

Meeting through your computer

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made easy through computer-assisted conferencing**

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As you read this article, 15 scientists from the U.S. Geological Survey (USGS) and three Energy Research and Development Administration (ERDA) National Laboratories are meeting to discuss modeling the impact on several western states of strip and underground mining, new power plants, and other schemes for energy extraction. At another meeting, several administrators from USGS offices in Menlo Park, Calif., and Reston, Va., are evaluating a contract proposal. At a third meeting, econometricians and other specialists are exploring the problems associated with the various approaches to modeling the U.S. economy.

What makes these conferences worthy of mention is that they have been underway for several months now and nobody has had to rush for airplanes or otherwise interrupt a busy workday to attend. Although the participants are hundreds or thousands of miles apart, they have been able to remain comfortably in their offices and converse with their colleagues—when they find it convenient to do so—via computer terminals and digital communication networks.

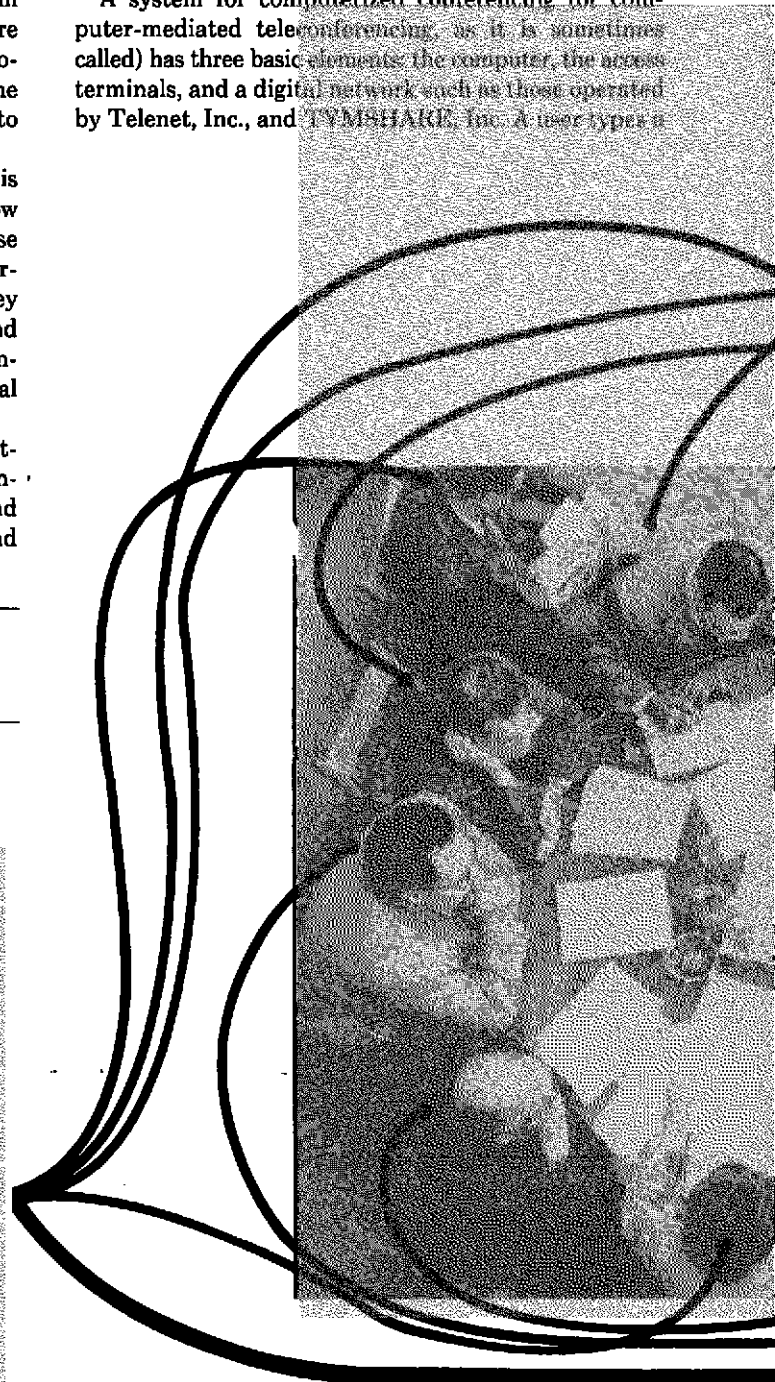
These meetings are among the first tests of "computerized conferencing," a new telecommunications technology that may eventually become as omnipresent and influential as the telephone in offices, laboratories, and

homes. It can bring about significant changes in the way engineers and other professionals work with one another, for computerized conferencing may be one of the most effective tools yet devised for coordinating the efforts of individuals in an engineering project, as well as for the management of the project.

A system for computerized conferencing (or computer-mediated teleconferencing, as it is sometimes called) has three basic elements: the computer, the access terminals, and a digital network such as those operated by Telenet, Inc., and TYMSHARE, Inc. A user types a

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message into the terminal and, when any necessary editing is completed, it is sent over the telephone to a host computer. There a number is assigned and the entry stored. The entry may be read at the recipient's terminal immediately, or days or weeks later—until it is purged from the computer's memory.

In a limited sense then, computerized conferencing can be viewed as a written version of the telephone conference call, except for the important advantage that each conferee can now select the time when he or she wishes to send or receive. For this reason, consider the metaphor of a giant blackboard that every participant can reach with a long piece of chalk—the chalk, of course, being the person's terminal and data link. The blackboard can be divided into "spaces," which participants use in the following ways:

- *Messaging.* A *private* space where an individual may "whisper" to anyone else in the conference. Private messages can be delivered when the addressee signs on; the sender can receive confirmation of the time and date of delivery, and the message is immediately purged from the computer's memory.
- *Conferencing.* A *common* space where a group (usually

between five and 50 people) can hold a common discussion on a topic and maintain a proceedings for later reference. Conferencing may be simultaneous, meaning that the persons engaging in the exchange are on the system at the same time, or delayed, meaning that they enter and retrieve materials at their own convenience. Conferences may stretch over weeks, or even months. Whenever people join an on-going conference, the simple act of "signing on" will bring them a complete transcript of the entries that have been made in their absence.

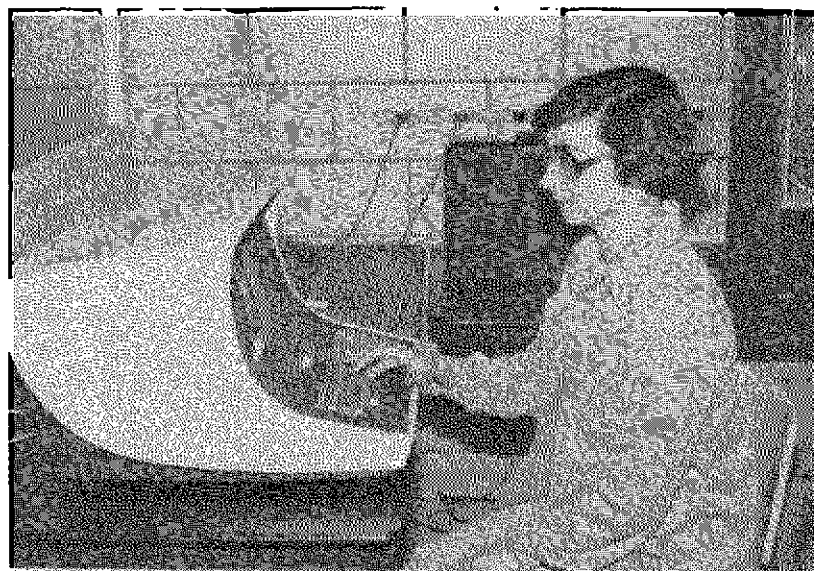
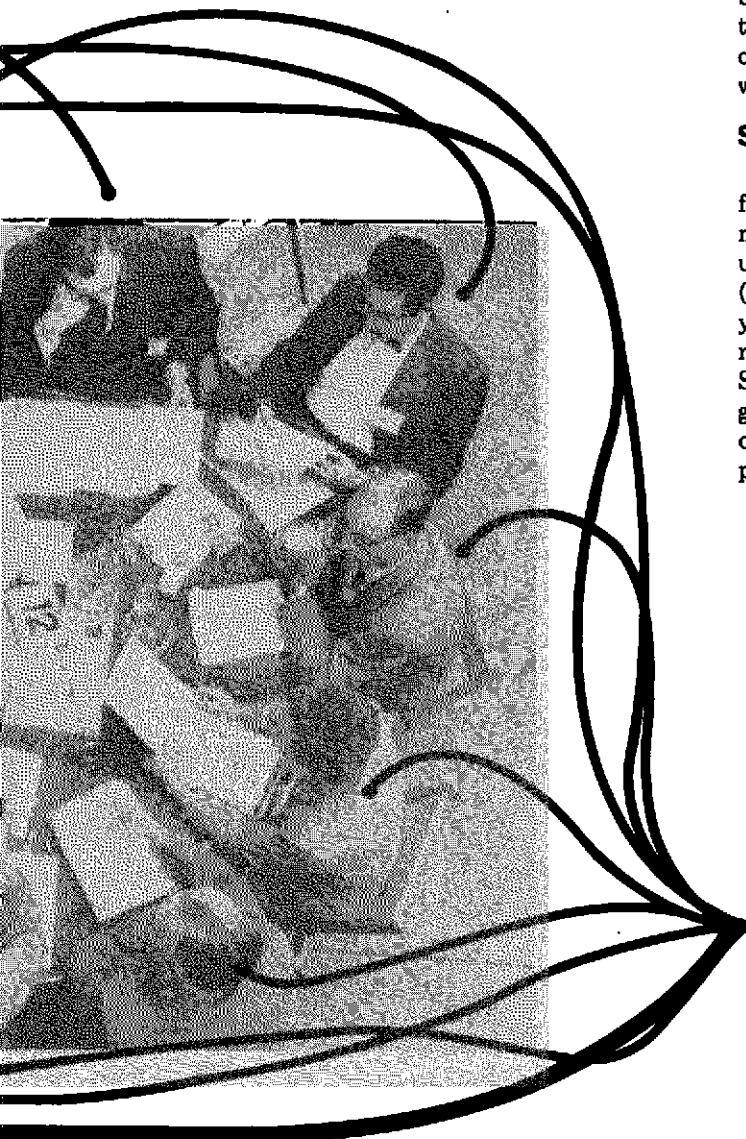
- *Notebooks.* A *personal* space for leisurely composing and revising material an individual might later wish to transfer to other parts of the system as entries. Pages of the notebook may be left open for others to read, or to write in as remote coauthors. Present systems permit storing thousands of typewritten lines in an individual's personal part of the computer memory.

- *Bulletins.* A *public* space for reports and newsletter-type items. Think of this as an on-line minijournal that enables the contents of a scientific paper or announcements of special events to be disseminated to interested members of the technical community without the delays associated with printed journals.

In addition, there can be a text-editing system that allows users to revise or rearrange material they either are preparing to enter or to have printed out. There also can be indexing, which allows entries to be searched and retrieved in a number of ways, including by topic, author, or date of entry, or as items that have been associated with an earlier item at the time of entry.

Systems in use

One of the earliest systems designed to perform these four functions—called EMISARI (Emergency Management Information System and Reference Index)—was used by the U.S. Office of Emergency Preparedness (OEP) starting in 1971. During the wage-price freeze that year, EMISARI monitored the data from some 40 terminals at OEP regional offices, the Internal Revenue Service, and the State and Treasury Departments. It greatly facilitated the gathering and analysis of statistics on complaints and inquiries, as well as the holding of policy meetings by anywhere from 30 to 100 people to



determine how the wage-price regulations should be applied in specific cases. Later, it was used by the Federal Preparedness Agency to monitor a voluntary petroleum-allocation program, the 1974 truckers' strike, a sudden shortage of chlorine that occurred for a few months in 1975, and similar situations. The total EMISARI package now known as RIMS (for Resource Interruption Monitoring Systems) still represents the most significant attempt to design a tailored human communications structure onto a computer system.

Among the other computerized conferencing systems in use today is the Institute for the Future system, called PLANET/FORUM. This is a relatively simple system, designed principally for conferencing and messaging. It uses a DEC PDP-10 computer and the TYMSHARE and Telenet networks. The thrust of the institute's work has been to evaluate computerized conferencing as a new medium, and to this end it has coordinated more than 50 such conferences, ranging from simple staff meetings to six-month discussions. Several hundred people—from the institute, various universities, and Government organizations such as USGS, the National Aeronautics and Space Administration (NASA), and ERDA—have already participated in these conferences.

PLANET/FORUM actually uses only a small part of a large time-shared computer system, but other computerized conferencing systems have been designed for use with smaller dedicated computers. Thus, the New Jersey Institute of Technology (N.J.I.T.) EIES system (see box on facing page) uses two INTERDATA 7/23 minicomputers. Access to EIES is provided via Telenet network ports.

What computerized conferencing costs

Strictly from a cost standpoint, computerized conferencing has justified itself over both face-to-face meetings and telephone calls. Because conferees can read and type independently, at their own speed, a typical group is able to pass more material among themselves in a given period or, equivalently, to reduce the time spent communicating verbally. An Institute for the Future analysis of a NASA technology assessment conference held between August 1975 and March 1976 with PLANET/FORUM revealed that the cost per user hour was \$26, of which \$16.33 was the hourly charge for the network connection (\$10) and computer usage. As the conference turned out, this meant some 35 NASA researchers were able to participate for less than \$100 per user per month.

At the \$8/hr typical of EIES (\$5 for the computer operation and \$3 for the average Telenet charges), ten people in the same building whose time is worth only \$9/hr would find it cheaper to sit down at their computer terminals than to go into a conference room and talk.

Meeting by typewriter

There are more subtle, and probably more significant, differences than cost between a computer conference and the face-to-face meeting, however. Consider the following aspects of the traditional group decision-making process (readers desiring supporting data should refer to the reports cited under "For further reading").

- Evidence exists that people who are "fast on the draw" in a face-to-face verbal situation, and who may not be particularly intelligent or correct, tend to dominate the discussion and decision-making process in small groups. Indeed, the more talking people do, the more likely they

are to be perceived as leaders.

- Leaders are sometimes inhibited in bringing up risky options for fear of losing face if rejected. Similarly, young or low-ranking members of a group are often unwilling to oppose the leader in a face-to-face discussion.
- Groups tend to get "hung up" on a topic, going over the same ideas rather than turning to new approaches. Often considerable time is lost at the beginning of a meeting in simply finding out what the issues are and "where everybody is at."
- When the hour gets late and people are tired or eager to leave, important decisions can get railroaded through without receiving the attention they deserve.

By permitting anonymity and leisurely reflection, computerized conferencing does not suffer from these drawbacks. Thus, we believe—and experiments are underway to demonstrate this—that computerized conferencing will provide a better means of considering complex technical issues, of ensuring that all the relevant facts and problems are brought out in the open, and so on. When one reviews the literature of unsuccessful engineering projects such as the Mohole drilling venture, or some of the projects described in the special "What went wrong?" issue of *Spectrum* (Oct. 1976), it is hard to escape the conclusion that an effective channel for group problem-solving was often lacking, one that might well have been provided by computerized conferencing.

Computerized conferencing, of course, is not without its own problems. The most obvious are the need for typewriting and the lack of the eye contact, facial expressions, gestures, and verbal intonations that lend so much richness to face-to-face and even telephone conversations. Also, Robert Johansen, Jacques Vallee, and Michael Palmer, of the Institute for the Future, have reported that their experience to date with PLANET/FORUM users suggests a few other troublesome aspects: a skepticism on the part of participants about using the medium for "delicate" interpersonal topics, the "striking necessity" for a strong discussion leader, and the need for users to be strongly committed to regular participation. "While computer conferencing makes more equal participation rates possible, it can also make it easy for busy participants to become undisciplined in their group participation," they caution.

Insofar as typewriting is concerned, engineers and others who feel they are not especially good at typing—or at writing in general—are hesitant about computerized conferencing. However, this hesitancy seems quite dependent on the atmosphere of the conference. Poor typists will obviously participate less actively in a conference where they feel constrained to produce perfect copy than they will in a more informal one. In our experiments at N.J.I.T., we have observed that as people gain confidence with the system and learn that this mode of communication need not be as rigorous as preparing a paper for publication, their inhibitions about writing are moderated. We have frequently observed new users, who at first sent such panicky messages as "Help, what do I do now?" (in response, say, to a command to "please review"), comment after 10 or 15 minutes, "Hey, this is fun." It is not long before they are sending drafts of "manuscripts" without worrying about spelling errors.

There is, in fact, a loss of verbal richness, and one of the questions yet to be answered about interaction via computerized conferencing is whether or not it can adequately substitute for daily face-to-face conferences with co-

Inside EIES

The EIES (Electronic Information Exchange System), developed at the New Jersey Institute of Technology with support by the National Science Foundation Division of Science Information Services, permits geographically dispersed groups of scientists and engineers to exchange information rapidly on research advances and problems of mutual interest. Currently, the system serves 200 people via 16 Telenet and eight local Newark ports.

Since becoming operational on an experimental basis in October 1976, EIES has been used for some 45 conferences with an average effective size of about 14 people. As of March 1, 1977, 3300 messages were being sent per month, with each message averaging a little over 200 words and going to between two and three people. At this stage, we have already observed a considerable amount of crosstalk as individuals joining for one purpose find other activities of interest. This normally occurs through use of the on-line directory or third-party introductions.

EIES was designed for maximum flexibility and ease of use, rather than for the utmost "efficiency" in terms of computer time. For instance, EIES has the complete messaging, conferencing, notebook, and bulletin features, as well as a directory of participants and groups of participants, a powerful text-editing system, and a voting system by which, besides casting a simple "yes-no" vote, a participant can indicate desirability, feasibility, or probability. The system is segmented so that a user need learn only those features he or she wishes to use at the time. Thus, the user can make productive use of the messaging, conferencing, and bulletin features within about 30 minutes of first joining the system; the more advanced features may be learned if and when the need arises.

EIES is also "forgiving"; nothing a user can do will hurt the system—if a mistake is made, the user will simply be asked to try again. Several modes of interaction are provided, ranging from a simple "menu" selection of options ("Notebook," "Conference," etc.) for the novice user to the capability to write and store one's own instructions for the experienced user. For example, people who participate regularly in several conferences can store a sequence of operations that will allow them—with only one command—to receive transcripts of the entries made since they last participated in the different conferences. In this way, they can decide which conference they wish to rejoin

without having actually to log in and out of each one.

Two INTERDATA 7/32 minicomputers, each connected via a separate disk controller to a DIVA DD/32 dual-disk system with more than 200 million bytes capacity, are the main hardware components. Only one of the minicomputers is used to operate EIES. The other minicomputer is for research and computer science education, but it can take over operation of EIES if a problem develops with the other processor.

Minicomputers were chosen for EIES because they:

- Provide computer-communication services at a third or less of the estimated cost of current commercial time-shared systems.
- Allow a predictable response rate for the user at the terminal by having everyone use the same software package. (Depending on the complexity of the task being performed, the computer may take between 1 and 15 seconds to respond to an input.)
- Provide the reliability and security that individuals need and expect from a communication service.

The software is based upon round-robin service doctrine, where service is given up by a user whenever an I/O (input/output operation) is executed. The "intelligent" I/O routine passes control to a scheduler, which chooses the next user in turn who is not waiting for an I/O service operation to be completed. At certain places in the program, virtual I/Os are used to ensure that no unfair allocation of service can occur. The result is a multiuser system regulated by events rather than time slicing, an arrangement that appears to be efficient for a system that is communications rather than computationally oriented.

One interesting special feature is the incorporation of Hal Zilog, a microprocessor that can respond to messages from other conferees with a host of special analysis and display graphics routines. Hal also operates his own dialer and can phone other computers to obtain information to send back from data bases or models located anywhere else. This allows the conference system to become a focal point for a group utilizing a variety of computer systems for some common objective.

The EIES system represents approximately \$200 000 worth of computer hardware and at that price range could be considered by many medium-to-large organizations as a vehicle for setting up their own dedicated systems.

workers in terms of satisfying the social-emotional needs of the participants.

However, on the basis of the admittedly limited experience to date, we suspect that the drawbacks will be compensated for by the advantages that stem from anonymity and also through the intriguing ways in which users learn to carry on the same informal social interaction as in a face-to-face meeting. For example, when someone enters an ordinary conference, people usually stop the discussion briefly to greet the newcomer, introduce themselves, and say a few pleasant words that will make the person feel comfortable participating. Computerized conferencing has built-in cues to replace the usual visual cues. When a person joins the system, those who are already on receive a notification that the person is "now joining"; likewise, they are notified when a person signs off and is no longer "there." Often a person already on the system sends a private "Hi" to the newcomer, adding something like "How's the smog in L.A. today?" And, just as any extended face-to-face meeting has its coffee breaks and lighter moments, so computerized conferencing systems tend to build in special conferences, open to all, such as a problems and complaints conference to let off steam, or a jokes and graffiti conference for di-

version. Two current entries on EIES and a poem from EMISARI, written during the wage-price freeze, will convey the flavor of these moments:

"On a clear disk, you can seek forever."

"Computerized conferencing is a terminal illness."

Ode to the Wage-Price Freeze

Egad! said Nixon,

Economy's a mess, needs fixing.

I think I'll have a wage-price freeze.

To OEP I'll resort.

Charge! said Lincoln, Report! Report! Report!

(Note: General Lincoln was Director of OEP.)

Applications to engineering management

Besides generally improving the effectiveness of information exchange among scientists and engineers, we believe there are three specific situations in which, by creating a new kind of communications network or structure, computerized conferencing will greatly facilitate managerial functions that are now very difficult.

Crisis management. Your general manager and three other executives suddenly quit . . . a wildcat strike of assemblers jeopardizes delivery of vital parts . . . an important customer has just rejected your first shipment.

