER MODE

The FORUM whisper mode introduces a new dimension in the activities of a conference participant. He can access the command language level and use the resources of the executive while engaged in a discussion. The design for this mode of operation has been completed and it is now being implemented. We expect to direct special attention to the problems of the interface with file systems outside FORUM, where real technical difficulties arise.

Private messages transmitted through the whisper mode are currently unnumbered. This makes them inaccessible in the review process described below. A period of experimentation is required before we can examine the impact of this inability to review private messages. Anonymous entries are numbered, and it may be that this same rule should apply to private messages, especially if FORUM comes to be used extensively as a mail processor.

REVIEW MODE

The ability to refer back to previous entries in the course of a conference is an essential one, especially when users operate CRT terminals, where the life of the information is quite short. We have designed an approach to the review problem that takes into account the following parameters:

- The date of an entry
- The author of an entry
- The entry number

Given a review criterion like:

Review Lipinski, Miller in 50-75

the system will review all entries between #50 and #75 inclusively which were made by Lipinski and Miller. It will display either a specified number

of lines of each message or the full text of each.

OTHER DEVELOPMENTS

A more sophisticated use of the conference transcript involves the option to transfer it into the participant's own directory as a file, which would then be available for processing under TECO or another text editor.

A reverse process involves the introduction of a prepared statement or other text into the transcript of a conference, either asynchronously or in the course of a "live" discussion. This feature will be triggered by a *SUBMIT* command, which is now being designed.

In addition to these refinements in the use of text, attention is now being given to the dynamics of conferencing in a more basic sense. We do not feel that our experience to date enables us to have a strong grasp of an overall structure in which the various conference modes could all be smoothly related. We need to pursue a development program to clarify the roles of the substantive chairman and the editor, and to understand the obstacles which the participant perceives when he tries to communicate with a group of his peers through a computer conferencing system.

APPENDIX

Complete Comments from Interviews
with ISI Staff, August 16, 1973

1. STRATEGY FOR *FORUM* USAGE

"We have been using FORUM to make working notes."

"Our experiences have been vague; as a group our topic was vague, and that tended to make things even harder to follow."

"The particular thing that we were talking about was very unstructured. The topic was the wrong thing for this."

"The work here is generally very exploratory and ill-defined. Therefore, there is usually a very large volume of communication. That is why FORUM was used to communicate what we did each day. Also, that use is partly a function of the fact that typing is a real drag. Also it is a function of how much thought of that type you are willing to commit to paper."

"Our group used FORUM precisely as a progress report medium. That worked very, very well."

"There weren't many of the 'Yes, the answer is 4' kind of message."

"If we would have been close together, it would have been silly not to have face-to-face meetings. If we were around the country, we could have put in position papers and eventually come up with a group decision."

"FORUM is clearly going to lose if people have the option of getting together and talking. It will also be more useful where people know what they want to talk about."

2. TACTICS FOR *FORUM* USAGE

"We at least tried to put out the ideas coherently in FORUM and throw them out for some kind of interaction."

"We could refer to FORUM for details, but the face-to-face meetings were used for the really fundamental questions which really needed to be hashed out in real time. There was a lot of personality dynamics going on in these meetings--a lot of shouting, which you can't do in FORUM (can't go into 'shout mode' and print out in blinking capital letters)."

"The main issues in the group were not really discussed in FORUM. FORUM was sort of the key that started the interaction. (It showed where ideas were coming together or diverging.) It kept people out of everybody else's hair. We were able to work quite independently. I think we got about three times as much work done because of this. But it's so hard to know what the effect of FORUM was because we were interacting in so many different ways at once."

"I didn't see too many individual things going into FORUM which hadn't been tested out in face-to-face meetings. A lot of what went into FORUM was well filtered by individual group meetings. Occasionally somebody would put in a response, but the things which were put in were usually well hashed out in group meetings."

"In general, when we talked to each other, we talked face-to-face."