Such major and unexpected events in the routine of an organization are crises. Robert Kupperman, Richard Wilcox, and Harvey Smith, who encouraged the development of EMISARI for dealing with crises at OEP, have emphasized that such crises are distinguished by extreme unpredictability with respect to the amount and importance of readily available information. Consequently, most conventional information systems are inadequate for the task.

Crisis management requires:

- Factual information from many sources.
- Value judgments from key individuals.
- Discussion on proposed alternatives and the ramifications of the suggested alternatives.
- Anonymity in voting or discussing such issues so that middle managers do not feel inhibited in criticizing the ideas of their superiors.
- A way of determining the general consensus within a short period of time when a decision must be reached.

EMISARI has demonstrated that computerized conferencing, with its ability to structure and categorize the information flow quickly, can clearly fill these needs. Richard Wilcox, who used a descendent of EMISARI when he had to report twice daily to the White House during the 1974 truckers' strike, points out that the typical MIS is highly structured and designed essentially for one-way communication from the field to headquarters. In a crisis, the advantage of computerized conferencing is its flexibility, he says. "Headquarters can communicate quickly back to the field, saying, for instance, 'The guidelines have changed, forget the Table 3 we asked you for yesterday, today we need the following information instead.' This request can, in turn, be questioned and perhaps modified through rapid communication with many people simultaneously."

Delphi conferencing for planning and forecasting. The Delphi method involves a structured series of questionnaires about probable future developments and possible plans for dealing with them that are administered to a group of "experts," usually from outside as well as inside the organization. Possible developments are rated according to their probability and desirability, and the answers, comments, and options generated by the participants are fed back anonymously after each round. The results are then used to generate another set of issues and projections, or are used as the basis for further discussion or voting, until a consensus or stability of position is reached. Automating the whole procedure by means of a computerized conference obviously can speed the process greatly. It can also facilitate the participation of many people from all parts of the organization without the expense of bringing them to the same location in order to avoid dragging the rounds out over several months.

Managing dispersed task groups. In an article entitled "Beyond bureaucracy," the noted management authority Warren Bennis predicted that in the future organizations will be based upon "adaptive, problem-solving, temporary systems of diverse specialists, linked together by coordinating and task evaluating specialists in an organic flux." How can this be reconciled with the increasing resistance of executives and their families to endless transfers from one location to another? We believe that one of the most profound impacts of computerized conferencing will lie in its capability to allow geographically dispersed people to work together as if they were in the same office.

Engineering management by computerized conferencing: a scenario

It is 7:30 a.m., and the smell of the bacon frying in the kitchen finally entices Joe out of bed. He is going to work in his study at home today, using his computerized conferencing system, so there is no need to get up at 6:30, grab a quick cup of coffee, and get out on the thruway.

"Good morning, Dad," says daughter Jill, popping her head in the bedroom door. "Can I see what's on the terminal, please, please?" Jill is ten and frequently vies with 12-year-old Jeff for the privilege of signing in the conference system and retrieving entries for Dad.

"Sure, Jill. Please take delivery of all messages, and also get me a copy of the Bulletin for today." The Bulletin is a daily on-line paper distributed to all middle- and top-management personnel in the company.

After Jill enters her father's user code, she receives the following inquiry from the computer:

Welcome to EIES 10/26/76 7:37 a.m.

Last active: 10/25/76 10:32 p.m.

Waiting:

2 private messages

1 group message

4 confirmations

Accept private messages (Y/N/#)? Jill types Y.

M37 John Hill 10/25/76 11:32 p.m.

Joe, don't forget that I will be in Chicago tomorrow. I am taking my terminal but probably will not sign in until the late evening.

CC: Smith, Jones

M43 Esther Smith 10/26/76 6:47 a.m.

Will arrive at 9:30 Friday in Newark for the Marketing Modeling Meeting. Will plan to take a taxi and should be there by ten. With all of the things we've worked out already on the conference, I assume that the meeting will be over by two and I can tell my family that I'll be back in Washington for dinner. What's your estimate?

Accept group messages? (Y/N/#)? Y

M68 John Hill

To: R&D Management Group

If you really want to beef up the new coating project, you're going to have to drain off about \$20 000 from other items. That's the best I can do on the current budget. The figures have to be finalized Friday because it goes in the computer and then it's in concrete short of a presidential directive.

M70 Abe Carter

To: R&D Management Group

Surely we can squeeze \$10 000 of what John wants out of Joe's projects. I don't see the need for some of the increases he has requested.

(How's that for ruining Joe's breakfast?)

Just how crucial this can be is evident from several studies that reveal that even within an organization the frequency of technical discussion tends to decrease exponentially with distance. Arthur Gerstenfeld has written: "We find that the telephone is seldom used for technical discussions, and colleagues on other floors might as well be in other states." (In a study of the causes of failure in R&D projects, Mr. Gerstenfeld cited "the lack of meaningful interaction between the marketing and R&D groups" as the most prevalent explanation for the high percentage of nontechnical failures.)

Computerized project management conferences would provide a written record of all specifications, changes, clarifications, and suggestions that took place, in addition to providing complete accountability, if ever needed.

For further reading

Readers desiring more on potential applications to engineering management are referred to M. Turoff and J. Scher, "Computerized conferencing and its impact on engineering management" (presented at the October 1975 Annual Joint Engineering Management Conference, Washington, D.C.) and R. Kupperman, R. Wilcox, and H. Smith, "Crisis management: some opportunities" (*Science*, Feb. 7, 1975, p. 404). Arthur Gerstenfeld's research is reported in *Effective Management of Research and Development* (Reading, Mass.: Addison Wesley, 1970), and Warren Bennis's article "Beyond bureaucracy" appeared in *Trans-Action*, July/Aug. 1964.

Pertinent aspects of group problem-solving, including the perceived relationship between talking and leadership, are examined by S. R. Hiltz, in "Communications and Group Decision-Making: Experimental Evidence on the Impact of Computer Conferencing," (Report No. 2 of N.J.I.T., Computerized Conferencing and Communications Center, 1975), and "A social scientist looks at computer conferencing" (*Proc. Int'l Computer Communications Conf.*, Toronto, Ont., Canada, Aug. 1976).

For more on the Institute for the Future's experience with PLANET/FORUM, see: R. Johansen, J. Vallee, and M. Palmer, "Computer conferencing: measurable effects on working patterns" (paper presented at the National Electronics Conference, Dallas, Tex., Nov. 29, 1976); J. Vallee and T. Wilson, "Computer-based communication in support of scientific and technical work" (final report to NASA, Mar. 1976); J. Vallee *et al.*, "Group communication through computers" (three vols., Oct. 1975).

A report on Bell-Northern's CMI experiment appeared in the company's journal *Telesis* (G. Millard and H. Williamson, "How people react to computer conferencing," Aug. 1976).

Cost is examined in detail in M. Turoff, "The cost and revenues of computerized conferencing" (presented at the 1976 ICCO meeting, Toronto).

An unpublished paper entitled "Computer-mediated communications and the disadvantaged," by S. R. Hiltz and M. Turoff, is available by writing to them at N.J.I.T. The Delphi method is covered in H. Linstone and M. Turoff, *The Delphi Method: Techniques and Applications* (Reading, Mass.: Addison Wesley, 1975).

There would also be a significant impact on the manager's ability to regulate his own time, and to be fully involved in more than one task force at once. With computerized conferencing, it is up to the user to choose when he or she wishes to review the new items and make contributions, rather than being a slave to the ringing telephone and the meeting scheduled at someone else's convenience.

Betsy Yount is a geologist with the U.S. Geological Survey who has been using PLANET/FORUM for nearly two years to confer with 20 other colleagues in a Congressionally mandated program to appraise the mineral potential of Alaska public lands. She says that with most of the Alaska branch geologists located at Menlo Park, and the USGS geochemists who do the analyses based in Denver, Colo., PLANET/FORUM has proved better than the telephone as a "bulletin board" for sending messages and keeping records. "It's very hard for us to get in touch with one another because people are in and out of their offices, and the time difference [one hour] makes it awkward. With PLANET/FORUM, you just enter the message once and can walk away assured it will get through; you don't have to keep calling back to get people in their offices."

Another USGS scientist, Gerald Askevold, may well

prove the forerunner of an increasingly large number of professionals who, we anticipate, will be eager to work from their homes once computerized conferencing becomes routine. Mr. Askevold works half-time for the USGS Office of Resource Analysis from his home in Ketchum, Idaho, via PLANET/FORUM. From the terminal in his study, he currently: supervises staff members in Menlo Park who are creating an Alaskan mineral resource data base; confers on administrative problems with USGS personnel in Reston, Va.; prepares a paper with a coauthor from the Institute for the Future (in Menlo Park); and participates periodically with several other USGS staff members in a contract proposal evaluation conference that has been underway since September 1976. Gerald Askevold says he has found the day-by-day record of his activities that his computer transcript provides to be a much more effective reminder of his activities and responsibilities than if he had only the telephone and the mail to rely on. However, he also says there are times at the terminal when he experiences a tremendous energy drain. "It forces me to concentrate harder than I would normally," he says.

The functioning of interindustry, intercompany, and professional society working committees or special-interest groups could also be greatly enhanced with computerized conferencing. (The IEEE Standards Office is currently considering using computerized conferencing for collecting failure rate data on components used in nuclear plants.) Relying only on mails and telephone, it is virtually impossible for a geographically scattered group to reach conclusions, agree on wording, and publish a polished report, without the effort either being concentrated in one or two people who dominate the proceedings or having it default to the one with the most clerical support.

Sam Scheele, of Social Engineering Technology, is directing a research effort for the Office of Environmental Education that involves a project team of about 30 people spread across the U.S. He believes the ability to coordinate such an effort has been considerably improved by the team's current use of EIES. A similar example of project coordination is the use of EIES by members of the 1977 National Computer Conference Steering Committee.

Computerized conferencing may also prove a much more effective means of getting people from different disciplines to "listen" to one another than the usual interdisciplinary symposium. This is one of the main reasons why the EIES system is being tried for a conference on national modeling now underway between Massachusetts Institute of Technology experts in the system dynamics approach and econometricians and others experienced in large-scale modeling. Dale Runge, assistant professor of management at the M.I.T. Sloan School and coordinator of the conference, explains that these are "distinctly different paradigms with very clear differences in the way they approach such basic questions as how one validates a model. With that sort of gap, the communications problems are awesome, and even when background papers are prepared in advance, people tend to talk past one another, with no real understanding of what's been said. In contrast, with computerized conferencing there is ample opportunity for people to read and reflect, and to question one another, without having to rely on memory or faulty hearing. There is a much better chance of understanding what the different sides

When satellite launch was delayed

A teleconferencing experiment between NASA Ames Research Center and the Institute for the Future, using PLANET-I, produced the following entries during the difficult period that followed successive postponements of the launching of the U.S./Canadian Communication Technology Satellite.

[96] Lumb 13-Nov-75 9:15 AM

Hunczak. To answer your questions of yesterday. For experiments 16, 17, and 18, the subcarrier frequencies we have hardware for in the analog FM TV mode are 5.14, 5.36, 5.79, and 6.2 MHz.

For experiment 16, 17, 18, the ARC transmit frequency is 14.2471666 GHz.

For experiment 4, the ARC transmit frequency is 14.0521666 GHz with a 25 MHz subcarrier service channel.

[97] Kaiser 14-Nov-75 9:00 AM

This one is for whoever from NASA is looking. I am working on the link budget calculations for the tech. managers meeting. I have some of it done; the rest will follow. Kim.

I see from the latest entries that people are watching this.

[333] Lew 12-Jan-76 2:47 PM

To all

In view of the short turnaround between the time that the decision is made (anticipated at noon EST, January 13) and a launch as early as 1821 EST, January 16, it is suggested that all PLANET folk check into PLANET on an hourly basis on January 13, 1976, starting at about 1000 EST.

From J. Vallee and B. Gibbs, "Distributed management of scientific projects" (*Telecommunications Policy*, p. 75, Dec. 1976).

are saying." For these reasons, Prof. Runge is hopeful that when the conference ends (possibly a year or more from now) the participants will feel a sense of accomplishment almost impossible without EIES.

More generally, computerized conferencing can facilitate the overall decentralization of information exchange and decision-making. The home office, for instance, might become much more of a supplier of services to relatively autonomous units of the organization.

Bell-Northern Research found that in a recent conferencing system field trial with personnel from the Canadian Post Office, a private business firm, and Bell Canada, managers and their secretary/typists quickly picked up the ability to use the system for sending messages, and that they liked its friendliness and availability. (One of the first dedicated minicomputer systems, it asks the name, rather than account code, of a person signing on. The system, known as Computer Mediated Interaction, understands commands in either French or English, and also keeps track of what a participant in a number of simultaneous conferences has seen. When that person returns to any one conference, he or she will be advised "60 messages since you were on; do you want them all?") At the height of the three-month trial, some 80 people across Canada were using CMI. It reportedly worked well in dealing with a major interruption in mail service. People were able to quickly exchange ideas on what they thought had gone wrong and what they might do to correct it.

Research directions

The National Science Foundation (NSF) Division of Science Information Services is now inviting research

groups in engineering and the natural and social sciences to submit proposals to demonstrate whether or not their use of EIES will improve their ability to exchange research information. Such groups will generally consist of ten to 50 people geographically dispersed throughout the U.S. and engaged in research in the same specialty area.

Among other assessment efforts, the Institute for the Future is midway into a two-year project to measure the effect of computerized conferencing on the working patterns of small, geographically dispersed groups doing energy research.

As a result of such assessment projects, within the next few years a fairly detailed picture should be available of the effects of computerized conferencing systems upon work patterns. While certain endeavors such as engineering project management seem well-suited to computerized conferencing, there are other areas—such as scientific productivity—where many years may be required to assess the impact.

Meanwhile, among the necessary advances in the technology of computerized conferencing, there is an obvious need for a "human communications language" that will enable a nonprogrammer to design and specify a communication structure for computerized conferencing in one to two weeks. Present systems represent many person-years of software development effort, which severely limits the introduction of such systems to large-scale and long-term projects. A major effort aimed at designing such a programming language is underway at N.J.I.T., with support from the National Science Foundation Division of Mathematical and Computer Sciences.

There is also a need to make graphics available to users of conference systems. At N.J.I.T. we are attempting to do this as part of a program sponsored by the HEW Office of Education to develop a computerized conferencing system for people involved in environmental education. The system would make such enormous graphics as network diagrams and relevance trees available on computer-output microfiche, and it would allow participants to send graphs, histograms, or outline drawings by simply typing in the necessary data. Obviously, this kind of capability would greatly increase the value of the system for engineering and scientific users. ♦

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LEARNING THE LIMITS OF TELECONFERENCING:
DESIGN OF A TELECONFERENCE TUTORIAL*

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A growing number of optimistic articles on the promises of teleconferencing have piqued the public's interest in new electronic media for small group communication. Yet, there exists a considerable gap between teleconferencing research to date and practical application. Bridging this gap requires accelerated development of organizational techniques to facilitate real-world applications of teleconferencing systems. At present, even "trying out" teleconferencing is often difficult.

Trying Out Teleconferencing

One organization which is trying out the new teleconferencing technologies is the Charles F. Kettering Foundation of Dayton, Ohio, U.S.A. The Kettering Foundation is a nonprofit organization concerned with devising ways for diverse individuals and institutions to come to grips with several major social problems. Its activities are currently focused on program interests in elementary and secondary education, urban and international affairs, and scientific research into factors related to world food supply. Many of these program activities involve close collaboration with other groups in the United States and abroad and hence depend upon numerous conferences for development and on-going coordination.

Because of this orientation, the Kettering Foundation would seem to be a likely organization for practical tests of theoretical promises of teleconferencing. So two years ago, enticed by articles on teleconferencing in publications such as *The Futurist*,¹ the Kettering Foundation began to explore the new media to determine whether they could be applied to its program activities. This exploration resulted in a series of prototype computer-based teleconferences in 1976. The primary intent of these conferences was to give the Foundation's program staff direct exposure to one teleconferencing medium--to use it to meet established communications needs which were typically fulfilled through mail, telephone, and face-to-face meetings.

"The Beauty and the Beast"

Evaluation of these initial computer-based teleconferences reveals a number of paradoxical attitudes and perceptions about the medium. In a sense, the medium has been viewed as a "beauty-and-the-beast" technology.

For some users, for example, the comparatively narrow bandwidth of computer-based conferencing places a

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valuable limit on the range of communication--by accenting the cognitive and diminishing the affective. One individual interested in the Foundation's teleconferencing activities wrote:

Computer-based teleconferencing is a highly cognitive medium that, in addition to providing technological advantages, promotes rationality by providing essential discipline and by filtering out affective components of communications. That is, computer-based teleconferencing acts as a filter, filtering out irrelevant and irrational interpersonal "noise," and enhances the communication of highly-informed "pure reason"--a quest of philosophers since ancient times. In management, for instance, computer-based teleconferencing would filter out rhetorical malarky, and in politics, it would filter out demagoguery.

Such a view is typical of new users of computer-based teleconferencing, but it is probably an overly simple view. What one participant sees as "pure reason," may be seen by others as sterile. One participant in the Foundation's computer conference commented:

I missed not only the faces but the voices of people. Therefore, the ideas communicated really lacked a personal touch for me.

As we discovered in surveying and summarizing the results of social research on various teleconferencing systems,² the relative advantage of each medium depends on the context in which it is used. Hence, it is hazardous to speak confidently about the "strengths and weaknesses" of any teleconferencing medium without first considering carefully the environment in which it is applied. A strength in one situation can be a weakness in another.

Comparisons with Other Media:
They Can Be Misleading

To potential users, some attributes of various teleconferencing systems will resemble those of other communications systems with which they have had prior experience. At times, this similarity can facilitate the introduction to a teleconferencing system. But in other cases, it can be an obstacle.

For example, the Foundation has not progressed quickly in implementing prototype audio conferences. One reason is the antipathy toward ordinary conference calls and toward the Speakerphone®. Also, the telephone has historically been seen as (and marketed as) a person-to-person communications medium--not as a group communications medium. Most people have neither the inclination nor the skills necessary for effective group communication via audio teleconferencing. Coupled with the rather crude state of equipment generally available for audio teleconferencing, it is simply difficult to encourage this type of communication. The Foundation's experience points out that potential users' attitudes toward teleconferencing will be shaped

by prior experience with systems which are superficially similar but which, in reality, are quite different.

A Learning Problem

In its current stage of development and use, any form of teleconferencing represents an unknown to the vast majority of potential users. It stands apart from their accustomed way of communicating with one another. Even among those who initially express an eagerness to "try out the system," virtually all participants in the Kettering Foundation's conferences have reported some anxiety during their initial sessions.

What emerges from the experience of the Kettering Foundation--as well as comparable prototype application efforts--is the realization that teleconferencing truly does present an "altered state of communication." The ability to capitalize upon this new form of communication requires a new set of skills for conference leaders and participants alike.

These skills do not appear to be easily mastered through vicarious learning. Rather, only direct and somewhat adventuresome experience leads participants to become increasingly facile in their communication. While most can master the basic mechanics of teleconferencing within a few days of use, participants generally report that it takes them three to six weeks to feel totally comfortable with the medium. Only then do they begin to take the medium for granted and concentrate fully on the substance of communicating with their fellow conferees. Just as some persons are more effective face-to-face communicators than others, it seems that there are special skills for effective communication via teleconference.

These observations suggest we should focus on ways to help new users learn to communicate via teleconferencing media. Early anxieties and misconceptions must be overcome. A willingness to experiment with new media should be encouraged. Finally, means should be developed to allow new users to feel "at home" with the system before they must rely on it for their actual communication needs.

Learning from Social Evaluations of Teleconferencing

Only tentative generalizations about learning can be drawn from the social evaluations of teleconferencing to date. These evaluations have relied largely on laboratory experiments, often involving only two-person communication rather than small groups. Subjects typically have had very brief exposure (sometimes less than one hour) to the teleconferencing media they were asked to use and evaluate. While the tasks have usually been chosen to be representative of the "real world," they have necessarily been somewhat contrived, geared toward comparison of results. There are relatively few examples of people who have used teleconferencing systems over extended periods of time as a normal part of their work or social life.

Such brief exposure to teleconferencing media under the artificial circumstances of the laboratory can provide only limited information about learning to use these media effectively on a long-term basis. Laboratory studies, however, have served to open the door on this important area of research and to suggest basic variables which are important to track in long-term studies.* For purposes of this paper, we are most

*Our point is not to disclaim the value of laboratory experiments, but simply to point out that research must not be limited to laboratory experiments if longer range implications are to be understood.

concerned with those variables which relate directly to learning to use teleconferencing media effectively.

The beginning point for such a selection of key variables is to identify basic elements of group communication via teleconferencing. In earlier Institute for the Future research, these elements have been grouped according to five categories: properties of the medium, task, rules, person, and group.* These general groupings provide a structure for examining the literature on social evaluation of teleconferencing media, from which the following learning-related variables emerge:

- personal communication style (and history) of participants
- group task(s) to be performed
- group structure and leadership
- sense of social presence
- teleconference arrangements

Personal Style: Old Techniques in a New Environment

Personal communication style (and history) refers to those habits and experiences which individual participants bring to the teleconference. Everyone has, to some degree, a tested set of communication techniques. When exposed to a new communications medium, participants will generally carry some of these techniques into the new environment. The ease of this transition process will depend on both the specific communication styles of participants and the characteristics of the teleconferencing medium being used. For instance, participants can use computer-based teleconferencing according to their own schedules: they "join" a teleconference, see what has been said since they were last present, perhaps make comments of their own, and leave. Such a usage pattern might seem initially attractive to busy people, and, in fact, computer-based teleconferencing can work effectively in some situations where scheduling meetings would be very difficult. However, this same characteristic of computer-based teleconferencing--its potential for asynchronous communication--can grate against the communication styles and history of some potential participants. For example, those managers who work best by responding to interruptions will find that computer-based teleconferencing has no facility to "interrupt" them and call for their participation. There is no equivalent of a ringing telephone or a banging gavel. An "interrupt-driven" manager will thus have to restructure his communication habits if he is to make effective use of computer-based teleconferencing.

Each teleconferencing medium has its own characteristics which might "mismatch" the communication styles of potential participants. At a very subtle level, these mismatches might involve the way people form alliances in small groups or the way they bend protocol to their advantage. Individual cognitive styles may vary, too, and new media may place some stresses on styles developed for communication via other media. The point here is that personal communication styles are important to the ways in which people

*A taxonomy of specific elements under each of these headings is given in Robert Johansen, Richard H. Miller, and Jacques Vallee, "Group Communication through Electronic Media: Fundamental Choices and Social Effects," *Educational Technology*, August 1974, pp. 7-20.

respond to teleconferencing. While the specific characteristics of each medium are only beginning to be understood, this interface with past experience will be crucial to the ways in which people learn to use teleconferencing.

Group Tasks: Which are Medium Sensitive?

Once a communications process begins, group tasks are perhaps the most visible factors which affect the learning process. And the perceived importance of the task to the participants is basic: without a high need to communicate, problems are likely to arise no matter what medium is used. It therefore seems appropriate to assume that learning will be faster if the task at hand is perceived as important. Beyond this almost self-evident (but often avoided) assertion, it also seems important to consider the complexity of the tasks to be pursued. Connors, Lindsey, and Miller suggest the general principle that the more complicated the task, the more the visual channel is likely to be perceived as necessary.³ Hammond and Elton note that video is better than audio when reactions of others must be carefully noted.⁴ These findings, while still tentative, imply that the complexity of the task at hand will be an important factor in the success or failure of a teleconference--especially if new users are involved. The general wisdom seems to be: if it is important to form a complex image of other participants, then video or face-to-face is likely to be more desirable than audio or print (computer-based) teleconferencing. However, it may be possible to develop special strategies to allow the effective use of "narrowband" media for complex tasks.

Williams and Chapanis, in a survey of experiments involving teleconferencing media comparisons,⁵ conclude that the following tasks show no media effects: "information transmission" (simple information transfer, such as the contents of a business letter), simple "problem solving," "generating ideas," and "interviewing." Williams and Chapanis also identify the following tasks which do seem to be affected by variations in communications media: "getting to know someone," "persuasion," "negotiation," "detection of lying," "coalition formation," "balance between cooperation and conflict," and "obedience." In the experiments on which these findings are based, the tasks were specific laboratory assignments made to subjects under experimental conditions.

The implication of these findings for learning to teleconference is that some tasks are likely to present more problems than others. (Indeed, tasks such as persuasion and negotiation often present difficult problems no matter what medium is used.) The laboratory experiments have shown that media effects occur when subjects are exposed to teleconferencing for brief periods of time. They certainly have not proved that people cannot learn to use teleconferencing media effectively for tasks such as bargaining, negotiation, and other complex tasks.

Group Structure: A Strong Leader Helps

The problems of group structure and leadership may also be affected by the quality of training in the use of teleconferencing. However, it seems likely that some group structures will work better in teleconferencing than others. Also, whenever a group is involved in any new experience, strong leadership is likely to ease the learning process. What is not clear is how long this need for guidance continues after the initial learning process is over. Is there an inherent need within teleconferencing for stronger leadership than in face-to-face meetings, even when the conferees are experienced? The evidence at this point is mixed. One

field experiment found that the time spent in maintaining group organization is higher for both audio and video conferencing than for face-to-face.⁶ However, a series of laboratory experiments at Carleton University concluded that video teleconferencing promotes a sort of "unorganized informality" which does not require strong leadership.⁷ In evaluations of computer-based teleconferencing, the general feeling is that there is a need for strong leadership--probably even more than in a comparable face-to-face meeting.⁸

Social Presence: Medium Characteristic or Social Skill?

The sense of social presence provided within a teleconferencing medium will also have important effects on the new user. Several studies have noted an initial preference for face-to-face over both video and audio teleconferencing,⁹ presumably because of the greater familiarity and sense of social contact. Short, Williams, and Christie, in a major book on social evaluation of teleconferencing, view social presence as inherently linked to each particular medium:

Although we would expect it to affect the way individuals perceive their discussions, and their relationships to the persons with whom they are communicating, it is important to emphasize that we are defining Social Presence as a quality of the medium itself. We hypothesize that communications media vary in their degree of Social Presence, and that these variations are important in determining the way individuals interact. We also hypothesize that the users of any given communications medium are in some sense aware of the degree of Social Presence of the medium and tend to avoid using the medium for certain types of interactions; specifically, interactions requiring a higher degree of Social Presence than they perceive the medium to have. Thus, we believe that Social Presence is an important key to understanding person-to-person telecommunications.¹⁰ (emphasis added)

Even if one assumes that social presence is inherently linked to each particular medium, there is some question about the uniformity of perceptions of social presence. As indicated earlier, a print-based medium may appear to lack social presence for some; others, however, find in it a strong sense of interpersonal contact.* Perhaps the sense of social presence can be cultured by teleconference leaders or encouraged by initial learning sessions. At any rate, it seems doubtful that "social presence" is a static variable welded unwaveringly to each teleconferencing medium. Rather, we hypothesize that social presence can be influenced directly by skilled teachers and leaders--though certainly basic constraints will be associated with each teleconferencing medium.

Teleconferencing Arrangements: As Important as Meeting Hall Arrangements

As with meeting rooms for face-to-face conferences, the physical arrangements of the teleconference rooms are crucial to the communication which evolves. The principle is simple: put people in a stiff, formal

*This sense of social presence has been documented for several conferences in Jacques Vallee and Robert Johansen, *Group Communication Through Computers*, Volume 2, Institute for the Future, Menlo Park, California, U.S.A., Report R-33, 1974; also Philip Spelt, "Evaluation of a Continuing Computer Conference on Simulation," *Behavior Research Methods and Instrumentation*, Spring 1977.

setting, and they are likely to feel (at least a little) stiff and formal. Beyond this effect of formal surroundings, the technical quality of various facilities can also influence communication. Teleconference facilities of varied quality can provide basic imbalances in the group communication process. In a recent Institute for the Future report, we speculated about the effects of a specially equipped video teleconference facility linked with lower quality temporary facilities:

... when Clemmons spoke, he sounded like a stern parent allowing his squeaky-voiced children but a few minutes of his valuable time. His voice boomed through the system, seemingly sucking the decibels from the other timid microphones.¹¹

This is a rather extreme example, but one which illustrates the need for a relative balance of the technical quality of the various rooms involved in a teleconference meeting.

For group-to-group teleconferencing, another important consideration involves the placement of group members at various locations. Several studies have pointed out the potential for "we" to "they" tendencies as communication varies from within-terminal to between-terminal patterns.¹² The group dynamics become complicated as subgroups are actually meeting face-to-face while communicating with other subgroups via teleconferencing. Often, uneven distribution of participation will result simply from the geographic distribution of the group. However, the effects of these imbalances need to be understood more fully, and techniques need to be developed to overcome the potential negative effects.

Teleconferencing arrangements also include such basic procedures as scheduling. Especially for novice users, it seems important to have some sort of regular teleconference schedule. Noll, in a study of the use of video teleconferencing by Bell Laboratory employees, emphasizes the importance of regularly scheduled meetings.¹³ The same seems true for audio teleconferencing and perhaps even more so for computer-based teleconferencing. In the latter case, participants are typically responsible for setting and maintaining their own schedules.

What Can Be Learned?

It is clear from social evaluations to date that much uncertainty remains with regard to the process of learning to use teleconferencing media effectively. What now appear to be "characteristics" of teleconferencing media may simply be results of poor system design or factors which must be overcome (or used to advantage) by new users if they are to maximize the communication potential of teleconferencing. On the other hand, teleconferencing media will undoubtedly place some constraints on even the most experienced user groups.

A central research task, then, is to map the potentials and limits of teleconferencing with a precision not heretofore accomplished. However, these potentials and limits do not lend themselves well to study via conventional social science methodologies. A new teleconferencing medium cannot be evaluated as an isolated component in the communications process; the medium is difficult to study as an "independent variable" in the classical sense. Rather, we propose a more active (and thus less controlled) research approach which focuses on (1) learning to use teleconferencing media effectively and (2) exploring the potential impacts of widespread use.

Teleconferencing research is advanced enough to offer some advice for developing teleconferencing systems which are adapted to varied group needs. The research also offers insight into the dynamics of user groups to caution them regarding potential limitations of the tool. This knowledge, however, does not mean that the full range of potential applications for teleconferencing can be predicted; neither does it mean that trustworthy information about its impact on the people who use it and on the society around them is easily available. In order to explore these complex effects, we are developing an approach which combines some techniques from small group research with those of simulation gaming to produce a "tutorial." This tutorial will be designed to give novice users a feeling for the power of each medium as well as a realization of its weaknesses.

The tutorial is rooted in the social evaluations of teleconferencing media which have occurred to date. Special attention has been given to the learning variables summarized earlier in this paper. For instance, the tutorial is designed to provide participants with a direct exposure to a variety of group tasks--both those for which teleconferencing appears well suited (e.g., information exchange) and those for which the use of teleconferencing is questionable (e.g., bargaining or negotiation).

It is difficult to describe the tutorial to someone who has not experienced it. The task of explanation is similar to explaining baseball to someone who has never heard of it. Thus, it may be most helpful to imagine that you are a participant in the tutorial. Here is what would happen:

1. You would be given basic tasks to accomplish during an upcoming meeting (actually the tutorial exercise). The purpose of the meeting is to decide which medium--audio, video, or computer-based teleconferencing--best serves the needs of a hypothetical group. Five participants are assigned media preferences based on the communication needs of different divisions of the group. One person is a leader who attempts to facilitate a unanimous decision, and two others are "experts." (The experts have research data from social evaluations of teleconferencing.)*
2. The meeting (i.e., the tutorial) begins; it is held over audio, video, or computer-based teleconferencing, or face-to-face. A typical meeting might last 1-1/2 to 3 hours, although an asynchronous computer conference might stretch out over several days, with each participant moving in and out of the conference.
3. If the group cannot agree on a unanimous choice among media (in fact, it is very difficult, given the tasks assigned to the various participants), some participants may decide to form a new group of like-minded persons. The "rules" of the tutorial place limits to how easily such a spinoff can be formed, but three or more participants can decide on this strategy.
4. The tutorial ends when a unanimous decision is reached, a spinoff group has been formed, or a stalemate has occurred.

*It is important to note that the tutorial does not involve role-playing or simulation in the sense of modeling a special social environment.

5. Each participant fills out brief posttutorial reporting forms, and a "debriefing" discussion follows.

The tutorial has two basic goals: (1) to allow participants to experience the strengths and weaknesses of communication via different teleconferencing media; and (2) to introduce participants to the results of social evaluation studies of teleconferencing. It can be used more than once with the same people, but with different media; thus, participants can "try out" different leadership styles or styles of self-presentation. In this way, the tutorial provides a context for practicing the more subtle skills of small group communication via teleconference.

Research Uses of the Teleconference Tutorial

In the teleconference tutorial, we hope to provide rapid learning as well as an entertaining and absorbing experience. Our interests, however, go beyond the learning of novice teleconference users. We wish to exhibit clearly the limitations of current media in order to help teleconference system designers. We expect to create an "environment" in which we can investigate group behavior via teleconference.

The tutorial can be "instrumented," allowing us to gather information about such issues as strategies for use of teleconferencing media, barriers to successful use, interpersonal or cross-cultural communication problems, and variations among teleconferencing media. Exploration of the latter issue will be most appropriately pursued in experimental laboratory situations where the tutorial represents an assigned task. Several teleconference research laboratories have already expressed an interest in using the tutorial for such cross-media comparisons.

Even when the tutorial is used for training novice teleconferencing users, however, posttutorial reporting forms will allow for research-oriented information gathering. These forms, together with tapes or transcripts of actual uses of the tutorial, should provide the opportunity for making comparisons across widely varied groups. While lack of control over group selection and other key variables could limit the type of comparisons which might be made, these uses of the tutorial should provide rich opportunities for learning about the possibilities and limitations of teleconferencing media. For instance, barriers to the acceptance of the media could be documented. If the sample groups were from different cultures, hypotheses about cultural variations might be developed; these could then be tested under more controlled conditions. Also, varied strategies of teleconference usage--at both personal and group levels--could be documented so that new users would have a better sense of the range of possibilities. General findings such as these would certainly expand current knowledge about possible uses and misuses of teleconferencing.

Conclusion

The teleconferencing tutorial will be publicly available in the fall of 1977. It is one attempt to develop a flexible approach to evaluating and learning to use varied forms of teleconferencing. Many such approaches will be necessary if we are to plan creatively for the communication potentials and pitfalls of teleconferencing. With new technologies, such a planning and learning process ordinarily takes years; many people must experience--and be influenced by--the technology in operation. Our tutorial is one attempt to compress this waiting period and explore future effects before they occur.

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INTERPERSONAL COMMUNICATION THROUGH COMPUTERS

An Introduction to Computer Mail and Computer Conferencing

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ABSTRACT

Computer mail and computer conferencing are examples of interpersonal communications media, where communication occurs through computers. While these new media are interesting examples of new computer software, they should also be viewed as communications media. Both computer mail and computer conferencing have their own characteristics: computer mail provides person-to-person communication, while computer conferencing is a group communications medium. Particular aspects of each medium are discussed in this paper, along with examples of specific systems which are already in existence. Some current systems, it will be shown, have been limited attempts to replace existing communication functions; others have been broader explorations of human interaction through computers. Thus, while this paper provides an introduction to current technology, its primary focus is on the concept of interpersonal communication through computers.

INTRODUCTION

Both computer mail and computer conferencing are horseless carriage terms, defining a technology of the future in terms of a technology of the past. Such an approach is particularly misleading in this case, since "mail," "conferencing," and even "computer" are all imprecise terms. What is clear, however, is that a new context for interpersonal communications is being created and that this future communications context will have unique characteristics not present in the media of the past.

The goal of this paper is simply definitional, although unfortunately the definitions are not simple. My goal is to step back from the confusing

terminology of today's exemplary systems for interpersonal communication through computers and draw some conclusions about basic concepts involved. Policy issues relating to these systems will not be discussed, since they are the subject of other sessions at this conference. The paper is intended for nontechnical readers with no exposure to computer mail or computer conferencing, but hopefully will be useful to those who have been involved as well.

Interpersonal communication through computers means that two or more people are communicating with each other and that the communication just happens to be occurring with a computer as an intermediary. It is important to remember that the basic notion here is people communicating with other people, not a person communicating with a machine ("man-machine communication") or a computer communicating with another computer ("computer communication"). Of course, both man-machine and computer communication are often involved in an episode of interpersonal communication through computers, but these are means toward the goal of interpersonal communication.

COMPUTER MAIL

Computer mail* is person-to-person communication, similar in kind to that provided by the telephone or the conventional postal system. The similarity with present media, however, is more misleading than helpful. Computer mail is a medium for sending messages from one person to one or more other people. The computer provides a means for instantly delivering the message (basically doing better what conventional mail already does), but it also provides remarkable facilities for editing, organizing, storing, and otherwise manipulating the message. It is these latter capabilities which move far beyond the capacities of conventional mail and belie the title "computer mail."

*The term "computer mail" will be used in place of the term "electronic mail," although the choice is quite arbitrary. The systems being discussed in the paper, however, are those which are directly tied to computer systems. Facsimile systems, for instance, are not discussed here although they could be considered in the general family of electronic mail systems.

Computer mail involves an individual sending a message, a computer terminal which encodes the message, a transmission system (often a telephone line), a computer, and one or more recipients of the message--again using a computer terminal of some type. Typically, an individual types a message on a typewriter computer terminal. This message is sent to a computer which stores the message until it is claimed by the intended recipients when they check into the computer system using their own terminal.

The type of communication that occurs through computer mail is generally ongoing as opposed to the specific time limitations of a computer conference. For instance, computer mail may be used within a corporate structure to provide a standard administrative communication system. It might also be used to coordinate activities of individuals who are traveling frequently, as was the case during the 1976 election when the Carter campaign staff used Scientific Time Sharing Corporation's "Mailbox" system. The structure for this person-to-person communication depends on the particular computer mail system being used. All computer mail systems, however, provide some basic alterations in the way interpersonal communication has occurred in the past.

Uhlig (1977), describing the considerable experience of DARCOM (U.S. Army Material Development and Readiness Command) with computer mail, states that:

The biggest single lesson we have learned from our experimental use of computer based message systems is that this is a major new medium of human communication and interaction, with a very positive impact on the way we do business. It is not just a replacement for letters, phone calls, TWXs, Telex, and Telegrams.*

Bair (1978) in Table 1 summarizes the benefits of computer mail which have been observed to date. These benefits arise primarily from the storage and manipulation capabilities of the computer, thus allowing even geographically-separated working groups to communicate independent of the usual time and space constraints. The "paperless office" becomes more feasible, as information is stored in computers, rather than in filing cabinets. Individuals can select the times they want to send or receive messages; the system can

*Ronald P. Uhlig, "Human Factors in Computer Message Systems," *Datamation*, May 1977, p. 126.

TABLE 1. LIST OF BENEFITS OF COMPUTER MAIL*

1. Permanent, searchable, stored record [of all communications desired]
2. No simultaneous activity necessary
3. No meeting schedule necessary
4. Optimum time for composing, reading, and responding may be selected
5. Physical co-location [of participants] not necessary
6. No interruptions
7. One action for general information distribution
8. Fast delivery at low costs
9. Automatic distribution [to designated persons]
10. Automatic headers [for messages]

*From James H. Bair, "Communication in the Office of the Future: When the Real Payoff May Be," *International Conference on Computer Communication*, Kyoto, Japan, August 1978, p. 10.

even remind them of important dates or provide a structure for organizing complex information. Panko and Panko (1977) speculate about what it might mean to merge the communication capabilities of the computer with some of its already-recognized capabilities:

Just as authors have suggested that initiative-taking "robots" will some day clean our households and run our shops, we suggest that large-scale automation systems will eventually evolve into reasonably autonomous "mindservants" that will not only take initiative in pacing tasks but will even be able to program themselves to understand and serve their masters' needs.*

Such a development in interpersonal communication through computers would go far beyond the definition of "mail," as well as redefining current understandings of interpersonal communication itself. Notions such as the "office of the future" come closer to describing this activity, but even it only provides a vague feeling for what might be possible--not a precise definition. The current systems for interpersonal communication through computers can thus be viewed as flirtations with a type of computer-aided communication whose form and effects are not yet known.

The British Viewdata system provides a taste for a possible evolution of the computer mail concept. Viewdata is a hybrid of computers, television, and the telephone to provide information services to both business users and the general public. While message services will not be present in the initial system, they will certainly be possible if policy decisions are made to implement them. A general message service could be provided via standardized messages for users with limited-function Viewdata terminals or full message sending (i.e., "computer mail") for those with full terminals. Market tests of the system are already underway with a large commercial usage scheduled to begin in early 1979.** Of course, the focus of the Viewdata system is

*Raymond R. Panko and Rosemarie U. Panko, "An Introduction to Computers for Human Communication," *Proceedings of the National Telecommunications Conference*, Los Angeles, December 1-3, 1977, p. 21.

**For a description of the current state of Viewdata activities, see Michael Tyler, "Viewdata and Electronic Publishing: Prospects and Problems," in this volume. For information about Viewdata, contact the Telecommunications Systems Strategy Department, Long-Range Studies Division, Post Office, 88 Hills Road, Cambridge CB2 1PE, England.

not currently on mail functions, but on providing information services (e.g., news, weather, sports, consumer information, business data). Yet the "mail" function, when residing on a computer system, has broad potential to adopt many features far beyond the scope of postal activities. The current View-data system is but one example of the possibilities for an extension of early notions of interpersonal communication through computers.

COMPUTER CONFERENCING

Computer conferencing can be viewed as a modest extension of computer mail, in much the same way as a conference telephone call extends a two-person call. However, research on the social psychology of small groups has indicated that there are sharp differences between dyadic communication and communication which involves more than two persons.* Similarly, group communication through computers is--in several ways--different from two-person communication. The current characteristics of computer conferencing, as distinct from computer mail, can be summarized as follows:

- Computer conferences generally have a group task orientation, often for a specific time period.
- A group record is kept automatically and can be reviewed by participants as needed.
- Current computer conferencing systems are often easier to use for nontechnical users; computer jargon is less imposing.
- Computer conferences can easily shift into synchronous group meetings, where more than one participant are present simultaneously. In such situations, everyone can be simultaneously typing, with a computer keeping a transcript of the proceedings and sorting the incoming messages.
- Computer conferences require group facilitation skills and leadership; organization of the meeting is critical.

Computer conferencing was used as early as 1970, and discussions of the concept took place even earlier. The Office of Emergency Preparedness (now

*A general review of the small group literature can be found in Paul A. Hare, *A Handbook on Small Group Research*, second edition, New York: The Free Press, 1976.

the Federal Preparedness Agency of the General Services Administration) developed a system for computer conferencing, combined with data-base resources, for monitoring and responding to national crises (Turoff, 1971, 1972). In the early and mid-1970s, a series of field tests were organized by Institute for the Future, with primary support from the National Science Foundation. NASA, USGS, ERDA (now DOE), the Charles F. Kettering Foundation, and other organizations were involved. These field tests generally involved groups of scientists, most of whom were geographically separated, who were engaged in joint tasks (Vallee et al., 1975; Johansen et al., 1978). Field tests of computer conferencing are still continuing at New Jersey Institute of Technology (Turoff, 1977) as well as the University of Michigan (Zinn, 1977) and one commercial firm is offering computer conferencing services (see Table 2).