"One of the uses for the thing is in the ability to catch up with the progress of the group for newcomers. It should be ordered at the option of the chairman or each individual. Perhaps each person should have the option of ordering it the way he wants to. It is the scissors/paste kind of thing."

"When I was scanning the interactions, I would respond to about one of every ten that was displayed. I don't respond very much."

"I would read everything on the terminal, but if I wanted to reply seriously I would go to the transcripts."

"I really could only assimilate what was coming out when I had a hard copy."

"I would read the hard copy and say, 'What bullshit' and run to the terminal and put in my response. Sometimes I responded right off the top of my head."

"Within my own group I relied only on the hard copy transcripts. On the other hand, I spent about half an hour a day reviewing the other group sessions on the terminal. It was a very good way of catching up."

"I didn't even read the stuff on the terminal. In all fairness, I wonder how much the fact that it was FORUM and was on the computer was really important as opposed to just writing things up at the end of the day. Once you start getting hard copy, you don't read what's in the machine. When the indexing feature is added, this might be different."

"I think it is a fairly nice medium, because it is a medium in which we felt fairly free to put out half-baked ideas. Now, if we were sitting around a table, we would do that, too. But they would be quarter-baked then."

"The other thing I tend to do is to put a general comment into FORUM to see what feedback occurs. This is much easier to do with FORUM."

"Once, one of the members of the group used FORUM to throw out a new idea which he hadn't really thought about very much. Nobody answered him in FORUM. We all went and talked about it in a meeting."

"I never sent a private message and I never received any."

"I got into a mode using FORUM where I didn't really worry about being very specific. Because I couldn't edit a lot, I would tend to type more loosely than I would for a polished thing. So that was probably good in getting me to just sit down and type and letting ideas flow."

"FORUM was not used as a way of generating and compromising ideas. The system was too slow for that purpose."

"There was no on-line responding to comments. We specifically were not in an on-line mode. It was like anything else I write; I take some notes and then type it in after that. Except for a few conveniences, the same process could have been done with a typewriter."

"FORUM material was written up by people who were trying to write it reasonably well and not just spew it in. With a moderate amount of editing, I can write this part of the report."

"FORUM is used as a reference material and doesn't include the arguments involved in getting to a particular point. Usually just one person actually enters information into FORUM."

"Only the good stuff got into FORUM. FORUM was our PR face."

"I think people made a conscientious effort to really summarize their thoughts before putting them into FORUM. After we had a meeting in the afternoon, someone could type in a synopsis of the meeting. You could then make comments immediately, so the next day in the hard copy you would get the initial input--plus whatever comments were entered about the working summary."

"The use for the AP notes was super. We are now summarizing what we did and it's a great reference. The only communication between the groups was the FORUM transcripts. Everybody had to at least make their thoughts concrete enough to write down."

"The first experiment with all of us on at once was a disaster. It was really terrible. I think that is not the right way to use this medium. It was just everybody talking at once. Much too much information. Asynchronous usage would be better."

"We sent lots of cutesy-pie private messages. Occasionally it was used genuinely to define and clarify general messages. (A disarming aside--'I really don't think you're full of baloney, but ...') It was like an extra kicker."

3A. GENERAL REACTIONS TO COMPUTER CONFERENCING

"Two things have to be going on in FORUM: one is the notes kind of thing (store and forward), and the other thing is some kind of summary document. There were so many notes collected that it took a real commitment to actually go into another conference. If you really want to have interaction, you need something that tells people what the salient things are which are going on in the group."

"FORUM itself wasn't that involved with the group, but I still feel that it was a worthwhile tool. I'm not sure I'd like to unhave FORUM. I mean it's very addictive; it's like DWIM at BBN that corrects spelling errors. It's something that you could live without for all your life, but after having it you don't want to unhave it. It's really nice to have it correct your spelling errors and other little sillinesses. It means that, like DWIM, I think there is a lot that could be added; I like it--just give me more! And that's how I feel about FORUM."