At least five styles of computer conferencing have been identified to date, although there are frequently overlaps among these styles:*

The *Exchange* is typically carried out over a period of months. The participating groups are usually quite large, ranging in size from 20 to 40.

The *Community* implies a qualitative change from the *Exchange* toward more cohesiveness as a group and a higher degree of personal interaction. The individuals become committed to the other participants, as well as to the substantive purposes of the group.

The *Seminar* is focused on a specifically defined topic. The most common example is the research seminar or open conference which involves asynchronous usage (when participants are not all present simultaneously), usually over a period of one week to one month.

The *Assembly* is an extension of the *Seminar*, with more participants (perhaps a hundred or more), multiple topics, and a number of separate parts to the proceedings. Rarely observed to date, this style would be a computer conferencing analog to professional society conventions.

*For more detail on computer conferencing styles, see Robert Johansen, Robert DeGrasse, Jr., and Thaddeus Wilson, *Group Communication through Computers, Volume 5: Effects on Working Patterns*, pp. 30-43.

TABLE 2. EXAMPLES OF CURRENTLY ACTIVE COMPUTER MAIL
AND COMPUTER CONFERENCING SYSTEMS*

Computer Mail Systems	Computer Conferencing Systems
ON TYME Tymshare, Inc. Cupertino, CA	ELECTRONIC INFORMATION EXCHANGE SYSTEMS (EIES) New Jersey Institute of Technology Newark, NJ
HERMES Bolt, Beranek, and Newman Cambridge, MA	CONFER University of Michigan Ann Arbor, MI
MSG; MS Advanced Research Project Agency Washington, DC	PLANET Infomedia Corporation Palo Alto, CA
HP-2026 NETWORK Hewlett-Packard Palo Alto, CA	MINT Nonmedical Use of Drugs Directorate Canadian Federal Government Ottawa, Ontario, Canada
MAILBOX Scientific Time Sharing Corporation Washington, DC	FORUM (Swedish version) Stockholm University Data Center Stockholm, Sweden

*This table lists most of the currently active systems, although no attempt was made to develop a list of all such systems. A more complete description of computer mail systems is contained in Konrad K. Kalba et al., *Electronic Message Systems: The Technological, Market, and Regulatory Prospects*, Kalba Bowen Associates, Inc., Cambridge, Massachusetts, April 1978.

The *Encounter* is somewhat similar in style to a face-to-face meeting, where participants are all present simultaneously discussing a topic for a short time (usually a few hours or less). The intensity of the *Encounter* is often quite high, since computer conferencing allows all participants to speak at once with the computer program sorting out the order.

The *Questionnaire* involves an unlimited number of participants in a structured question-and-response format. Such questionnaire formats are typically used as part of other computer conferencing styles, rather than by themselves.

These six styles, however, only document the ways in which computer conferencing has been used to date. Like computer mail, however, there is little reason to assume that the first uses of this medium will be good precursors for future uses. The designation "conferencing" is already inadequate to describe current applications, and it is likely to become even more so. As with computer mail, the major extensions of this medium are likely to come from the computer's capacity for storing, organizing, and manipulating information. For instance, mathematical models might be used as "participants" in computer conferences to provide quantitative inputs to group discussions of particular substantive areas.* Another possibility is to use computer programs to aid in group decision-making, perhaps through consensus building or weighted voting techniques.**

*See Jacques Vallee, *Technology Forecasting and Social Change*, vol. 10, no. 4, March 1977. A current project is underway at the Institute for the Future, under support from a National Science Foundation grant, to explore the possible hybrids between computer conferencing and mathematical modeling processes. For information, contact Dr. Hubert Lipinski at the Institute.

**These methods have had limited testing, with mixed results. The major problems seem to be in blending the group dynamics issues with the specific decision-making aids. Computer programs rarely provide easy answers to group decision-making problems, and they can sometimes make them worse. While development of computer programs to aid group decision-making is still an important task, it may be more important to explore ways of integrating these programs with the normal processes of small group communication.

COSTS AND COMPARISONS

The costs of both computer mail and computer conferencing are difficult to estimate and even more difficult to project for future periods. Panko, however, after doing a number of studies on the costs of computer mail systems, has concluded that these services will become very reasonable by 1980 (compared to existing media) and even more reasonable by 1985.*

Costs of computer conferencing are slightly higher, but again should be quite attractive by 1980.** Direct comparison among media in terms of costs are complex, though, since very different services are provided. The actual costs will vary dramatically depending on the needs of specific users and the value they place on various features. Since this paper is only an introduction to interpersonal communication through computers, detailed cost comparisons will not be made here. The simple point is that costs of these media are already competitive with existing media in some circumstances, and the longer range outlook is even more economically attractive.

While there are important differences between two-person and group communication through computers, computer mail and computer conferencing have been separated more by historical accident than by logical differences. These media are but early examples of a communications context not yet created: interpersonal communication through computers. A mix of new communications media seems most likely, with eventual discarding of terms such as "mail" or "conference" which no longer describe the phenomenon taking place.

But the development of interpersonal communication through computers may be a slow process. The great majority of current users are either system developers themselves or members of organizations which are consciously

*See Raymond R. Panko, "The Outlook for Computer Mail," *Telecommunications Policy*, June 1977, pp. 242-53. Panko has also done a more recent study, available only in draft form at this writing. He is currently at the College of Business Administration, University of Hawaii, Manoa, HI 96822.

**An analysis of actual cost of a recent computer conference organized for the PLANET System at commercial rates is contained in *Planet News*, Infomedia Corporation, 430 Shreman Avenue, Palo Alto, CA 94306.

experimenting with these technologies. There are very few examples of actual operating systems for interpersonal communication through computers outside R&D environments. At the present time, even a motivated potential user would have difficulty trying out various systems and would quickly discover that choosing the "right" system is no easy task. Existing systems are rarely on interconnected computers and almost always have their own idiosyncratic structure of user commands. Current users experience frequent frustration as they are required to check several incompatible mail systems for messages, each with its own subtle (and not-so-subtle) barriers to easy use. Integrated systems are not yet here, and they could easily be slow in coming.

CONCLUSION

Interpersonal communication through computers is a frontier. The first few explorers, using crude systems typecast as "computer mail" and "computer conferencing," have returned from the frontier with promising reports about what might be possible. And there are a few "settlements" on the frontier, each of which is using its own version of interpersonal communication through computers and each of which would like to think of itself as a model for the future. Enough is known to say with some certainty that the domain of interpersonal communication through computers is a frontier. But that is only a beginning; to think it more would be to severely limit the shape of future possibilities.

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Social evaluations of teleconferencing

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This article is taken from *The Camelia Report: A Study of Technical Alternatives and Social Choices in Teleconferencing*, supported by the Charles F. Kettering Foundation, Menlo Park, CA, Institute for the Future, 1977. Others involved in this research effort are Jacques Vallee, Kathleen Spangler, R. Garry Shirts, and Kent Collins. The report will be expanded in a forthcoming book to be published by Addison-Wesley, 1978.

¹ This reporting format was first suggested by James Craig of the Communications Research Centre, Ottawa, Ontario, Canada. He used a 'pros' and 'cons' system in an unpublished paper summarising results from a group of evaluations of audio teleconferencing.

² The studies summarised here are limited to social evaluations of audio, video, or computer-based teleconferencing. Studies from related fields are cited only when the results bear directly on teleconferencing. Studies of face-to-face communication are cited only when direct comparison with mediated communication is involved.

A search for social evaluations of audio, video, or computer-based teleconferencing requires detective work far beyond the scope of conventional library research. While a significant literature does exist, it is scattered and many studies have never been formally published. Those that have been published have often had very limited distribution: frequently they are passed around the research community in the form of fading photocopies. Therefore, a comprehensive summary of evaluation results seems necessary. In this article the literature is summarised in three ways. First, the findings of the evaluations conducted to date are paraphrased and classified as 'strengths' and 'weaknesses' for each medium.¹ This classification, of course, involves judgements which may be subject to debate: strength in one situation may be a weakness in another. Next, a table describes each of the studies cited in the list of strengths and weaknesses: the table reports basic information about the type of study, the medium used, the number and type of participants, the length of the media usage period, the conferencing arrangements, and the tasks. Thus it is possible for a reader to make general judgements about the context from which the findings emerge. Finally, a bibliography provides the complete references for all the studies summarised, as well as for the studies of general value to those interested in teleconferencing.² This effort has undoubtedly missed some sources of information. I hope that readers will inform me of any additions which they think should be included.

Evaluations of video teleconferencing strengths

Video meetings are satisfactory for a wide range of typical business communication tasks, but are particularly valuable, compared to non-visual media, for complex communication situations.

1. Picturephone[®] is perceived as more effective than telephone and less effective

than face-to-face for all common business situations. *Wish, 1975.*

2. Video is perceived as satisfactory for giving or receiving information, asking questions, exchanging opinions, solving problems, and generating ideas. *Champness, 1973; Williams and Holloway, 1974; Jull and Mendenhall, 1976.*

3. The exchange of information is as effective via video as via face-to-face. *Champness and Reid, 1970; Davies, 1971a,b; Williams and Holloway, 1974.*

4. Video is perceived as more satisfactory than face-to-face for handling regularly scheduled communications and for giving or receiving information. *Noll, 1976.*

5. Video is more useful than audio for complex group discussions, private conversations, and non-private dyadic conversations. *Christie, 1974a.*

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6. The more complicated the task, the more the visual channel is likely to make a contribution (and be perceived as necessary). *Westrum, 1972, in Commors, Lindsey, and Miller, 1976.*

7. The Bell Laboratories' video system has been used for talking to several people at once, communicating with people of the same rank, and communicating within the company. *Noll, 1976.*

8. Video is perceived to be satisfactory for committee-like coordination and information exchange. *Noll, 1976.*

Video is more effective than non-visual media for tasks which stress interpersonal communications.

9. Video is perceived as better than audio for interpersonal relations. (Contrary findings exist.) *Champness, 1972a.*

10. Video is perceived as more effective than audio for forming an impression of others. *La Plante, 1971, in Short, Williams, and Christie, 1976; Williams, 1972a,b, 1974c; Not shown in Young, 1974.*

11. Video provides a greater feeling of social contact than audio. *Communications Studies Group, 1975; Short, Williams, and Christie, 1976.*

12. Video is perceived as better than audio if participants do not know each other. *Christie, 1974b.*

13. Video is better than audio when reactions must be carefully noted. *Hammond and Elton, 1975.*

14. Video is more effective than audio for maintaining friendly relations (tentative conclusion). *Williams, 1974c.*

15. Eye contact is an important part of communication for feedback, synchronisation of speech, and affiliative balance. *Argyle, Laljee, and Cook, 1968.*

16. There is less group uncertainty when participants can be seen. *Westrum, 1972.*

17. The sense of presence of the other people via video may be more important than the specific visual information which is communicated. *Communications Studies Group, 1975; Short, Williams, and Christie, 1976.*

18. Seeing the other person is of real, but limited, value for conversational tasks. *Klemmer, 1973.*

The visual capabilities inherent in video systems are important advantages for some types of group communication.

19. Video is better than audio when language barriers exist. *Hammond and Elton, 1975.*

20. For both Italian and English subjects, higher accuracy scores for communicating information about two-dimensional shapes were obtained when gestures were allowed. *Graham, Ricci Bitti, and Argyle, 1975.*

21. For both English and Italian subjects, emotional messages can be conveyed through facial expressions alone as effectively as by gestures and other bodily clues combined. *Graham, Ricci Bitti, and Argyle, 1975.*

22. A person's detection, information processing, and retention are greater when both the audio and video senses are used. *Mowbray and Gebhard, 1961.*

23. Video communication seems essential for situations involving remote supervision of an anaesthetic, speech therapy, and psychiatric diagnosis. *Mark, 1975.*

24. Video teleconferencing can be used to manage successfully more than 90% of the medical problems typically encountered in a general ambulatory clinic. *Murphy and Bird, 1974.*

25. Teleconferencing can serve as a medium for collegial interaction among distantly located health professionals. *Bashshur, 1975.*

26. When telediagnosis is used, the physician's time with patients can be maximised. *Park, 1975.*

27. Telemedicine is an integrative mechanism which counters the proliferation of medical specialisation. *Bashshur, 1975.*

Video meetings are orderly, but not necessarily hierarchical.

28. Time spent for maintaining group organisation is lower for video than for audio (but video is greater than face-to-face). *Weston, Kristen, and O'Connor, 1975.*

29. Meetings seem to be conducted more quickly via video than via face-to-face. *Williams and Holloway, 1974.*

30. Video meetings are perceived to be more orderly than face-to-face meetings. *Champness, 1973; Williams*

and Holloway, 1974; Ellis, McKay, and Robinson, 1976.

31. Internal group structure and hierarchy do not emerge as clearly in video as in face-to-face. *Strickland, Guild, Barefoot, and Patterson, 1975.*

32. Video has an implicit 'unorganised formality'; people are more polite and solicit participation from quiet members in a way that does not happen in face-to-face. Leaders do not emerge spontaneously and indeed seem not to be needed. (Contrary findings exist.) *George, Coll, Strickland, Paterson, Guild, and McEown, 1975.*

New users tend to respond positively to video.

33. Video is more aesthetic than audio. *Champness, 1972b.*

34. People tend to react more positively to video (and face-to-face as well) than to audio. *Weston and Kristen, 1973; Ryan and Craig, 1975.*

35. New users typically have positive feelings towards the use of video teleconferencing. *Duncanson and Williams, 1973; Williams and Holloway, 1974; British Columbia Telephone, 1974; Champness, 1973; Ellis, McKay, and Robinson, 1976.*

36. People are generally more confident in their perceptions of others via video than via audio, but not necessarily more accurate. *Reid, 1970.*

37. Video is perceived to be faster and more convenient than the telephone, but this perception is not supported by objective measures. *Woodside, Cavers, and Buck, 1971.*

38. Doctors appear to be more confident in their diagnoses of patients by video or face-to-face than audio. *Moore, Willemain, Bonanno, Clark, Martin, and Mogielnicki, 1975; not supported in Conrath, Dunn, Bloor, and Tranquada, 1976.*

39. In a survey of Bell Laboratories' personnel, only 3% of travellers would be willing to substitute a system which did not provide moving picture video. *Snyder, 1973.*

Video meetings may be more 'persuasive' than meetings via other media.

40. More opinion change occurs via video than via face-to-face (but less than or the same as via audio). *Short, 1972a,b, 1973a,b.*

Evaluations of video teleconferencing weaknesses

Video meetings are not perceived as satisfactory for communicating with strangers or people of different ranks; furthermore, they may not be necessary for many tasks for which they are satisfactory.

41. Bell Laboratories' video system is not used for communicating with strangers, talking to one or two people, or communicating with subordinates or superiors. *Noll, 1976.*

42. High-status persons use the Picturephone® to call subordinates, but subordinates are much more likely to use the telephone when communicating with someone of a higher rank. *Imberger, 1975, in Christie and Elton, 1975.*

43. Participants are more likely to prefer a face-to-face meeting (rather than video) if they have not known each other previously. *Christie and Holloway, 1975; Jull and Mendenhall, 1976.*

44. Video is perceived as questionable for getting to know someone, bargaining, and persuasion. *Champness, 1973; Short, 1973; Williams and Holloway, 1974; Jull and Mendenhall, 1976.*

45. Video systems are only marginally superior to audio systems which include telegraphics. *Casey-Stahmer and Havron, 1973.*

46. Managers are no more likely to choose to telecommunicate rather than travel when video is an option than

when audio is an option. *Christie and Kingan, 1976.*

47. The addition of a visual channel to audio does not appreciably decrease times to solution of simple problems. *Weeks and Chapanis, 1976.*

48. Less than 20% of existing business meetings need to be conducted by video. *Christie and Elton, 1975.*

While better than audio for some interpersonal tasks, video meetings may not match the quality of face-to-face meetings.

49. Video is sometimes perceived as lacking a sense of personal contact with other participants. *Champness, 1973; Williams, 1973; Short, Williams, and Christie, 1976.*

50. The feeling of 'presence' is low for normal TV screens. A projection display increases feeling of 'presence', but is difficult to use and maintain. *Midorikawa, Yamagishi, Yada, and Miwa, 1975.*

51. Some very important aspects of social interaction are visual. (Contrary findings exist.) *Argyle, 1969.*

52. In a seminar taught by video, students at locations remote from the professor felt inhibited, had more negative attitudes towards the course, and earned lower grades than those in the same room with him. *Larimer and Sinclair, 1969.*

53. While remote patient diagnosis was accurate in primary diagnosis, it was not as effective as face-to-face in

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detecting secondary illness. *Conrath, Dunn, Swanson, and Buckingham, 1975; Wempner, 1975; not supported in Conrath, Dunn, Bloor, and Tranquada, 1976.*

Some of the characteristics of video may be perceived as disadvantages by the users.

54. Video systems are less 'private' than audio or face-to-face. *Champness, 1972a,b; Ryan, 1975; British Columbia Telephone, 1974.*

55. Personal communication style (eg referring to personal notes while talking) is sometimes more limited by video. *Short, Williams, and Christie, 1976.*

56. Features of video (eg colour necessary for map display, as well as wide-angle shots) may be difficult to match to the specific needs of a group. *Christie, 1974b.*

57. Video is susceptible to a 'Hollywood syndrome' where participants, often unconsciously, use film or television as models for how they are to behave. *Bretz, 1974.*

58. In group-to-group teleconferencing, 'we'-to-'they' tendencies can develop, influencing within-terminal and between-terminal communication patterns. *Casey-Stahmer and Havron, 1973; Weston, Kristen, and O'Connor, 1975; Williams, 1975a; British Columbia Telephone, 1974.*

59. Even a small distance to a video studio can be a disincentive to participation in a video conference. *Jull and Mendenhall, 1976; not supported in Christie and Kingan, 1976.*

Evaluations of computer teleconferencing strengths

The print mode provides some advantages over the spoken word of other media.

1. The written record basic to the computer conferencing medium is crucial for some tasks. *Sinaiko, 1963; Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975; Ferguson and Johansen, 1975; Vallee and Wilson, 1976; Vallee, Johansen, Lipinski, and Wilson, 1977; Spelt, 1977.*

2. Handwritten messages are more persuasive than video or face-to-face communications. (Contrary findings exist.) *Wall and Boyd, 1971.*

3. Computer conferencing allows time for reflection on the topic of conversation. *Turoff, 1974a; Vallee, Johansen, Lipinski, and Wilson, 1977; Ferguson and Johansen, 1975; Zinn, Parnes, and Hench, 1976; Spelt, 1977.*

4. Typewritten communications are much less verbose than voice channels

for solving the same simple problems. *Weeks and Chapanis, 1976.*

5. Computer conferencing is well suited for communication involving the deaf, the handicapped, and homebound persons. *Turoff, 1975b.*

Computer conferencing increases continuity of communication by making it less dependent on time and space.

6. Access to computer conferencing can make working hours more flexible. *Turoff, 1974a; Vallee, Johansen,*

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Lipinski, Spangler, and Wilson, 1975; Ferguson and Johansen, 1975; Hiltz, 1976b; Irving, 1976; Vallee, Johansen, Lipinski, and Wilson, 1977.

7. Computer conferencing can be used well as a preface and/or follow-up to a face-to-face conference. Vallee and Wilson, 1976.

8. Computer conferencing can provide a continuous link among disseminated researchers. Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975; Zinn, 1977; Vallee, Johansen, Lipinski, and Wilson, 1977.

9. Computer conferencing can promote communication among disseminated groups who may not otherwise communicate, if the need to communicate is high enough. Ferguson and Johansen, 1975; Hiltz, 1976b; Irving, 1976; Spelt, 1977.

10. With computer conferencing, as many as fifty people can work together on a project. Turoff, 1975; Irving, 1976.

It is possible to achieve a sense of interpersonal interaction with computer conferencing.

11. Computer conferencing can support self-presentation and emotional subtleties. Vallee and Johansen, 1974.

12. There can be a strong sense of personal interaction. (Contrary findings exist.) Spelt, 1977; Vallee, Johansen, Lipinski, and Wilson, 1977.

13. Synchronous sessions are seen as more personal than asynchronous sessions and are desired by users.

Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975; Ferguson and Johansen, 1975.

Computer conferencing is particularly well suited to tasks involving the management of technical information.

14. Computer conferencing introduces human judgment at a new level in an information system. Vallee and Askevold, 1975.

15. Users have reported an ability to deal with larger amounts of information more efficiently (though beyond a certain point, information overload can occur). Vallee and Askevold, 1975; Bennett, 1975.

16. Computer conferencing appears particularly useful in coordinating technical projects. Vallee and Askevold, 1975; Vallee and Wilson, 1976.

17. Participants can obtain more deliberate answers to technical questions, backed up by written facts and with less delay. Vallee and Askevold, 1975.

18. Computer conferencing can be used to enhance crisis resolution. Kupperman, Wilcox, and Smith, 1975.

19. Computer conferencing can be used to aggregate group judgment. Turoff, 1972b, 1974a; Lipinski, Lipinski, and Randolph, 1972; Jillson, 1975.

20. Computer conferencing is perceived as satisfactory for exchanging information, asking questions, exchanging opinions or orders, staying in touch, and generating ideas. Vallee, Johansen, Lipinski, and Wilson, 1977.

Computer conferencing promotes equality and flexibility of roles.

21. Participants vary their roles from conference to conference. Vallee and Johansen, 1974; Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975.

22. Computer conferencing can enhance candour of opinions. Turoff, 1972a, 1975b; Day, 1975; Vallee and Askevold, 1975; Irving, 1976.

23. The amount of communication per participant is more nearly equal in the real-time typewritten mode than in audio or face-to-face. (This equality can sometimes be a negative factor.) Krueger, 1976, in Williams, 1976b.