"The use for the AP notes was super. We are now summarizing what we did and it's a great reference. The only communication between the groups was the FORUM transcripts. Everybody had to at least make their thoughts concrete enough to write down."

"I have this feeling that it has cut the face-to-face communication (at least for me). And the communication is still quite adequate."

"It's easier to drop topics in face-to-face meetings. Somehow topics seem to go on forever in FORUM. (Long after they are irrelevant.)"

"The system is extremely useful for the things that it fits. For real idea generating, it's too slow. For both history and long-term thinking (I don't know exactly what the difference is between long and short term thinking), it is very good. (FORUM is good for 'slow thinking'.)"

"FORUM allowed interaction, but it didn't force it. In face-to-face there was more demand for a response. You had the ability to time the interaction which you wanted to explore when you wanted to do it."

"I think it will be much more successful using it in asynchronous mode than when we all tried to get on the system at once."

"I really appreciated the fact that now at the end of the summer we have a good basis of written material."

"I am skeptical of using it synchronously because of the organizational problems."

"I looked at the transcript of the synchronous conference (I wasn't in it) and it seemed that they were more interested in playing with the system than actually dealing with a topic."

"Our experience doesn't really test the conversations mode. Our one crack at that isn't really a fair test."

"If you have a conference on a more concrete topic (more directed), you'll find a kind of different use of the system. Our topic was just not focused as a team."

"It's kind of a funny medium. It has some uses: as a working history, as a way of getting a longer-term discussion down in hard copy, it is very good. It has disadvantages--that working copy is, like any working copy, very confused."

"It was hard to move right into that new environment. It's a new medium and conversing in that mode is just strange."

"In the conversational mode, you are using it as a substitute for talking. I'm not sure that will ever work, but even if it does, that is a lot different from the way we are using it now."

"Actually using it in the conversational mode would take a good deal of acclimating--at least for me. Typing with two fingers is a handicap."

"There isn't really a context which is implicit in the interaction using FORUM, such as there is a context which can be assumed in face-to-face communication."

"Even if you have the best possible indexing capability, there will only be a certain amount available on the screen. Hard copy may definitely be necessary."

"There is an intense stimulating brainstorming thing that happens in face-to-face meeting, and I'm not sure that can happen through a typewriter."

"The biggest bummer of the system is having to type, because typing is a bummer for half the people around. (The half that took Chemistry II instead of Typing.)"

"It's not the same as having a bunch of television/telephones. I don't think a typewriter serves the same purpose. If you want to have a conference phone call, then you have a conference phone call. If you want to use FORUM, then you use FORUM. I don't think you should try to make FORUM be a conference telephone call."

"The time spent typing is definitely wasted time. It's not productive, even if you are a good typist."

"FORUM was not used as a way of generating and compromising ideas. The system was too slow for that purpose."

"There was no on-line responding to comments. We specifically were not in an on-line mode. It was like anything else I write; I take some notes and

then type it in after that. Except for a few conveniences, the same process could have been done with a typewriter."

"The other thing I tend to do is to put a general comment into FORUM to see what feedback occurs. This is much easier to do with FORUM."

"Our group used FORUM precisely as a progress report medium. That worked very, very well."

"We really haven't used the system enough--that's clear."

"The first activity had three threads of conversation going on. When we went to the five activities, it turns out that in general the same thing happens--each one has at least three different conversations going on. That seems to be a very interesting phenomenon."

"The feedback seems to be an important difference. In talking, you get immediate feedback and your thoughts change very rapidly. I tend to express things very differently when they are written. Usually in talking you express half an idea; in writing, you have to express the full idea."

"FORUM structures things much more explicitly. The option to pass through other people's material was there, but you could work within your own group without necessarily processing through other kinds of responses."

"Certainly it's been an interesting experience, if for nothing more than improving my typing ability."