24. Greater equality in group participation can be facilitated by the use of computer conferencing. Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975; Ferguson and Johansen, 1975.

Computer conferencing can be used by people without highly specialised skills.

25. Participants can learn to use computer conferencing quickly. Turoff, 1972b, 1975b; Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975; Irving, 1976.

26. Computer expertise is not a prerequisite to effective use of computer conferencing. Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975.

27. Lack of typing ability is not a barrier to participation in computer conferencing. Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975.

Evaluations of computer teleconferencing weaknesses

The written communications inherent in computer conferencing are less efficient than other media.

28. Both audio and face-to-face allow many more messages to be exchanged in a given time period than does typing. Sinaiko, 1963; Chapanis, Ochsman, Parrish, and Weeks, 1972; Chapanis, 1973; Chapanis and Overby, 1974; Ochsman and Chapanis, 1974; Weeks and Chapanis, 1976; Krueger, 1976, in Williams, 1976b; not supported in Turoff, 1972b.

29. Written negotiations take more time, are more rigid, and are more susceptible to developing intransigent positions. Kite and Vitz, 1966.

30. It is sometimes difficult to focus the discussion in computer conferencing. Ferguson and Johansen, 1975.

31. Problems take longer to solve in written modes. Chapanis, Ochsman, Parrish, and Weeks, 1972; Krueger, 1976, in Williams, 1976b; Ochsman and Chapanis, 1974.

32. Participants are sometimes reluctant to make certain statements in

writing. Kite and Vitz, 1966; Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975.

33. Computer conferencing is perceived as unsatisfactory for bargaining, resolving disagreements, persuasion (contrary findings exist), and getting to know someone. Vallee, Johansen, Lipinski, and Wilson, 1977.

The self-activated nature of the medium may inhibit its use.

34. Regularity of individual participation is sometimes difficult to enforce in computer conferencing.

Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975; Ferguson and Johansen, 1975; Spelt, 1977.

35. A perceived need to communicate is necessary to encourage regular participation in computer conferencing. Vallee and Johansen, 1974; Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975.

36. In written or typewritten communication, the amount of time spent in non-communicative activities is much greater than in the oral mode. Ochsman and Chapanis, 1974.

37. Managers have a strong preference for verbal and immediate (often unscheduled) communication. Mintzberg, 1971.

The communication process in computer conferencing is very demanding.

38. Training of new users is very important. Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975; Irving, 1976.

39. Participants must learn new skills to use computer conferencing (eg how to send a message). Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975.

40. Computer conferencing is vulnerable to poor human/machine interface with both computer networks and computer terminals. Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975.

41. Computer conferencing could easily be used to confuse other participants. Vallee, Lipinski, Johansen, and Wilson, 1975.

The sense of interpersonal interaction is sometimes weak in computer conferencing.

42. The volume of information in a computer conference can sometimes become overwhelming. Ferguson and Johansen, 1975; Vallee, Johansen, Lipinski, and Wilson, 1977.

43. In synchronous computer conferencing, messages are not

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sequential and multiple topic threads can appear; information overload can thus result. Vallee and Wilson, 1976; Vallee, 1976.

44. Computer conferencing demands strong leadership. Johansen, Vallee, and Palmer, 1976.

45. There is often a lack of interpersonal feedback; those who perceive the need for immediate feedback might thus be frustrated. Ferguson and Johansen, 1975.

46. Participants sometimes feel a lack of group interaction. Ferguson and Johansen, 1975.

47. Questions asked within computer conferences often go unanswered. Hiltz, 1976b.

48. The use of surrogates in a computer conference can inhibit levels of trust and security. Vallee, Johansen, Lipinski, and Wilson, 1977.

49. French Canadians react more negatively to computers and their potential than do English Canadians. Ryan and Cummings, 1973.

Evaluations of audio teleconferencing strengths

Audio meetings are adequate for a number of typical business and research situations; they are particularly satisfactory for communications tasks which stress information exchange and problem solving.

1. The telephone is not in any simple sense inferior to face-to-face contact. Reid, 1976.

2. Audio is perceived as only slightly less satisfactory than face-to-face meetings. Craig and Jull, 1974; Weston and Kristen, 1973.

3. Managers are no more likely to choose to telecommunicate rather than travel when video is an option than when audio is an option. Christie and Kingan, 1976.

4. About 40% of existing business meetings could be conducted by audio or audio-plus-graphics. Christie and Elton, 1975 (3 Communications Studies Group surveys).

5. Simple problem solving can be effectively conducted via audio. Davies, 1971a,b; Champness, 1971, 1972a,b; Short, 1971a,b, 1972a,b; Woodside, Cavers, and Buck, 1971; Chapanis, Ochsman, Parrish, and Weeks, 1972;

Connors, Lindsey, and Miller, 1976; Thomas and Williams, 1975; Christie, 1975b.

6. Meetings which emphasise 'information seeking' and 'discussion of ideas' can be effectively conducted via audio. Williams, 1974c; Connors, Lindsey, and Miller, 1976; Thomas and Williams, 1975.

7. Audio is satisfactory for giving orders, decision making, settling a difference of opinion (contrary findings exist), and holding briefings. Stapley, 1973.

8. Audio is good for continuing contacts with those with whom one is already acquainted. Connors, Lindsey, and Miller, 1976.

9. There is no difference in output or quality of ideas in audio brainstorming sessions compared to video and face-to-face. (Contrary findings exist.) Williams, 1975a.

10. The visual channel is not necessary for gaining initial perceptions of others and in understanding how others perceive you. (Contrary findings exist.) Young, 1974b.

11. Audio meetings are generally perceived as at least as 'rewarding',

'friendly', and 'enjoyable' as face-to-face committee meetings. Christie, 1975a.

12. Audio can be used as effectively as face-to-face or video for interviewing. Reid, 1970; Janofsky, 1971; Young, 1974a.

13. Audio is perceived to be effective for crisis decision-making when a face-to-face meeting would not be possible. Thomas and Williams, 1975; Short, 1973c.

14. For conducting psychiatric interviews, the telephone can be used as effectively as face-to-face. Simon, Fleiss, Fisher, and Gurland, 1974.

15. Teleconferencing can serve as a medium for collegial interaction among distantly located health professionals. Bashshur, 1975.

16. Audio teleconferencing, used by sophisticated health professionals, is suitable for most neighbourhood health clinics, chronic disease follow-up programmes, etc. Mark, 1975.

In intense communication situations, such as bargaining or negotiation, audio meetings may offer subtle advantages to some participants.

17. In negotiation, the side with the strongest case is more successful in

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audio than in face-to-face. *Morley and Stephenson, 1969, 1970; Short, 1971a,b; Weeks and Chapanis, 1976.*

18. In bargaining and negotiation via audio, effective communication is less dependent on interpersonal than on substantive considerations; a visual image can actually be distracting to the substantive proceedings. *Sinaiko, 1963; Morley and Stephenson, 1968, 1970; Short, 1971a, 1974.*

19. More opinion change occurs in conflict situations via audio than face-to-face, implying that audio is better for persuading or adopting another point of view. (Contrary findings exist.) *Short, 1972a,b, 1973b; Young, 1974b (but not statistically significant).*

20. Participants feel it is easier to get a point across without a lengthy debate in audio than in face-to-face. *Christie, 1975a.*

21. Individuals are perceived as more persuasive and trustworthy via audio than face-to-face or video. *Short, 1972c.*

22. Lying is easier to detect in audio than in face-to-face. *Krauss, in Williams, 1976; Maier and Thurber, 1968; Reid, 1970 (found no significant difference between audio and face-to-face).*

23. Audio is perceived as more

revealing than video or face-to-face during interviews. *Young, 1974a.*

Audio permits rapid communication, with less travel.

24. Audio meetings are shorter than face-to-face meetings. *Craig and Jull, 1974; Short, 1973; Casey-Stahmer and Havron, 1973; Christie, 1975a; Mendenhall and Ryan, 1975; Thomas and Williams, 1975.*

25. Media which involve voice communication are much faster than writing or typing. *Ochsman and Chapanis, 1974.*

26. Audio tends to be faster than face-to-face for simple problem solving experiments when unlimited time is available. *Davies, 1971a; not supported in Chapanis, Ochsman, Parrish, and Weeks, 1972.*

27. Audio is most useful when meetings are short and regular. *Short, Williams, and Christie, 1976.*

28. Audio can be most useful when people are more than one-half hour apart. *Williams, 1975c; Short, Williams, and Christie, 1976.*

29. Audio has been highly successful in reducing the total amount of travelling done by a bank's management staff. *Christie, 1975a.*

Audio permits accurate communication.

30. Accuracy in the transmission and reception of information is not affected by the absence of vision. *Champhess and Reid, 1970; Davies, 1971a,b; Reid, 1976; Stapley, 1973; Simon, Fleiss, Fisher, and Gurland, 1974.*

31. Participants feel they are more attentive to what is being said in an audio system than face-to-face. *Christie, 1975a.*

32. Audio is at least as effective as face-to-face for assessing other people. *Giedt, 1955; Maier and Thurber, 1968; Reid, 1970.*

33. The audio channel can provide all the basic information necessary for preliminary medical diagnosis. *Conrath, Bloor, Dunn, and Tranquada, 1976.*

Audio promotes controlled participation.

34. Meetings are more orderly (business-like) in audio than in face-to-face. *Short, 1973c; Jull, McCaughern, Mendenhall, Storey, Tassie, and Zalatan, 1976.*

35. Audio allows more control over individuals who dominate the conversation and thus more chance for everyone to participate. *Holloway and Hammond, 1976.*

Audio can create an impersonal, unco-operative communications environment.

43. Audio is perceived as less 'personal' than face-to-face. *Morley and Stephenson, 1969; Williams, 1972a; Short, 1973c; Holloway and Hammond, 1976.*

44. Non-verbal cues are important to indicate the psychological state of each participant (eg their reactions) in the progress of the interaction. *Argyle, Lalljee, and Cook, 1969; Duncan, 1969.*

45. There is often scepticism concerning the content of a message in an audio-only conference, especially when the message is not followed by a written note. *Mendenhall and Ryan, 1975.*

46. In group-to-group teleconferencing, 'we'-to-'they' tendencies can develop, influencing within-terminal and between-terminal communication

Evaluations of audio teleconferencing weaknesses

Audio meetings are not satisfactory for tasks which stress impersonal communication, such as negotiation or getting to know someone.

36. Audio is not satisfactory when emotions run high or nature of the task is 'complex'. *Connors, Lindsey, and Miller, 1976.*

37. Participants feel that audio is not satisfactory for such activities as resolving conflicts, persuading others (contrary findings exist), resolving disagreements (contrary findings exist), or negotiating. *Short, 1973c; Craig and Jull, 1974; Thomas and Williams, 1975; Connors, Lindsey, and Miller, 1976; Christie, 1975a.*

38. There is more breakdown in negotiation via audio than face-to-face. *Dorris, Gentry, and Kelley, 1970, in*

Short, 1971a; Short, 1971a; Champhess, 1971.

39. Audio meetings are not satisfactory for forming impressions of others. (Contrary findings exist.) *Craig and Jull, 1974.*

40. Audio is not perceived to be satisfactory for getting to know someone. (Contrary findings exist.) *Stapley, 1973; Craig and Jull, 1974; Thomas and Williams, 1975; Connors, Lindsey, and Miller, 1976.*

41. Audio can be poorly received if participants have not known each other previously. *Christie and Holloway, 1975; Connors, Lindsey, and Miller, 1976; Jull and Mendenhall, 1976.*

42. For 'getting to know someone', people who have met face-to-face or via video are judged more favourably than people who have met by telephone. *Williams, 1972a, 1975b.*

patterns. *Casey-Stahmer and Havron, 1973; Weston, Kristen, and O'Connor, 1975; Williams, 1975a.*

47. Audio environment is considerably more 'hostile' than either video or face-to-face. *Weston, Kristen, and O'Connor, 1975.*

48. In negotiation situations, such as the game called 'Prisoners' Dilemma', cooperation is difficult to achieve using audio. *Wichman, 1970; La Plante, 1971, in Short, Williams, and Christie, 1976; not replicated by Heilbron, 1971, in Wilson, 1974.*

49. In controlled experiments, individuals will administer more severe shocks to victims they cannot see. *Milgram, 1965; not supported in Penner and Hawkins, 1971, in Short, Williams, and Christie, 1976.*

Audio may be less productive than other media.

50. Audio groups spend less time on task-related discussion (about 10% less) than either video or face-to-face. (Contrary findings exist.) *Weston, Kristen, and O'Connor, 1975.*

51. An unseen audience inhibits cognitive performance more than a visible audience. *Wapner and Alper, 1952.*

52. Fewer words were spoken in a

given time period via audio than via either video or face-to-face. *Weston, Kristen, and O'Connor, 1975; not supported in Chapanis, 1973.*

53. In a conference held to generate recommendations, audio groups made far fewer and less complex recommendations. *Weston, Kristen, and O'Connor, 1975.*

54. Audio meetings are not satisfactory for generating ideas. (Contrary findings exist.) *Craig and Jull, 1974.*

55. While remote patient diagnosis was accurate in primary diagnosis, it was less effective than face-to-face in detecting secondary illnesses. *Conrath, Dunn, Swanson, and Buckingham, 1975; not supported in Conrath, Dunn, Bloor, and Tranquada, 1976.*

Audio meetings are personally demanding.

56. Audio meetings require more chairman control than face-to-face. *Short, 1973c.*

57. Time spent for maintaining group organisation was greater for audio than for face-to-face. *Weston, Kristen, and O'Connor, 1975.*

58. Audio meetings are more tiring than face-to-face meetings. *Short, 1973c; Jull, McCaughern, Mendenhall, Storey, Tassie, and Zalatan, 1976; not*

Social evaluations of teleconferencing supported by Mendenhall and Ryan, 1975; Christie, 1975a.

Users typically have negative expectations about audio.

59. Varied accents are often difficult to understand over the telephone. *Woodside, Cavers, and Buck, 1971.*

60. People often react negatively to audio teleconferencing. *Weston and Kristen, 1973; Ryan and Craig, 1975; Christie, 1975a.*

61. Audio promotes more initial scepticism on the part of users than does video or face-to-face. *Mendenhall and Ryan, 1975.*

62. In a survey of Bell Laboratories' personnel, only 3% of travellers would be willing to substitute a system which did not provide video capability. *Snyder, 1973.*

63. Patients prefer colour video to audio for communicating with a doctor during remote diagnosis. *Conrath, Dunn, Bloor, and Tranquada, 1976; not supported in Moore, Willemain, Bonanno, Clark, Martin, and Mogielnicki, 1975.*

64. Doctors are more confident in their diagnoses of patients by video or face-to-face than by audio. *Moore, Willemain, Bonanno, Clark, Martin, and Mogielnicki, 1975.*

Evaluations of face-to-face conferencing strengths

Face-to-face meetings are particularly important for intense, interpersonal communication tasks.

1. Face-to-face is better than audio or video for interpersonal relations and for conflict. *Champness, 1972a.*

2. Meetings which emphasise 'conflict' probably should be conducted via face-to-face rather than via audio or video. *Wichman, 1970; La Plante, 1971, in Short, Williams, and Christie, 1976; Dorris, Gentry, and Kelley, 1972, in Williams, 1974c; Short, 1972a; Williams, 1974b.*

3. Meetings which emphasise 'negotiation' should be conducted via face-to-face rather than via audio or video. *Morley and Stephenson, 1969, 1970; Champness, 1971; Short, 1971a,b.*

4. Face-to-face is better than both audio and video for persuasion. *Short, 1973b.*

5. Meetings for 'disciplinary interview' should be conducted via face-to-face rather than via audio or video. *Williams, 1975a.*

6. Meetings for 'presentation of a report' can be conducted more effectively via face-to-face than via audio or video. *Williams, 1975a.*

7. The most important aspects of social interaction are transmitted in the visual channel. *Argyle, 1969.*

Face-to-face meetings promote greater information exchange than audio or video.

8. Time spent for maintaining group organisation is less for face-to-face than for either video or audio. *Weston, Kristen, and O'Connor, 1975.*

9. More possible solutions to a problem are discussed in face-to-face than in audio before reaching a decision. *Davies, 1971a,b; Champness, 1971.*

10. More messages are exchanged face-to-face than via other media in a given amount of time. *Chapanis, Ochsman, Parrish, and Weeks, 1972; Chapanis, 1973; Chapanis and Overby, 1974; Ochsman and Chapanis, 1974; Weeks and Chapanis, 1976.*

Face-to-face is a 'friendly' medium.

11. Face-to-face meetings are more friendly than video meetings. *Williams and Holloway, 1974.*

12. In face-to-face meetings, people are much more likely to address their remarks to the group as a whole; in audio or video meetings, there is more tendency to address individuals or a subgroup. *Weston, Kristen, and O'Connor, 1975.*

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13. There is less tendency to inflict pain when a victim is visible than when he is isolated. *Milgram, 1965.*

Face-to-face is more 'commanding' than other media.

14. There is a greater tendency to obey commands issued via face-to-face than those issued remotely. *Milgram, 1965.*

15. In controlled experiments in which subjects are ordered to shock another person, subjects are more likely to be obedient when orders are given face-to-face rather than over the telephone. *Milgram, 1965.*

People generally prefer face-to-face to other media.

16. Face-to-face is generally rated more favourably than audio or video. *Champness, 1972a,b; Christie and Elton, 1975; Ryan and Craig, 1975.*

17. Discussions held by audio or video are generally judged less favourably than discussions held face-to-face. *Christie and Elton, 1975; Champness, 1972a,b; Ryan and Craig, 1975.*

18. Face-to-face is preferred over teleconferencing for meetings which are important or complex. *Connors, Lindsey, and Miller, 1976.*

19. People are generally more confident in their perceptions of others based on face-to-face meetings than those based on either audio or video, though they are not necessarily more accurate. *Reid, 1970.*

20. A doctor's confidence in a diagnosis is greater in face-to-face situations than in either audio or video situations. *Moore, Willemain, Bonanno, Clark, Martin, and Mogielnicki, 1975; not replicated in Conrath, Dunn, Bloor, and Tranquada, 1976.*

21. Patients prefer face-to-face to remote diagnosis via either audio or video. *Conrath, Dunn, Bloor, and Tranquada, 1976.*

Evaluations of face-to-face conferencing weaknesses

While face-to-face is preferred for many tasks, it may be unnecessary.

22. Only about 30% of all business meetings actually require face-to-face contact. *Christie and Elton, 1975 (3 Communications Studies Group surveys).*

The 'personal' nature of face-to-face may inhibit communication.

23. Face-to-face communication is

more dependent on interpersonal or interparty considerations than is audio. *Morley and Stephenson, 1969, 1970; Short, 1971a, 1974.*

24. In negotiation situations, face-to-face meetings (and video meetings) emphasise the affective content of messages compared to audio or written media. *Wichman, 1970; La Plante, 1971, in Short, Williams, and Christie, 1976.*

25. In conflict situations, face-to-face may create visual distractions which

reduce participants' concentration. *Short, Williams, and Christie, 1976.*

26. For meetings of short duration where long travel time is involved, people will prefer to telecommunicate rather than attend a face-to-face meeting. *Christie and Kingan, 1976; Duncanson and Williams, 1973.*

27. Face-to-face meetings tend to be dominated by one person, thus limiting the range of ideas suggested and the quality of the final decisions. *Hiltz, 1975a; Hiltz and Turoff, 1976.*

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Table 1. A classification of social evaluations of teleconferencing.

Citation	Organisational affiliation	Type of study	Medium (ia) used	Number and type of participants	Length of medium (ia) usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Argyle, 1969	Oxford University	Theoretical analysis; literature review	Primarily face-to-face	Primarily subjects ^a	—	Varied	Varied
Argyle, Lalljee, and Cook, 1968	Oxford University	Laboratory experiments	Face-to-face; simulated audio	Subjects (28 students at University of Delaware; 32 students at Oxford; 80 middle-aged adult education students)	Brief ^b	Dyads	Interviews
Bashshur, 1975	University of Michigan	Literature review; theoretical analysis	Video	—	—	Medical professional to patient	Remote diagnosis
Bretz, 1974	Rand Corporation	Field test	Video (the MRC system)	Senior and middle-level personnel	3 years	Multipoint	Varied
British Columbia Telephone, 1974	British Columbia Telephone	Field test	Video	134 British Columbia Telephone employees, businessmen, students (no cost to users)	Varied	Group-to-group	Varied business meetings
Casey-Stahmer and Havron, 1973	Human Sciences Research, Inc	Survey (interview); theoretical analysis	Bell Canada: video; DINA: audio + facsimile; DOC: audio + graphics; FNCB: video + graphics	7 middle-level personnel at Bell Canada; 8 middle-level personnel at Department of Indian and Northern Affairs; 6 middle-level personnel at Department of Communications, Canada; 4 senior managers at First National City Bank (NY)	Bell Canada, DINA, DOC: several months; FNCB: 12 years	Group-to-group	Bell Canada: demonstration; DINA: coordination with remote sites of DINA; DOC: experimental; FNCB: management meetings
Champness, 1971	Communications Studies Group	Laboratory experiment	Face-to-face; television; audio	214 male subjects	Brief	Group-to-group (2 acquaintances, 2 strangers)	Bargaining
Champness, 1972a	Communications Studies Group	Laboratory experiment	Audio; close-up television; broader, view television	112 subjects (senior British civil servants)	Brief	Dyads	Varied
Champness, 1972b	Communications Studies Group	Laboratory experiment	Face-to-face; loud-speaking audio; closed-circuit television	72 subjects (managerial British civil servants)	Brief	Dyads	Discussion of personal choices (from Kogan and Wallach's Choice Dilemmas' questionnaires)
Champness, 1973	Communications Studies Group	Survey (questionnaires)	Video	200 subjects (middle-level British Post Office personnel)	Brief (almost 75% were first-time users)	Group-to-group	Information exchange; trying out Confravision

^a 'Subject' refers to those paid or unpaid subjects who used the media for simulated tasks; all others used the media to perform their normal activities.