"I think it is a fairly nice medium, because it is a medium in which we felt fairly free to put out half-baked ideas. Now, if we were sitting around a table, we would do that, too. But they would be quarter-baked then."

"In any research group, I think they might find FORUM useful. It needs to sit around for a while; that is, sit around here and be available and see how it is used. This is one use. It should kick around at a few different kinds of installations."

"It would be very handy for a programming group to be able to keep things in this form (using FORUM)."

"I'd like to try a class where most of the class was run with FORUM."

"I would use FORUM for the following kinds of issues: particular answers to particular questions, anything that is very particular, very high level things that I just want people to notice (in a hand waving sense), the intermediate areas where there is a general discussion area which needs to be defined to some particulars."

"The ARPA net is used heavily for sending mail back and forth. FORUM could probably add to this ability."

"If we could have been close together, it would have been silly not to have face-to-face meetings. If we were around the country, we could have put in position papers and eventually come up with a group decision."

"FORUM is clearly going to lose if people have the option of getting together and talking. It will also be more useful where people know what they want to talk about."

3B. GENERAL REACTIONS TO FORUM

"I don't think the subgroups could have worked interactively within FORUM. It is too slow. There is no blackboard. It would be too detailed and things change much too fast. (The problem we were dealing with was the defining of a program within an ill-defined area.)"

"It's a tool that uses paper, and part of Institute philosophy is to go to a paperless system, but FORUM doesn't seem to work very well paperless. I liked being able to go to it before I had the printouts. But I also like having the hard copy as a reference."

"The first experiment with all of us on at once was a disaster. It was really terrible. I think that it is not the right way to use this medium. It was just everybody talking at once. Much too much information. Asynchronous usage would be better."

"CRT is better than a hard copy terminal if you can have hard copy. The perfect system is to have CRTs and a good secretary."

"Eventually the AP project is going to have programming needs. What you would like to do is get access to those files from within FORUM."

"Obviously a multi-screen terminal would be nice; especially if you have several conferences going at once. It's a little tiring watching things go off the top. I'd like to have it like the screens over hospital beds, where you could take the readings of various groups and respond as a need occurred."

"I didn't even read the stuff on the terminal. In all fairness, I wonder how much the fact that it was FORUM and was on the computer was really important as opposed to just writing things up at the end of the day. Once you start getting hard copy, you don't read what's in the machine. When the indexing feature is added, this might be different."

"Recently someone in Conference 3 put in a little story which he had reference to in some other writings. It was thrown out for stimuli and I reacted to it right now. I wanted to get back to them that I thought the whole goddam thing was presumptious. I mean it was a nice point; it was just poorly made."

"Another thing that seemed to be wrong was that when you came back in and it asked you how many messages you wanted to see, usually it showed you the wrong number, or some other confusion. One time I just couldn't get it to not show me everything, and I did not want to see 65 messages!"

"We really haven't used the system enough--that's clear."

"I would really like to see some dating and time of messages."

"I try to go back and tap into the same drummer I was listening to before when I had written something in."

"I really would have liked it if the numbering was sequential and you didn't lose a number if you canceled a test entry."

"I would also like the ability to go back and write my own messages again. I realize this is a question of philosophy which you may have already decided about, but this is my opinion."

"There's a lot of garbage messages in there. That's why we have a lot of messages which end mid-sentence, followed by 'Oops'."

"It seems to me that often somebody will make some comment which will receive all kinds of replies, and he will go back and decide that it was simply badly phrased. Therefore he goes back and adds a postscript so that the other people in the conference won't be misled."

"The option of adding a postscript is a sure thing; whether you want the option of rewriting is another question. I think you should have the option for both."

"The linear transcript is not very entertaining. There are coo many confusing threads."

"When really trying to do something polished, the editing facilities were terrible. I would have liked to at least be able to insert a file that I had edited outside of FORUM."