^b Brief = less than one hour.

Table 1 continued

Citation	Organisational affiliation	Type of study	Medium (ia) used	Number and type of participants	Length of medium (ia) usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Champness and Reid, 1970	Communications Studies Group	Laboratory experiment	Face-to-face; simulated audio; telephone	72 subjects (male students)	Brief (about 5 minutes per medium)	Dyads	Communication of contents of a business letter
Chapanis, 1973	Johns Hopkins University	Laboratory experiment	Typewriting; hand-writing; simulated audio; face-to-face	Subjects (40 high school boys, 32 Johns Hopkins students)	Brief	Dyads	Finding address of a physician closest to a hypothetical residence; assembling a trash can carrier; similar simple problems.
Chapanis, Ochsman, Parrish and Weeks, 1972	Johns Hopkins University	Laboratory experiment	Typewriting; hand-writing; simulated audio; face-to-face	40 subjects (high school boys)	Brief	Dyads	Finding address of a physician closest to a hypothetical residence; assembling a trash can carrier; similar simple problems
Chapanis and Overbey, 1974	Johns Hopkins University	Laboratory experiment	Audio; typewriting	32 subjects (college students)	Brief period for each of 4 days	Dyads	Finding address of a physician closest to a hypothetical residence; assembling a trash can carrier; similar simple problems
Christie, 1974a	Communications Studies Group	Laboratory experiment	3 different types of audio; black-and-white television	36 subjects (American business executives)	5 minutes per medium	Group-to-group (3 per group)	General discussion
Christie, 1974b	Communications Studies Group	Survey (interviews)	Video	13 middle-level personnel at Department of Environment, London	One group: 6 months; other group: 1 meeting	Group-to-group	Information exchange; general discussion
Christie, 1974d	Communications Studies Group	Laboratory experiment	Face-to-face; television; telephone; letter; audio	36 subjects (civil servants)	Three 5-minute discussions per person	Dyads	Attempt agreement on ways of reducing rise of crime, cost of housing, and pollution in British cities
Christie, 1975a (Chapter X)	New Rural Society Project	Field test	Stereophonic audio plus facsimile	24 upper- and middle-level management personnel	6 months	Group-to-group	Business meetings between 2 branches of a bank, 45 miles apart
Christie and Elton, 1975	Communications Studies Group	Literature review of Communications Studies Group studies	Audio; video; face-to-face	—	—	—	—
Christie and Holloway, 1975	Communications Studies Group	Laboratory experiment	Audio; video	104 subjects (management-level volunteers from business and government)	Brief	Group-to-group (2 or 3 per group)	Simulated business meetings
Christie and Kingan, 1976	Communications Studies Group	Laboratory experiment	Audio; video	50 subjects (volunteer civil	Brief (25-50 minutes)	Group-to-group (2 per group)	Media evaluation

Table 1 continued

Citation	Organisational affiliation	Type of study	Medium (ia) used	Number and type of participants	Length of medium (ia) usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Communications Studies Group, 1975	Communications Studies Group	Literature review of Communications Studies Group studies	Audio; video; face-to-face	—	—	—	Varied
Connors, Lindsey and Miller, 1976	National Aeronautics and Space Administration	Survey (questionnaires)	Audio teleconferencing rooms; portable audio (Bell 50A); conference telephone calls	162 Senior- and middle-level personnel from 5 NASA installations	6 months (less than once per month)	Group-to-group and multipoint	Programme review; general planning, management; education
Conrath, Bloor, Dunn, and Tranquada, 1976	University of Waterloo; University of Toronto; Flemingdom Health Center (Toronto)	Field experiment	Color television; black-and-white television; still frame black-and-white television; and hands-free telephone	10 doctors (7 male, 3 female) 1 nurse; 1015 patients visiting a medical clinic (volunteered to be examined via teleconference, as well as normal visit)	Diagnostic session: less than 1 hour per patient; doctors used varied modes	Dyad (physician to patient, with nurse present)	Medical diagnosis
Conrath, Dunn, Swanson, and Buckingham, 1975	University of Waterloo; University of Toronto; Peat, Marwick, and Partners, Toronto	Field experiment	Color television; black-and-white television; hands-free telephone; face-to-face	32 patients; 8 physicians; 6 nurses	Brief (average exam less than 15 minutes)	Dyads (physician to patient, with nurse present)	Remote diagnosis
Craig and Jull, 1974	Communications Research Center, (CRC), Canada	Field experiment	Face-to-face; audio plus graphics	Senior research managers and United Way planning group	Several months	Group-to-group	Normal business meeting
Davies, 1971a	Communications Studies Group	Laboratory experiment	Face-to-face; telephone	40 subjects (British civil servants; 36 males, 4 females)	Brief	Dyads	Factory-location problem (specially developed)
Davies, 1971b	Communications Studies Group	Laboratory experiment	Face-to-face; telephone	Subjects (British civil servants)	Brief	Dyads	Factory-location problem (specially developed)
Day, 1975	Bell Canada	Descriptive analysis; literature review	Computer-based teleconferencing	Varied	Varied	Multipoint	Varied
Dickson and Bowers, 1973	Cornell University	Literature review and analysis (authors call it a 'preliminary technology assessment')	Varieties of the video telephone	—	—	Primarily dyads	—
Duncan, 1969	University of Chicago	Literature review	Primarily face-to-face	Primarily subjects	Varied	Varied	Varied

Table 1 continued

Citation	Organisational affiliation	Type of study	Medium (ia) used	Number and type of participants	Length of medium (ia) usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Ellis, McKay, and Robinson, 1976	Swinburne Institute of Technology; Telecom Australia	Survey (interviews)	Video (Telecom Australia System)	21 users of the Confravision service who had not continued to use it; paid at rate of \$150 per hour	One-half to several hours	Group-to-group	Varied business meetings
Ferguson and Johansen, 1975	Institute for the Future/Lilly Endowment, Inc	Field test (with postconference questionnaire)	Computer-based teleconferencing	19 senior- and middle-level personnel (no cost to users)	1 week (with brief training period preceding)	Multipoint	Information exchange; discussion of ideas; policy formulation
Giedt, 1955	—	Laboratory experiment	Written transcripts; sound recordings; film plus sound	48 psychiatrists, social workers, and psychologists	Brief	Dyads	Judging patient via recorded interview
Graham, Ricci Bitti, and Argyle, 1975	Oxford University	Laboratory experiment	Videotape; limited image videotape	Subjects (English and Italian)	Brief	Dyads	Communicating description of a two-dimensional subject
Hammond and Elton, 1976	Communications Studies Group	Literature review; descriptive analysis	Audio; video; face-to-face	—	—	—	Varied
Hiltz, 1975a	New Jersey Institute of Technology (NJIT)	Literature review of small group research	Face-to-face	Varied	Varied	Varied	Varied
Hiltz, 1976a	New Jersey Institute of Technology	Literature review of small group research (face-to-face); descriptive analysis	Computer-based teleconferencing; face-to-face	—	—	—	—
Hiltz, 1976b	New Jersey Institute of Technology	Literature review of small group research (face-to-face); descriptive analysis	Computer-based teleconferencing; face-to-face	—	—	—	—
Hiltz and Turoff, 1976	New Jersey Institute of Technology	Descriptive analysis and projections	Computer-based teleconferencing	—	—	—	—
Holloway and Hammond, 1976	Communications Studies Group; Open University	Survey (interviews)	Telephone conference calls	29 students and faculty using the telephone in teaching at the Open University, London	About 1 year	Multipoint	Faculty/student meetings during academic courses
Hough, 1976	Stanford Research Institute	Catalogue and descriptive analysis of existing teleconferencing systems	Audio; video; computer-based teleconferencing	Varied	Varied	Varied	Varied

Table 1 continued

Citation	Organisational affiliation	Type of study	Medium (ia) used	Number and type of participants	Length of medium (ia) usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Irving, 1976	University of Waterloo	Case study; survey (questionnaires)	Computer-based teleconferencing and message-switching	About 40	10 months	Multipoint	Coordination among regional centres of the Nonmedical Use of Drugs Directorate in Canada
Janofsky, 1971	University of Oregon	Laboratory experiment	Telephone; face-to-face	160 subjects (paid student volunteers)	10 minutes	Dyads	Interview to get to know strangers
Jillson, 1975	Nonmedical Use of Drugs Directorate, Canadian Government	Case study	Computer-based conferencing and response elicitation	About 20	About 2 months	Multipoint	Information exchange and polling
Johansen, Vallee, and Palmer, 1976	Institute for the Future	Preliminary analysis of extended field test	Computer conferencing	About 100 energy researchers	12-15 months	Multipoint	Varied; primarily coordination of energy research projects
Jull, McCaughern, Mendenhall, Storey, Tassie, and Zalatan, 1976	Department of Communications (DOC), Canada	Review of research by Department of Communications, Canada; laboratory experiments and surveys, descriptive analysis	Audio; audio plus graphics; video	Varied	—	Primarily group-to-group	Varied
Jull and Mendenhall, 1976	Department of Communications, Canada	Literature review	Audio; audio plus graphics; video	—	—	Primarily group-to-group	Varied
Kettering Foundation (forthcoming)	Kettering Foundation	Survey	Computer conferencing	About 50 scientists, teachers, and administrators	1-3 months	Multipoint	Varied
Kite and Vitz, 1966	Institute for Defense Analyses	Laboratory experiment	Teletype; audio; face-to-face	Subjects	Several hours	Multipoint	Crisis simulation ('Summit')
Klemmer, 1973	Bell Labs	Theoretical analysis literature review	Audio; video; face-to-face	—	—	—	Varied
Kupperman and Wilcox, 1975	Personal proposal	Theoretical proposal	Computer-based teleconferencing	—	—	Varied	Crisis management
LaPlante, 1971	University of Windsor	Laboratory experiment (MA thesis)	Face-to-face; closed circuit TV; telephone	Subjects	Brief	Dyads	Problem solving ('Prisoners Dilemma' game)
Larimer and Sinclair, 1969	Pennsylvania State University	Field test	Video	22 teachers taking a graduate course at Pennsylvania State University	1 semester	Group-to-group (11 per group)	Graduate seminar in education

Table 1 continued

Citation	Organisational affiliation	Type of study	Medium (ia) used	Number and type of participants	Length of medium (ia) usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Maier and Thurber, 1968	University of Michigan	Laboratory experiment	Face-to-face; audio; written transcript	Subjects	Brief	Subject watching; listening; or reading about the role play	Judging accuracy of role-played situation
Mark, 1975	Varied	Theoretical analysis	Video	—	—	Primarily medical professionals to patients	Primarily remote diagnosis
Mendenhall and Ray, 1975	Communications Research Center, Canada	Laboratory experiment	Audio; video; face-to-face	51 subjects (middle-level civil servants)	Brief (about 30 minutes per medium)	Group-to-group	Personnel management problem
Midorikawa, Yamagishi, Yada, and Miwa, 1975	Electrical Communication Laboratories, Tokyo	Field test	Video plus graphics	About 150 senior and middle-level personnel	At least 3 hours	Group-to-group	Business meetings
Milgram, 1965	—	Laboratory experiment	Face-to-face; audio	Subjects	Brief	Dyads	Giving orders
Mintzberg, 1971	McGill University	Participant observation	Face-to-face; telephone; mail	Corporate managers	Varied	Varied	Varied
Moore, Willemain, Bonanno, Clark, Martin, and Mogielnicki, 1975	Cambridge Hospital	Field experiment	Television; telephone	354 patients; 3 practitioner nurses; several physicians	7 months	Dyads (physician to patient, with nurse present)	Remote medical diagnosis
Morley and Stephenson, 1969	University of Nottingham	Laboratory experiment	Variations of face-to-face and telephone	Subjects	40 minutes or less	Dyads	Industrial negotiation problem
Morley and Stephenson, 1970	University of Nottingham	Laboratory experiment	Variations of face-to-face and telephone	Subjects	40 minutes or less	Dyads	Industrial negotiation problem
Mowbray and Gebhard, 1961	Johns Hopkins University	Theoretical analysis	All sensory modes	—	—	Varied	Varied
Murphy and Bird, in Shinn, 1975	—	Field test	Video	1000 subjects (patients)	—	Telediagnosis; patient, physician, and support personnel	Telediagnosis
Noll, 1976	Bell Laboratories, AT&T	Survey (questionnaires)	Video conferencing	21 senior- and middle-level personnel sampled from all users of video system at Bell Labs (represents 7 different user groups)	10 video conferences over last year	Group-to-group	Committee-like coordination; information exchange

Table 1 continued

Citation	Organisational affiliation	Type of study	Medium (ia) used	Number and type of participants	Length of medium (ia) usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Ochsman and Chapanis, 1974	Johns Hopkins University	Laboratory experiment	Various combinations of teletype, handwriting, typewriting, video, audio, and face-to-face	120 subjects (male undergraduates at Johns Hopkins University)	Brief	Dyads	Simple problem solving
Panko, Pye, and Hough, 1976	Stanford Research Institute and Communications Studies Group	Technology assessment	Video; audio; telephone	—	—	Varied	Office decentralisation
Park, 1975	Alternate Media Center	Literature review; theoretical analysis	Video	Varied	Varied	Medical professionals to patient	Remote diagnosis
Penner and Hawkins, 1971	—	Laboratory experiment	Face-to-face; audio	Subjects	Brief	Dyads	Giving orders
Pye, 1976	Communications Studies Group; Stanford Research Institute	Literature review; descriptive analysis	Audio; video; face-to-face	—	—	—	—
Reid, 1970	Communications Studies Group	Literature review; primarily laboratory experiments	Audio (usually telephone); face-to-face	Primarily subjects (civil servants)	Typically brief	Primarily dyads	Communicating contents of 9200-word business letter; interviewing
Reid, 1976	British Post Office	Literature review, primarily laboratory experiments	Telephone; face-to-face	Primarily subjects	Typically brief	Primarily dyads	Varied
Ryan, 1975	Communications Research Center, Canada	Laboratory experiment	Audio; video; face-to-face	Subjects (51 civil servants)	Brief	Group-to-group	Case study problem ('The Tardy Staff')
Ryan and Craig, 1975	Communications Research Center, Canada	Laboratory experiment	Video; audio; face-to-face	51 subjects (Canadian middle- and senior-level civil servants)	Brief	Group-to-group (3.5 per group)	Solving problem of a tardy employee
Ryan and Cummings, 1973	Communications Research Center, Canada	Survey (questionnaires)	—	120 subjects (French- and English-speaking undergraduates)	—	—	Subjects surveyed about their attitudes towards computer
Short, 1971a	Communications Studies Group	Laboratory experiment	Face-to-face; telephone	60 subjects (civil service college volunteers)	Brief	Dyads	Industrial negotiation problem (labour-management)
Short, 1971b	Communications Studies Group	Laboratory experiment	Face-to-face; telephone	64 subjects (civil service college volunteers)	Brief	Dyads	Mixed-motive bargaining game

Table 1 continued

Citation	Organisational affiliation	Type of study	Medium (ia) used	Number and type of participants	Length of medium (ia) usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Short, 1972a	Communications Studies Group	Laboratory experiment	Face-to-face; audio; video	120 subjects (British civil servants)	Brief	Dyads	Arguing opposite points of view on social issues
Short, 1972b	Communications Studies Group	Laboratory experiment	Face-to-face; audio; video	Subjects	Brief	Dyads	Arguing opposite points of view on social issues
Short, 1972c	Communications Studies Group	Laboratory experiment	Face-to-face; audio; video	Subjects	Brief	Dyads	Arguing opposite points of view on social issues
Short, 1973a	University College, London	Laboratory experiment (PhD thesis)	Face-to-face; audio; video	Subjects	Brief	Dyads	Arguing opposite points of view on social issues
Short, 1973b	Communications Studies Group	Laboratory experiment	Face-to-Face; audio; video	Subjects	Brief	Dyads	Arguing opposite points of view on social issues
Short, 1973c	Communications Studies Group	Survey (interviews)	Audio (Bell 50A sets)	12 administrators and faculty at the University of Quebec	Regularly for at least 1 year	Group-to-group	Administrative meetings
Short, 1974	Communications Studies Group	Laboratory experiment	Telephone; face-to-face	Subjects	Brief	Dyads	Mixed-motive bargaining game
Simon, Fleis, Fisher, and Burland, 1974	New York State Department of Mental Hygiene	Field experiment	Face-to-face; telephone	85 incoming psychiatric patients	Brief	Dyads (social scientist to patient)	Admissions interviews for psychiatric care
Short, Williams, and Christie, 1976	Communications Studies Group	Literature review and descriptive analysis (based primarily on CSG research)	Audio; video; face-to-face	Varied, but primarily subjects	Varied, but typically brief	Varied, but primarily dyads	Varied
Sinaiko, 1963	Institute for Defense Analyses	Laboratory experiment	Teletype; telephone split-screen television	Subjects	Several hours	Multipoint for audio and teletype; group-to-group for television	Crisis simulation ('Summit')
Snyder, 1973	Bell Laboratories	Survey (questionnaires)	Varied	3777 employees at Bell Labs (with travel between Bell Laboratory sites over a 1-month period)	Varied	Varied	—
Spelt, 1977	Wabash College	Survey (questionnaires); content analysis	Computer-based teleconferencing	8 psychology professors at small colleges	20 days	Multipoint	Development of a computer simulation for use in psychology
Stapley, 1973	Communications Studies Group	Survey (questionnaires); description cost analysis	Audio (Remote Meeting Table)	3 separate surveys of RMT users, senior- and middle-level personnel	Varied	Group-to-group	Varied
Stapley, 1974	Communications Studies Group	Review and descriptive analysis	Audio; video	Senior- and middle-level personnel	Varied	Group-to-group	Varied

Table 1 continued

Citation	Organisational affiliation	Type of study	Medium (ia) used	Number and type of participants	Length of medium (ia) usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Strickland, Guild, Barefoot, and Patterson, 1976	Carleton University	Laboratory experiment	Face-to-face; video	Subjects (university students)	Brief	Group-to-group	Simulated tasks
Thomas and Williams, 1975	Communications Studies Group	Survey (questionnaires)	Audio (Bell 50A sets)	186 administrators and faculty at the University of Quebec	Most had used the system at least 5 times	Group-to-group	Administrative meetings
Turoff, 1972b	Office of Emergency Preparedness (US Government)	Descriptive analysis; cost analysis	Computer-based teleconferencing	Officials in US Office of Emergency Preparedness	About 1 year	Multipoint	Coordination of responses to emergency situations (eg 'price freeze' in USA)
Turoff, 1974a	Office of Emergency Preparedness (US Government)	Descriptive analysis	Computer-based teleconferencing	Officials in US Office of Emergency Preparedness	Several years	Multipoint	Coordination of responses to emergency situations
Turoff, 1975	New Jersey Institute of Technology	Descriptive analysis, based on previous experience	Computer-based teleconferencing	Senior- and middle-level personnel	—	Multipoint	Coordination of responses to emergency situations (eg 'price freeze' in USA)
Turoff, 1976	New Jersey Institute of Technology	Descriptive analysis; cost analysis	Computer-based teleconferencing	—	—	Multipoint	—
Vallee and Askevold, 1975	Institute for the Future/US Geological Survey	Field test	Computer-based teleconferencing	About 20 senior- and middle-level personnel	About 6 months	Multipoint	Information exchange; discussion of data base on mineral reserves
Vallee, Johansen, Lipinski, Spangler, and Wilson, 1975	Institute for the Future	Field test	Computer-based teleconferencing	About 150 middle-level personnel (28 separate conferences; no cost to users)	1 week to 6 months	Multipoint	Primarily information exchange and discussion of ideas
Vallee et al, 1977	Institute for the Future	Survey	Computer-based teleconferencing	70 middle- and senior-level users of the PLANET computer conferencing system	Varied	Multipoint	Varied
Vallee and Wilson, 1976	Institute for the Future/National Aeronautics and Space Administration	Field test	Computer-based teleconferencing; audio	13 experts working on a NASA contract and 15 principal investigators on the Communications Technology Satellite	About 8 months	Multipoint (the single audio conference was group-to-group)	Project coordination; information exchange; emergency messages
Wall and Boyd, 1971	—	Laboratory experiment	Face-to-face; written messages; videotape	Subjects	Brief	Dyads	Opinion change exercise
Wapner and Alpen, 1952	Clark University	Laboratory experiment	Seen and unseen audience	120 subjects (60 male, 60 female undergraduates)	Brief	Person-to-group	Problem solving
Weeks and Chapanis, 1976	Johns Hopkins University	Laboratory experiment	Audio; video; face-to-face; teletype	96 subjects (male undergraduates at Johns Hopkins University)	Brief	Dyads	2 cooperative problems; 2 conflictual problems