"The system is very well human engineered. I can say that again and again. It's beautiful! It's simple; you just follow the instructions, and it does all of the right things."

"Reading one line at a time and then having others disappear may be all right for reading dime novels (that's what the speed reading people tell you to do), but it doesn't work for technical material."

"I wish I could just do this (making wringing motion with her hands) to FORUM. I'd like to be able to tell it to roll front and roll back. Just roll it around like it was really a scroll. It would also be nice to jump in in the middle or just advance a line or go back a line."

"We were so worried about system crashes and that sort of thing that we tended to write shorter messages."

"You've done some things to make CRTs very nice. TENEX has this abominable thing where when you delete a character, it Xes through it, which is patently absurd on a CRT. I really think that a well human engineered system knows that you are using a CRT. TENEX doesn't know at all; FORUM knows a little bit, but it could know more."

"We really suffered from not being able to get back and forth between messages. Especially not even being able to get our own messages at all. There was no way to step into the print option and add or respond."

"The system is just beautifully simple. It is very well done. I may be biased because it looks so good on a CRT."

"A lot of people went into command mode in the middle of a message and lost the message."

"The ability to insert dynamically--if I can get an idea in an appropriate sequence, it seems to me there is a win."

"Two things have to be going on in FORUM: one is the notes kind of tning (store and forward), and the other thing is some kind of summary document. There were so many notes collected that it took a real commitment to actually go into another conference. If you really want to have interaction, you need something that tells people what the salient things are which are going on in the group."

"In using it as an on-line recorder of events (when not expecting any real time response), firstly, I would like very much to be able to edit before actually inputting the information. The only solution is to have access to a full-scale text editor."

"The thing needs to be my friend. My friend wouldn't walk in here and throw a mirror up to me. I need a shave! I've got things in there that I'm trying to type in as fast as I can; I don't want that thing sitting there under my name later on if I know it's going to. If I'm in a petty little research environment, I'm constrained and you're putting pressures on me that I don't want. I've made my goofs, and I'll go back and rework it, and say that's not what I meant--that's not what I meant at all."

"Chronological ordering of comments is a very secondary thing. There should be some kind of dynamic sorting ability--that is most important."

"One of the things I found myself using a great deal was the print option, but it is a pain. It is pure unadulterated hard work. I can act off of a series of old dialogue as if it were new dialogue, and I can get new stimuli and want to respond. But the ideas go right out of my head when I can't record them on my screen as they go by. The purpose of the thing is to find me, stimulate me, and find out where my head is."

"I obviously should be able to generate a list of the conference and insert ideas as I go through it again. I want a macro way to come into the conference so it is easy to keep my thought in my head. The thing it provides me with is an answer to that old thing about 'go back time in thy flight, I thought of the comeback I needed last night'."

"There is something about putting ideas in and then having them edited so they look pretty and are readable. My wife was up here one Sunday evening and I had some things I wanted to put in, and she typed them in for me. Then I asked her how it occurred--that sentence doesn't make sense! Right! And it wasn't her fault. I had written it out and it was interpretable, at least one different way and she picked out what was a reasonable interpretation of what I had written down. But I couldn't change it!"

"Unless you're doing some kind of psychological profile on me, I don't think it is necessary to have all those initial comments in their initial form."

"By the time I had gone through that entire review thing, I wasn't sure what I had intended to say at all."

"My philosophy is that I would much prefer to have virtually full control over what I was doing. I would like to give the user this capacity and trust him not to do stupid things."

"I got into a mode using FORUM where I didn't really worry about being very specific. Because I couldn't edit a lot, I would tend to type more loosely than I would for a polished thing. So that was probably good in getting me to just sit down and type and letting ideas flow."

"It didn't work in real time. We expected that."

4. GROUP DYNAMICS AND *FORUM* USAGE

"One of the uses for the thing is in the ability to catch up with the progress of the group for newcomers. It should be ordered at the option of the chairman or each individual. Perhaps each person should have the option of ordering it the way he wants to. It is the scissors/paste kind of thing."

"FORUM structures things much more explicitly. The option to pass through other people's material was there, but you could work within your own group without necessarily processing through other kinds of responses."

"It was positive in the sense that people were following their own stimuli; this way it was an extension of a letter thing, ad reducto, ad absurdum. You wanted to see an idea trampled into the ground and you could see it happening."

"I haven't got an experimental design to tell how our group was affected by using FORUM. Here's where the errors are compounded: the group was new, we don't have any basis for comparison, to separate contributions from the normal maturation of the group. As a consequence, the things that I did observe could have been as a result of maturation or the use of FORUM. What the system's effect on group interaction is, is speculative. I did observe that ideas became more developed and communication became much more facilitated."

"My office is separated from the rest of my small group. (I am upstairs and they have desks in the same office downstairs.) Since all the others are down in essentially the same offices, they can very easily turn to the next desk and start talking. Since I am upstairs, I tended not to do that. I don't go down there much at all. I found that FORUM was perfectly adequate for most kinds of communication I need to do. If it wasn't available, I probably would have had to spend more time down in their offices."

"I have this feeling that it has cut the face-to-face communication at least for me. And the communication is still quite adequate."

"You don't get the personality conflicts in FORUM that you do in face-to-face meetings. It seems like the face-to-face conference causes a lot more information back and forth than the FORUM sessions."

"It's easier to drop topics in face-to-face meetings. Somehow topics seem to go on forever in FORUM (long after they are irrelevant)."

"The main issues in the group were not really discussed in FORUM. FORUM was sort of the key that started the interaction. (It showed where ideas were coming together or diverging.) It kept people out of everybody else's hair. We were able to work quite independently. I think we got about three times as much work done because of this. But it's so hard to know what the effect of FORUM was because we were interacting in so many different ways at once."

"We could refer to FORUM for details, but the face-to-face meetings were used for the really fundamental questions which really needed to be hashed out in real time. There was a lot of personality dynamics going on in these meetings--a lot of shouting, which you can't do in FORUM (can't go into 'shout mode' and print out in blinking capital letters)."

"We had all just started working together and we didn't know each other. We were all new here and it was a new environment. You could see in the transcript that there was trouble with the names even."

"I am skeptical of using it synchronously because of the organizational problems."

"I can't think of any effects on the group which actually came from FORUM usage, except that we have a good transcript. It makes writing the report much easier."

"Having this feature (FORUM) really was a nice addition to the groups and I think it kept them moving pretty well."

"FORUM itself wasn't that involved with the group, but I still feel that it was a worthwhile tool. I'm not sure I'd like to unhave FORUM. I mean it's very addictive; it's like DWIM at BBN that corrects spelling errors. It's something that you could live without for all your life, but after having it you don't want to unhave it. It's really nice to have it correct your spelling errors and other little sillinesses. It means that, like DWIM, I think there is a lot that could be added; I like it--just give me more! And that's how I feel about FORUM."

"It went smoother when we broke it up into groups. The level of transfer of info between groups fell off, but the groups were productive within themselves."

"Within my own group, I only relied on the hard copy transcripts. On the other hand, I spent about half an hour a day reviewing the other group sessions on the terminal. It was a very good way of catching up."

"I don't think the subgroups could have worked interactively within FORUM. It is too slow. There is no blackboard. It would be too detailed and things change much too fast. (The problem we were dealing with was the definition of a program within an ill-defined areas.)"

"The stuff talked about in FORUM was much more productive. What happened was you could have small meetings, and then type into FORUM and everybody else could see it."

"I didn't see too many individual things going into FORUM which hadn't been tested out in face-to-face meetings. A lot of what went into FORUM was well filtered by individual group meetings. Occasionally somebody would put in a response, but the things which were put in were usually well hashed out in group meetings."

"In general, when we talked to each other, we talked face-to-face."