Table 1 continued

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Wempner, 1975	US Department of Health, Education, and Welfare	Survey (questionnaires)	Video	7 physicians who had used telemedicine systems	Varied	Physician-to-patient	Remote diagnosis
Weston and Kristen, 1973	Carleton University University of Montreal	Field experiment	Audio plus graphics; video; face-to-face	About 50 subjects (students, sampled from a population of 650)	3 consecutive weeks, one 45-minute session per week	Group-to-group	Course evaluation
Weston, Kristen, and O'Conner, 1975	Carleton University; University of Montreal	Further analysis of data from Weston and Kristen, 1973	Audio plus graphics; video; face-to-face	About 50 subjects (students, sampled from a population of 650)	3 consecutive weeks, one 45-minute session per week	Group-to-group	Course evaluation
Westrum, 1972	Purdue University	Survey (questionnaires) (PhD dissertation)	Letter; telephone; face-to-face	Sample of US senior- and middle-level business people	Varied	Varied	—
Wichman, 1970	Claremont Graduate School	Laboratory experiment	Face-to-face; simulated audio; written notes	88 subjects (paid female students at Claremont)	Brief	Dyads	Problem solving ('Prisoners Dilemma')
Williams, 1972a	Communications Studies Group	Laboratory experiment	Face-to-face; video; audio	Subjects	Brief	Dyads	Free discussion; conflicts of opinion
Williams, 1973	Communications Studies Group; Bell Canada	Survey (interviews)	Video (Bell Canada's conference television system)	26 senior- and middle-level Bell Canada employees (no cost to users)	Primarily repeated users	Group-to-group	General business meetings
Williams, 1974c	Communications Studies Group	Literature review, primarily of laboratory experiments	Video; audio; face-to-face	Primarily subjects	Typically brief	Primarily dyads	Varied
Williams, 1975c	Communications Studies Group	Laboratory experiment	Face-to-face; closed-circuit television; audio	180 subjects (middle-level executives and administrators from civil service and nationalised industries)	30 minutes for each group	Group-to-group (2 per group)	Generation of ideas about problems of travelling in Britain
Williams, 1972b	Communications Studies Group	Laboratory experiment	Audio; video; face-to-face	Subjects	Brief	Dyads	Conflictual task
Williams, 1975c	Communications Studies Group	Descriptive analysis	Varied types of audio	—	—	Group-to-group multipoint	Varied
Williams, 1976a	Communications Studies Group	Literature review of laboratory experiments	Audio; video; face-to-face	Primarily subjects	Typically brief	Primarily dyads	Varied

Table 1 continued

Citation	Organisational affiliation	Type of study	Medium (ia) used	Number and type of participants	Length of medium (ia) usage	Conferencing arrangements	Task(s) or purpose(s) of conferencing usage
Williams, 1976b	Communications Studies Group	Literature review by laboratory experiments; analysis of findings	Audio; video; face-to-face	Primarily subjects	Typically brief	Primarily dyads	Varied
Williams and Holloway, 1974	Communications Studies Group; Bell Canada	Survey (questionnaires)	Video (Bell Canada's conference television system)	190 senior- and middle-level personnel (63 from Bell Canada, others from other Canadian organisations; no cost to users)	Most had used the system only once	Group-to-group	Information exchange; problem solving
Wilson, 1974	Communications Studies Group	Theoretical analysis; comparison with experimental findings	—	—	—	—	—
Wish, 1975	Bell Laboratories	Survey (questionnaires)	Picturephone; telephone; face-to-face	Middle- and senior-level personnel	Varied	Varied	Varied
Woodside, Cavers, and Buck, 1971	Bell Northern Research	Laboratory experiment	Speakerphone; face-to-face; Project 91 videophone	36 engineers from Bell Northern Research	Brief	Dyads	Resource allocation
Young, 1974a	Communications Studies Group	Laboratory experiment	Audio; television; face-to-face	36 subjects (18 students as interviewees, 18 experienced interviewers)	Brief	Dyads	Simulated interview for civil service employment
Young, 1974b	Communications Studies Group	Laboratory experiment	Face-to-face; audio	48 subjects	Brief	Dyads	Arguing opposite points of view on social issues
Zinn, 1977	University of Michigan	Case study	Computer-based teleconferencing	Over 100 students and faculty, primarily at University of Michigan	Varied	Multipoint	Professional communication; adjunct to face-to-face convention; courses
Zinn, Parnes and Hensch, 1976	University of Michigan	Case study	Computer-based teleconferencing	About 500 students and faculty at University of Michigan	Several months	Multipoint	Course; faculty meetings

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**COMPUTERIZED CONFERENCING
& COMMUNICATIONS CENTER
at
NEW JERSEY
INSTITUTE OF TECHNOLOGY**

DEVELOPMENT AND FIELD TESTING OF AN ELECTRONIC INFORMATION EXCHANGE
SYSTEM: FINAL REPORT ON THE EIES DEVELOPMENT PROJECT

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RESEARCH REPORT NUMBER NINE
COMPUTERIZED CONFERENCING AND COMMUNICATIONS CENTER
NEW JERSEY INSTITUTE OF TECHNOLOGY
MARCH 1978

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System: Final Report on the EIES Development Project

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ABSTRACT

The Electronic Information Exchange System (EIES) is a particular design of a computerized conferencing system intended to allow both the facilitation of scientific and technical communications and experimentation and research into human information-communication processes. To meet the first objective EIES offers functional components of messaging, conferencing, notebooks and bulletins for its users. To meet the second objective EIES allows for the tailoring of interfaces by individuals and groups, and the incorporation of special processing and interconnect options to other computer and information systems.

EIES is designed as a research tool or laboratory without walls in order to allow information scientists and those in related fields to observe, evaluate, experiment with and investigate the utilization of such systems by individuals and groups.

During the test period EIES was utilized by about 200 individuals. Approximately 10,000 hours of usage occurred, 40,000 items of text were composed and over 123,000 items of text delivered. This comprised approximately 2 million lines of text communicated among the user population. The initial results demonstrate very different behavior patterns for individuals than exhibited by other types of interactive systems.

By a process of induction from the various types of data collected during the pilot project, a number of conclusions were arrived at, stated in the form of a list of hypotheses for further testing.

The results of this grant are:

- 1) The development of an operational system.
- 2) Initial concepts on evaluation, utilization and experimentation with this type of system.

- 3) Test usage and observation of usage over a one year period, comprising the single largest experiment with any computerized conferencing system to date.
- 4) Numerous papers were published and professional presentations made.

ACKNOWLEDGEMENTS

While the authors of this report take the responsibility for style and content, the EIES development project could not have succeeded without those who did a great deal of the actual work. These were: Alan Leurck, James Whitescarver, James Grover, Dave Harvey, John Howell, Anita Rubino and Thomas Featheringham.

PERSPECTIVE: Goals and Historical Overview of the EIES Project

In the summer of 1975 the New Jersey Institute of Technology was awarded a grant by the Access Improvement Program of the Division of Science Information of NSF. The objectives of the grant were:

- 1) To design and implement a computer-communication system which would enhance the ability of a group of scientists to regularly communicate about current research activities and findings.
- 2) To develop evaluation procedures and tools applicable to understanding both the appropriateness for and the impact of this form of communication upon scientific communication.
- 3) To provide the Access Improvement Program of DSI with whatever information was needed in developing their own plans for obtaining user groups through an NSF announcement.
- 4) To pilot test both the system and evaluation instruments.
- 5) To promote awareness of the effort among communities concerned with scientific communications.

The design specifications for the system were developed and published in August of 1975 as Research Report Number One of the Computerized Conferencing and Communications Center at NJIT. This design was the result of reviewing previous computerized conferencing systems and evaluating proven features as well as incorporating new design features desirable for scientific user groups. The major portion of the first twelve months (from August '75 to August '76) was spent in the implementation of the software, representing a five person year effort, and on the incorporation of additional equipment. The system was planned and implemented as a dedicated mini-computer operation. This had the objectives of:

Providing computer-communication services at 50% or less of what appears to be the cost on current commercial time sharing systems.

Allowing a predictable response rate for the user at the terminal because all users of the hardware are utilizing the same software package.

Providing the reliability and security which individuals expect from a communication service.

As of October 1976, the system entered the pilot test phase, and has provided service to over 200 users in the period through September of 1977. The pilot system provided service in terms of messaging, conferencing and word processing.

In June of 1976 the central computer was tied into the TELENET digital packet network, so that users would be able to gain access by making local calls to any of some ninety major cities in the United States.

Parallel to the implementation effort, the effort to establish evaluation procedures had proceeded on schedule. The pilot use of the system provided a test of the design principles and evaluation instruments developed under this task. Further details on the implementation and the evaluation are to be found in the appropriate sections of this report.

Based upon the pilot trials over the period of September 1976 to September of 1977, considerable redesign of the user interface occurred and a great many special features were added to the system. These changes were incorporated in the summer of 1977. Many of the advanced features such as "procedures" were the result of research findings under a separate grant from the Division of Mathematical and Computer Sciences. The basic features included in the final design are described in the user information brochure called "How to Use EIES", contained in the Appendix to this report. Advanced features are noted in a one page guide and described in on-line explanations.

In addition to the formal effort, an attempt has been made to make individuals aware of the project and to engage in discussions with parties who might represent likely user groups. Furthermore, a number of papers have been published and presentations made as a result of this effort. These are abstracted in a separate section of this report.

The EIE test facility is specifically meant to augment four primary aspects of scientific and technical information exchange that involve a considerable amount of human communication. These are:

Recent Research Findings and Peer Group Exchanges

The process of mail, phone, travel and professional meetings all carry with them delays and characteristic inefficiencies that have grown rather than decreased in recent years. Both the rising costs of travel and the greater needs of multidisciplinary and/or interdisciplinary research make these informal and semiformal communication and exchange processes somewhat inadequate. Many research communities are finding the members rarely have professional meetings in common.

Joint Authorship and Joint Efforts

Unless authors and/or team members are in the same location this is a rather difficult and time consuming operation. Certain types of efforts like the implementation of a computer model are almost impossible to undertake unless the key members of the team are colocated. Furthermore, it is somewhat common today to find researchers who have discovered that the fellow researchers they most relate to are located elsewhere than their home institution.

Refereeing

The time delay in getting a paper reviewed and often re-reviewed prior to publication is well known to us all. For many areas of professional activity, this can take a year or more.

Evaluation

This is perhaps the area that has received the least attention in current efforts at improving scientific information flow and transfer. How often have we retrieved an article based upon an examination of title, abstract and/or index keys only to discover it was not what was expected? Where was the mechanism for the reader to update the system, indicate an appropriate change in the title, abstract or keys, so that others would have a better chance for a more relevant search with respect to the particular item? As important as the original article are the later reviews of or reactions to it published elsewhere or merely passed among the scientific group. Even if published, these are not well correlated with the original reference in most information retrieval systems.

Current efforts at improving journal production and the retrieval of Abstracts and published material have not aided the above pre-publication and post publication processes, which account for a significant delay time in many scientific and technical fields. The characteristics of EIES described in the next section

are meant to facilitate the removal of the above bottlenecks.

It has also become apparent from our investigations and experience with EIES that it holds the potential of being an important communications factor in the support of secondary scientific activities. Among these are: standards committees; advisory committees; peer review processes; consulting; technology transfer efforts; technology assessment studies; R&D management or research priority setting and scientific educational efforts. In order to establish the effectiveness of some of these particular applications, it may be desirable to conduct controlled experiments rather than the current field trial approach. Certain of these applications might require some additional software support as exemplified by a specialized data structure within the EIES notebook for a standards setting working group. For controlled experimentation into information exchange processes, EIES offers the ability to tailor the interface and capabilities by individuals and groups.

EIES CHARACTERISTICS

The system itself may be viewed as a large common blackboard available to scientific users of the system regardless of their location or their preferred time of use. The blackboard has been subdivided into four major segments which offer the different components necessary for communication and information exchange among a group of professionals. These are:

A personal NOTEBOOK where an individual can leisurely compose material for later use elsewhere in the system, and where he or she can invite others to coauthor short papers or reports.

A private MESSAGE system where an individual can send a private communication to any other individual or set of individuals, such as a group.

A CONFERENCE system where a group of MEMBERS can hold a common discussion around a specific topic and maintain a proceedings for later reference and reflection.

A BULLETIN where an author or coauthors can submit a short paper or recent findings for review through direct conferences among anonymous referees and the authors. If accepted, such papers are considered public and placed in the BULLETIN. The BULLETIN is similar in concept to research newsletters which are published by some professional societies for the benefit of special interest groups.

The system is designed to provide regular and current communication facilities for a group. It is not designed as an archival system for historical records or for the production of large documents.

There is also a directory of users or members of EIES, into which each user is asked to enter his address, telephone number and a brief description of interests for the benefit of other users. The directory also allows the description and membership listing of groups, where a "group" is a set of members engaged in some common purpose or objective. A user can belong to more than one group. Normally a group has associated with it a private group conference or discussion. The group may also have its own bulletin or "newsletter" in which to publish material it wishes to make public.

The message file has a finite size which will be adjusted so that delivered messages will disappear approximately three months after delivery. A sender or receiver of a message may choose to copy the message into his or her notebook if desired. The sender may also initiate a termination of a message at any time.

A conference set up for an established group will maintain a proceedings that is normally up to three hundred comments long. This may be adjusted in special cases to be larger. Normally, the oldest comments will disappear to make room for new ones, once 300 or the adjusted maximum length has been reached. The individual moderating or facilitating the conference has the ability to selectively delete comments. The author of a particular comment may also date or delete that comment. This means that conference groups can selectively determine what is outdated.

A temporary conference, which can be set up by any user, is normally allocated space for fifty comments, which may also be adjusted by a request to the system monitor. Such conferences will be automatically deleted if a minimum level of activity, as defined by the system monitor, is not maintained. A particular user may normally have only one temporary conference in existence at any one time. The user setting up the temporary conference designates who are the other conferees. If the conferees wish to pool their allocations for temporary conferences, the system monitor would increase the allowance on conference size.

There are also a number of public conferences which do not maintain a membership list and are therefore open for anyone to access and make comments. Typically, this facility would be used for describing problems with the system or offering suggestions for improving the system or for discussions of general interest to members of many groups on the system.

Each user is normally allocated a hundred page notebook. This may also be adjusted by the System Monitor when a special need arises. A set of two or more users may merge this allocation into one. In addition, the owner of a notebook may make portions of his or her notebook available to others for reading and writing or reading only. The notebook is basically a personal file for retaining copies of items and for developing items at leisure, such as comments for a conference or papers for the bulletin.

The Bulletin will not be made available to the first scientific communities until early 1978, when all four initial user groups have gotten their members active on EIES and chosen a Bulletin editor. At that time, the user communities themselves, having become familiar with the system and its relation to their communication needs, will participate in making the final design decisions for the BULLETIN features. However, its basic mode of operation has been set.

The bulletin will be designed for short papers on current research activities (in the range of five to twenty pages, although this is not a hard and fast rule). There is to be an automatic procedure to submit a paper for review. Until accepted the paper will remain in the user's notebook, where it may be modified until the review procedure is complete. The reviewers chosen by the bulletin editor are to be given access to read the paper and can engage in an anonymous discussion with the author or authors through a temporary conference set up for that purpose.

The bulletin will allow members of the research group to submit news items or items that can be voted upon, with the vote displayed to the readership. This might be the statement of a research hypothesis, with a group response as to the degree of agreement; or a proposal for an experiment, with potential significance evaluated by the group. The author may select from some nine available voting scales. In addition, direct comments on submitted items or papers may be

contributed and will be automatically associated with the original item, for those wanting to retrieve the commentary on such items.

In addition to being a user or member of EIES and a member of different groups, certain individuals have the following roles:

The "editor" of the bulletin for a group;

The "coordinator" of a group, who may add or delete members of the group;

The conference "moderator," who can act as the chairman of a meeting through his or her editing powers, or merely act as a secretary in keeping the "minutes" or proceedings organized.

The "system monitor," who establishes the existence of members, notebooks and groups, and who can adjust the sizes allowed for conferences and notebooks;

The "user consultants," who are available for aid in learning to utilize the system or some of its advanced features.

The system provides four modes of interaction which may be used singly or in combination:

The straightforward menu selection - i.e., selecting an option from a list of choices;

An anticipatory mode, where a user can answer menu choice questions ahead of time and avoid being asked a series of questions to accomplish something;

A command mode which provides all the options in the menus and then advanced features as well;

A procedure mode, where the advanced user can define his or her own commands by storing under labels preset answers to operations he or she often performs.

The system also provides a number of elementary editing features for quick error corrections as well as some advanced ones for automatically formatting tables, centering items, etc.

There also exists a programming capability which a few users have learned. It allows retailoring of specialized interfaces as well as the automatic collection of data via form fillouts from other users of EIES.

The system is designed in a segmented manner so that the user need only learn the minimum necessary to do specific things such as composing, sending and receiving messages. An on-line explanation file allows the user to learn about advanced features as the need arises. The basic operations of composing, sending and receiving items can gradually be learned by someone with no computer background in less than an hour of practice. The system, hopefully, forgives all errors and allows a trial and error approach to learning.

Specifically in terms of the problems of Scientific Information, EIES will allow a group of researchers to work together on a day to day basis regardless of geographic location and individual time constraints, since it does not require the time coincidence of phone conversations. The timely exchange of research findings or views, and the resolution of differences can proceed as quickly as desired by the group. Joint authorship becomes a painless procedure with respect to the mechanics of the process. Actual projects can be undertaken by a dispersed team. Refereeing can now involve direct discussions between authors and referees by utilizing PEN NAMES for the referees. Reviews and critiques of published items can be rapidly disseminated. At least, these items seem feasible within the design of EIES. What cannot be stated so firmly is that research groups will take advantage of these facilities. We do not accurately know at this time the characteristics of a research group that make it want to or not want to take advantage of EIES type capabilities, and likely or unlikely to be able to achieve their objectives by using the system. It is, however, the intent and purpose of the NSF announcement and the experimental program established by the Access Improvement Program* to try to gain insight into these factors.

*NSF Announcement: Operational Trials of Electronic Information Exchange for Small Research Communities (NSF-76-45)

TECHNICAL OVERVIEW OF EIES

The system is comprised of two INTERDATA 7/32 mini-computers, each connected via a separate disk controller to a disk system with over 300 million bytes capacity. Only one of the processors is utilized to operate EIES. The other is utilized for research and computer science educational activities. However, it can be utilized to take over the operation of EIES if a problem develops with the other processor. The EIES utility processor has approximately half a million bytes of core. One half the core is sharable with the second processor. Either processor can access the disk storage via two separate controllers. The 7/32 has a 32 bit word structure and over a million bytes of core can be directly addressed. Therefore, adding more core to be able to service more users requires no software change as far as core allocation requirements.

Currently the system provides a 24 port capacity over TELENET and eight local Newark ports. The disk system is expandable by adding additional disk units. The result is a system able, through the modularity of the hardware, to be expanded to accomodate a maximum population of 1000 users.

The software is based upon round robin service doctrine, where service is given up by a user whenever an I/O (input/output operation) is executed. The "intelligent" I/O routine passes control to a scheduler which chooses the next user in turn who is not waiting for an I/O service operation to be completed. This also means that at certain places in the program virtual I/O's are used to insure that no unfair allocation of service can occur. The result is a multiuser system regulated by events rather than time slicing. We believe this is a more efficient doctrine for a system that is communications oriented as opposed to computation oriented.

This main interaction program itself is written at the FORTRAN level as if it only knows about the one terminal (or one user). All data pertinent to a user

are defined in a common block. Special routines, triggered by the I/O, literally fool the FORTRAN code by shifting from where the FORTRAN code believes the common data area to be to the area containing the new user's data. In order to implement this approach, advantage was taken on the INTERDATA FORTRAN V feature of producing assembler level output. A special "Mid-Processor" was produced that could modify the subroutine linkages and reorganize the data structure of the compiled FORTRAN program. Other work necessary involved modification to certain executive routines and I/O routines as well as the disk controller's software.

Having the interaction flow at the FORTRAN level with over 40 subroutines specialized for common types of operations ultimately allows a straightforward capability for adding or modifying user features and allowing the system to adjust to the preferences of the users.

In addition, a reentrant input and separate output editor were written at assembly level. The editors and user input/output routine represent an integral independent routine that can be off loaded to a front end processor if this should prove desirable for the larger user population that might occur in later years.

The EIES system has an internal priority structure which can be utilized when necessary to establish different classes of user service. The system allows 32 relative priorities on such functions as editing, receiving and searching. Also a different priority function forces sharing of work space or swapping to disk of lower priority users. This was specifically added to allow incorporation of a large secondary user population who would not interfere with primary NSF users resulting from the funded trial projects.

The approach to the overall software development effort has been to maximize the flexibility and anticipate what modifications may be desirable in the

future. This is in sharp contrast to building a minimal capability needing major revisions to account for any growth in service. The system will be operated in a manner which will allow users to express their wishes for additional features and to utilize this input to formulate the development over time. This input exists via the public conferences PROBLEMS and SUGGESTIONS where any member of EIES may enter his or her comments and through the evaluation follow-up questionnaires. The total completed software development effort under the grant is estimated to be six person years.

EVALUATION

Objectives

From the point of view of the evaluation effort, EIES is an interesting innovation in scientific communication which must be examined in terms of two main questions:

1. Will it actually be used? If so, how much and in what ways, by various individuals and groups? Most importantly, what factors may explain variations in amount and pattern of use?
2. If it is used extensively by a group (as is the hope of the designers of the system), what effects will this have on such factors as productivity, the degree of "paradigmatic development" of method and theory, the social structure of the research community, prevailing norms, etc.? What will be the unanticipated consequences, and how can we plan data gathering so as to "capture" them for later analysis? Or, will there be no noticeable effects of the communications medium at all, with EIES simply substituting for current forms of communication?

The purposes of the evaluation effort were to:

1. Develop and pre-test questionnaires to be used in the assessment.
3. Develop monitoring statistics and ways of utilizing them so as to be as descriptive as possible of the type and amount of activity on the system, without invading the privacy of individuals.
3. Develop procedures for automatic analysis of the questionnaire data and monitor-gathered statistics.
4. Begin to serve a "formative evaluation" function by observing and reporting the ways in which members of EIES actually use the system; what they like and do not like; and those things with which they seem to have difficulty or experience frustration. This information was gathered through direct observation in conferences, and personal interviews with some members, as well as through the questionnaires.
5. Visit with and explain the evaluation to potential principal investigators and assessors for groups which express an interest in responding to the NSF announcement to utilize the EIES system, in order to maximize the cooperation of potential user groups and their assessors.
6. Develop a program to perform citation analyses in order to assess certain long-term effects of the use of EIES by scientific specialties.

Objectives three and six were not accomplished, due to cessation of funding; considerable progress was made toward the other goals, despite lack of funding. Although the original grant provided for limited support of the above sorts of assessment activities, such support was excluded from the renewal grant and subsequent contract.* What will be reported here will be the efforts supported by D.S.I. through the end of January, 1977, supplemented by some findings from the continued evaluation efforts which proceeded without funding or with small amounts of support obtained elsewhere. The Division of Mathematical and Computer Sciences is now supporting evaluation efforts of this nature as a separate project. (MCS 77-27813, effective March 1, 1978.)

We will present a brief and necessarily selective report on the evaluation activities carried out and some of the initial findings and observations. All such "findings" are very tentative, since there was no group of scientists who used the system for a long enough period of time to warrant any firm conclusions, before funding for the evaluation ceased. What this section will do is describe the initial groups that were studied; the evaluation instruments used to collect data on them; the initial findings for these pilot groups; and some of the main methodological problems related to the assessment of the impacts of these field trials. We will then turn to the monitor-gathered statistics collected over a much longer period and to conclusions that can be drawn from them.

*One unfortunate result is that the questionnaire data collected for the pilot period could never be coded and analyzed in detail, since this had been scheduled for the summer of 1977.

Questionnaire Development and Pretesting

The development of the questionnaires represented a continual trade off between (1) the need to include a great many variables that may affect the amount and type of use of EIES and its effects upon scientific research groups; and (2) the need to keep the length of the questionnaires within some reasonable limit so as to assure as high a response rate as possible.

Four different questionnaires were developed and pretested:

1. A pre-use questionnaire for scientific research groups.
2. A "general users" questionnaire for groups which do not fall under the above, such as NSF's group 20.
3. A first follow-up questionnaire for individuals who have made five or more hours of on-line use of the system during the approximately first three months after authorization to use the system.
4. A short follow-up questionnaire for those who have made little or no use of the system.

Initial drafts of the pre-use questionnaire for scientists were developed by Roxanne Hiltz and Ian Mitroff; several subsequent versions were evolved by Hiltz, Featheringham, and Turoff, with some consultation by Diana Crane, Barry Barnes, and Nicholas Mullins. Final revisions and pretesting of the questionnaire took place after expiration of NSF funding.

The initial draft of the pre-use questionnaire for general users was developed by Tom Featheringham; Featheringham and Hiltz subsequently worked together to produce several sections that would be exactly the same for the two versions, in order to facilitate comparative analysis.

All new users of EIES were sent a copy of the appropriate pre-use questionnaire with their starter packet. Initially, they were asked to complete the questionnaire before signing on the system the first time; subsequently, however, it was decided that this might be keeping some users off the system for several weeks. Instructions now read that the new user may choose to complete the

pre-use questionnaire before signing in the system, or may sign on first and try the system for a short while before completing the questionnaires. Besides proving less of a barrier to use of the system, this procedure should provide a more similar answering condition between those who have seen live demonstrations of EIES and those who have not.

Revisions to the pre-use questionnaire have been made in response to marginal comments; high rates of no answers for some initial questions; and direct comments made during the personal administration of some interviews or personal follow-up interviews subsequent to a respondent's completing a questionnaire.

The pre-use questionnaire now contains questions on the following items, which have been developed into structured, precoded questions in so far as possible:

Information on the user group's research specialty (age of specialty, number of years active in it, existing journals and conventions, outstanding people; degree of competitiveness).

Scientists current style of work and communication:

1. Hours/week spent in various professional activities
2. Current forms and amount of communications
3. Previous contacts with EIES user group
4. Concern about work being "stolen" by others
5. Positions on two norms of science:
 - a. emotional neutrality vs. emotional commitment
 - b. universalism vs. particularism

Background items:

(Age, sex, years since degree, prizes and publications, cognitive style, perceived standing in the specialty).

Communications skills and facilities:

1. Reading, writing, speaking, and typing skills
2. Attitudes toward computers
3. Previous use of computers and terminals
4. Access to terminals, at home and at work
5. Types of terminals (hard copy or CRT, etc.)

Current expectations about EIES:

1. Reaction to the information brochure
2. Anticipated amount of use
3. Incentive for using the system
4. Overall rating of probable worth of EIES
5. Probable limitations to use.

Since an unanticipated large proportion of invited members of the initial groups on the system never signed on or made very little use of the system, it was decided that a separate, short follow-up questionnaire needed to be developed for them. The follow-up questionnaire has been pretested on Groups 20, 70 and 80. Only a few revisions need to be made, on the basis of responses received. Completion time for the "long" follow-up has averaged twenty minutes, which is on target. We experimented with "reminder messages" sent to those from whom follow-up questionnaires had not been received within three weeks, and these helped somewhat.

For the follow-up questionnaire (long version), the variables covered are:

A. Access and use pattern

1. Time spent using EIES (actual vs. preferred; off-line vs. on-line; office vs. home or other).
2. Access to computer terminals
3. Input procedures

4. Filing procedures

B. Overall reactions to the EIES Mode of Communication

This is a series of nine seven-point scales. They may be used individually to obtain average profiles of perceived aspects of the system; clustered by factor analysis; or added together to form a subjective reaction scale whose value ranges from nine to ninety.

C. Reactions to specific features of the system

1. (A one to four scale, ranging from "Extremely valuable" to "useless", on specific features)
2. Learning pattern
3. One-to-five rating scales on other aspects of the EIES system (brochure, language, editing commands, subjective feelings during use)
4. Reactions to privacy aspects of the system and to synchronous exchanges
5. Difficulties with terminal, telenet, or anything else which has cut down use

D. The concluding section consists of four open-ended questions which ask for overall progress and positive and negative aspects of use of EIES for the group.

The follow-up questionnaire (short version), consists of a check list of possible reasons for little or no use of the system; plus several open-ended questions probing attitudes toward potential advantages and disadvantages of the use of the system by the group, and potential conference topics of interest.

Every structured question in each of the questionnaires is designed as a measure of a variable which is included in sets of hypotheses developed before the questionnaire was designed. The open-ended questions and unstructured interviews are designed to probe for unanticipated or possible negative consequences of use, which might be further explored in subsequent structured questionnaires.

Initial User Groups

The quantified results that will be reported are based on returns of pre-use and follow-up questionnaires and monitoring statistics from the two groups which were on the system for at least three months by the end of 1976. It must be noted that none are typical of the "small research communities" for which the system was designed:

"Group 20" consists of the administrators and contractors and grantees of the Access Improvement Program of the National Science Foundation. They were requested to use the system to communicate with the NSF office.

"Group 80" was a multidisciplinary team engaged in an environmental education project for the Department of Health, Education and Welfare. The system was used by them mainly as electronic mail for project administration, rather than for substantive discussions. The project director strictly rationed allocated hours on the system.

Groups 70-73 were part of a Workshop on Computerized Conferencing sponsored by the Division of Computer Research. "Group 72," a Computerized Conferencing Workshop on Applications and Impacts of Computerized Conferencing, had generated a discussion involving approximately 25 invited participants and over one hundred conference entries by the end of February 1977.

"Group 89," was a national modeling group consisting of persons representing different approaches to the question of how and for what purpose to build large scale economic-social models. (Systems dynamics, econometric, and sociological approaches were represented by members of this group).

The Human Element: Variations in Participation*

The evaluation was primarily concerned with the "human element" in the

*For a fuller account of preliminary results of the evaluation, see Hiltz, 1977b, from which this section is derived.

use and impact of the EIES system, such as how and why individuals use (or fail to use) the system; and the carrying out of basic human roles which must form part of a successful man-machine communication system.

The basic human role in EIES is that of a "member" or participant; a person has to be motivated to sign on to the system regularly and to engage in free and fairly time-consuming exchanges, if the system is to have any noticeable impact upon group communication or productivity.

During the first three months of pilot field testing, we found that participation was very uneven and that there are definite variations by group. A large number of persons who are invited to use the system either never sign on at all; or use it one or two times and then stop. (Figure 1 shows the distribution of total number of connect hours for the first four trial groups on the system, during the first three months the system was available). All of those individuals who had spent in excess of fifty hours on-line belonged to at least two groups and were group coordinator or conference moderator for at least one group.

Rough estimates of the relative importance of various reasons for little or no use can be obtained from the initial returns from the follow-up questionnaires, based on 25 members of groups 20 and 80 who returned the "short follow-up" (sent to those who used the system a total of less than five hours). Question one was a structured question which read, "Which of the following have limited your use of the EIES system?" (Figure 2 shows the proportion who marked each answer.)

Some people do not have access to a computer terminal, so that explains their lack of participation. Others, however, just do not feel inclined to use the system, and never bother to spend the two or three hours that it takes to become an accomplished user. Among these are persons who do not know many people in their "group" or wish to communicate with them; persons who had a bad

Figure One

Variation in Distribution of Number of Hours of Connect Time by Group
(for the First Three Months Trial Use of EIES, for Four Trial Groups)

<u>Number of Hours</u>	<u>Number of People</u>				
	Group 20	Group 72	Group 80	Group 89	All Four
Zero	9	2	6	1	17%
1	9	2	6	1	18%
1-4	15	7	7	4	33%
5-9	11	2	1	1	15%
10-49	4	5	4	0	13%
50+	1	4	1	0	6%

Figure Two

Reasons Given for Non-Use of EIES

% Checking

52%	I have temporarily been tied up with other things; but intend to use it more in the future.
32%	Inconvenient access to a terminal
32%	Trouble with telephone or TELENET connection.
32%	Tried but had some bad experiences (system crashes, etc.)
24%	There is no one on this system with whom I wish to communicate a great deal.
12%	The system looked too complicated to use
12%	I really do not have the time to use a system like this.
(none)	I do not know how to type or do not like to type.
(none)	I do not like using computer systems.
Other	
	(1 person) system not available Pacific time in evenings
	(1 person) Used up allocation

Source: Follow-up questionnaires, Group 20 and 80, N=25.

Tabulation of the data was partially supported by a grant from the Division of Mathematical and Computer Research; fuller results of follow ups are included in Hiltz, 1977b.

Source: Hiltz, 1977b.

experience with the TELENET, hardware, and software failures that plagued the system during the first few months; persons who feel they are "too busy" for the particular activities going on in their group.

One variable which was not explored in the short follow-ups is the substantial psychological hurdle provided for a new user who receives a very bulky set of materials in the mail, but no human help in learning to use the system and no face-to-face contact to smooth the formation of social relationships in the user group. It is hypothesized that an interal face-to-face meeting would result in much higher participation rates. At such a meeting, the participants would learn the fundamentals of using the system, so that the written documentation would be needed only for review and further practice. Secondly, the group solidarity and consensus about the purpose of the EIES communication for the group could be strengthened. The strongest test of this explanation of missing facilitating and motivational factors will be provided in the current field trials, in which two groups are following the pilot - period pattern of receiving only written documentation andd two groups and beginning with a face-to-face meeting.

On the other hand, some members begin to use the system for an average of an hour or more a day, doing the bulk of their professional communications through this medium. When a person gets to the point where he or she begins to receive fifty or so messages or conference entries a day over the system, then a new human problem begins to be felt; that of "information overload", or how to cope with the volume of things that comes pouring in. This phenomenon needs to be studied more thoroughly in follow-up data collection procedures.

Though total time on the sytem is distributed very unevenly, participation in actual conferences tends to be much more equal. For instance, in conference 72, the distribution of the number of text lines contributed by each of the

persons who joined the discussion is shown below (for the first 109 entries, 2345 lines, through February 1977).

1-99 lines	5 persons
100-299 lines	6 persons
300-399 lines	3 persons

Two of the five "low" participants were actually in the conference for less than a month. What these figures show is that the majority of the participants made fairly substantial contributions; it seems unlikely that a face-to-face conference of fourteen persons would have resulted in such a relatively equal participation pattern.

Turning to other human roles, just as it takes a lot of work for the organizer of a session at a professional meeting to put together a group which is well balanced among different points of view and to help the session run smoothly, so too, there is need for a human organizer of a computerized conference.

In order for a computerized conference to be successful, according to initial observations, the moderator has to work very hard at both the "social host" and the "meeting chairperson" roles. As social host she/he has to issue warm invitations to people; send encouraging private messages to people complimenting them or at least commenting on their entries, suggesting what they may be uniquely qualified to contribute. As meeting chairperson, she/he must prepare an enticing sounding initial agenda; frequently summarize or clarify what has been going on, try to express emerging consensus or call for a formal vote, sense and announce when it is time to move on to a new topic. Without this kind of active moderator role, a conference is not apt to get off the ground.

It should be noted that the "chairperson" role was hampered during the pilot period by the absence of several software aids that were not available, such as titles for conference entries (which can be listed and serve as a table of contents for participants); sequencing of comments to show which are related to one another; or voting.

User Reactions to the EIES Mode of Communication: Initial Results*

Seven long follow-ups were received from members of groups 20 and 80 who were connected neither with NJIT nor with NSF, by the end of January, 1977. Of course, this is a very small number, and those who both used the system more than five hours on line and returned their questionnaires immediately upon receipt cannot be said to be representative of all EIES users. However, their reactions help to pin down the probable typical image of the system held by regular users, in terms of subjective impressions.

There were nine seven point scales; One was the highest rating; 4 was neutral; 7 was the lowest ("bad adjective") rating, except for the "frustrating" scale, which was inadvertently reversed on these initial draft questionnaires. Below are the items and the mean ratings.

Overall, the EIES communication system is

Extremely Good	...	Extremely Bad	3.0
I find using EIES to be			
Stimulating	...	Boring	3.6
Productive	...	Unproductive	3.6
Great Fun	...	Unpleasant Work	3.14
Time Saving	...	Time Wasting	4.0
Frustrating	...	Not Frustrating	4.14
Friendly	...	Impersonal	3.14
Easy	...	Difficult	2.14
Not Demanding or Intrusive	...	Very	2.86

Mean Time until they had "learned to use EIES well" was 3 hours.

All but one of the ratings were on the positive side. The exception was that they found it neither time saving nor time wasting (at this point). The highest ratings were for "easy to use"; in contrast to the sizeable proportion

*For results based on 29 returns, see Hiltz 1977b.

of nonusers who thought it looked too complicated or difficult to learn.

The information brochure was in obvious need of improvement (and this was subsequently done). On a one-to-five scale, the mean ratings from these seven most experienced users were:

understandable ... not understandable	3.14
easy to read ... hard to read	2.86
well organized ... not well organized	3.86

One problem pointed out by some users is that the style and organization of a training manual for new users is not optimum for a permanent reference document; perhaps two different documents are needed, for these two purposes. Indexing has also been suggested by several users.

Some Initial Observations About Variations in Acceptance and Use of EIES

Based upon the behavior of the pilot groups using the system, the following conditions seem to be necessary for heavy use to be made of EIES:

1. The members must have easy access to computer terminals, preferably at home as well as at the work location. (Seems obvious but has not been made a condition for being given membership).
2. There seems to be some minimum "critical mass" of the group, both in number of members and number of different geographic locations in which the clusters of members are located. A rough guess at this point is that the minimum may be about a dozen active participants in three or more locations.

Below this "critical mass", there are not likely to be enough new messages or conference comments entered so that there are always new items to be received and responded to. Above the minimum size and dispersion, enough activity and controversy can be generated to motivate members to sign on frequently and to actively participate in the exchanges.

Group 89 suffered from the problem of insufficient size and was the source of the "critical mass" hypothesis. It had only five participants; and three of them were co-located within one hundred feet of one another's desks.

3. There has to be a considerable investment of time and effort by several members of the group who play key roles. If the conference moderator or group leader do not sign on frequently, the use of the system by the group will atrophy.

An important factor in determining the success or impact of this system is what are the possible rewards or motivations for scientists to assume these time-consuming roles? For example, being the editor of an established journal confers prestige; however, being the editor of an EIES BULLETIN may not be seen as having very many extrinsic rewards.

4. The group must be a "real" group and must want to use the system.

By a "real" group, is meant one in which most of the members already know one another personally or professionally, and in which there is a history of shared research concerns and familiarity with and exchange of materials on one another's work. The medium, unlike the professional convention, cannot be relied upon to foster the development of acquaintances and common interests when absolutely none exist to begin with.* The members cannot be coerced or subtly pressured to agree to try the system. Though a person can begin to use the system's message and conference features after about a half hour of practice, it takes several hours to become comfortable and familiar with all of the various commands and options. A user who is not strongly motivated to communicate with the other group members to begin with will not be willing to invest this learning time.

An example of a lack of these conditions is group 20. In the pre-use questionnaire, a majority indicated that use of the system was not a free choice by them:

*If a user is strongly motivated to communicate with members of one group and signs on frequently, it is likely that he/she will make new or additional professional contacts on the system, however.

Q: Which statement best describes your incentive for using the system?

4 = I am required to use.

4 = I have been requested to use it.

4 = I am free to use it as I wish.

After three months many of the inactive users indicated on the follow-up that they still did not know who was in their group, or what its purpose was. The following are some comments which illustrate this:

"I don't know who is a member of conference 20."

"Not sure yet (how many he knows). Perhaps two or three."

"I think that your main problem is that many of the participants have no interest in EIES. They have been recruited and have not volunteered."

"Group 20 seems to be a dumping ground without charter or purpose. I look to other groups for activity."

This latter comment also points to an interesting phenomenon. Having found group 20 to be in a state that might be termed "anomie," at least four members joined or formed other groups that were oriented to a specific purpose, and seemed quite active or enthusiastic about them.

Perhaps this is the most important conclusion which can be made at the present time; that users will utilize the system in many unanticipated and innovative ways. For example, one conference moderator decided to solve the "getting to know you" problem by starting the group's conference with a synchronous (simultaneous - on-line) Friday evening "cocktail party" ("bring your own!"). Some of these innovations will work; some will not. The evaluation project will continue to attempt to capture, document, and generalize conclusions that can be derived from such unanticipated behavior and its outcome, in terms of its implication for future design and applications of systems such as EIES.

Some Unresolved Methodological Problems*

Some problems are resolvable if a higher degree of importance were attached to systematic evaluation. These include:

1. The bulk of the communication on EIES occurs through private messages, the content of which is not available to an evaluator. About 75% of the items and 50% of the text lines sent were in messages rather than in comments. Some mechanism must be found for evaluators to have access to at least a sample of the content of these communications if they are to be able to fully describe and analyze the communications they are studying.

2. No users of the system are required to cooperate in answering questionnaires or supplying other data. The non-respondents tend to be the non-users or the infrequent users. Some sort of incentive seems necessary in order to obtain acceptable response rates from user groups.

3. Ideally, for research purposes, user groups would either serve as "their own controls" by having their communication and productivity monitored for 3-6 months before use; and/or by being matched to similar groups who do not use the system.

4. Incomplete system -- Some of the potentially most valuable communication aids are not available on the current EIES system. This includes graphics and a fully operational "HAL" to interface other computer resources.

Other methodological problems and limitations seem to be intrinsic to a limited-scale field trial. It is recognized that this field experiment will distort and fail to measure what might actually occur should computerized conferencing become a "normal" widespread, non-experimental mode of communication.

*Several of the ideas in this section benefited from a discussion with Joseph Martino of the University of Dayton Research Institute.

Among this class of problems are:

1) The Technology Is New and Will Be Limited to a Single Group.

One analogy which might be made is to the situation when telephones were new and owned by only a few persons. Just as one used to have to shout to be heard over long distance and was subjected to much static, so it can be expected that there may be a few technological kinks in the system in the beginning, which may discourage and frustrate users.

Secondly, the scientist-users will have to resort to other communication modes for other roles they play and their associated communications. Eventually, terminals in the home and the use of computerized conferencing might become as cheap and widespread as T.V. ownership is presently. At that point, one could belong to many "conferences", corresponding to all of one's roles: a "family news" conference, for example, and a chess conference. For the duration of this field experiment however, only the approximately 300 scientists on the system will be able to be reached by computerized conferencing.

As a result, use of the system will have to be added on to use of other communications modes rather than replacing much of their use. A related factor is that for system planning purposes, the specialty group's ability to expand to include new members on the system has been arbitrarily limited during the course of the experiment. If computerized conferencing were a generally available service like the telephone, any number of additional persons might join the network. Still another factor related to the newness and scarcity of the technology is that many of the scientists might never before have used a computer terminal and might not have any other use for it; thus, the learning might be somewhat annoying. Furthermore, since the user will not generally have a terminal both at home and in the office, he/she must take the trouble to carry it around if it is to be available at all times. If the day ever comes when

terminals are as omnipresent as T.V.'s, they will always be conveniently at hand without foreplanning, and used with as much frequency and ease as more familiar household appliances are now.

2) The Hawthorne Effect

The scientists in this study will know that they are being observed. They will also know from the questionnaires they answer and from announcements of the project what variables are being watched. This cannot help but affect the behavior of the persons involved. They may tend to be self-conscious about what is entered into the system, knowing that "big brother" evaluator may be out there somewhere reading the transcript. They may deliberately distort their questionnaire.

3) Long Term Effects

In the current experiment, scientific communities are given approximately a year of access to EIES. However, the development of a new scientific concept or the transition from hypothesis to proven "fact" may stretch over time frames of a decade or more. In addition, the knowledge that access to this new communication medium is only temporary may decrease the motivation of scientists to learn to use the full capabilities offered or to become dependent upon it.* Thus, it will be difficult to determine the extent to which one single year's use would produce the same kinds of impact upon the work of a scientific community as would a permanent system whose future availability for the completion of long term projects could be counted upon.

4) Geographic Limitation

The most important potential effects of computer based communication systems may be the facilitation of international communication. The present experiment is limited to North America, however.

*Several members of current EIES groups have explicitly stated to the evaluator that this is the case.

V. EIES USAGE DURING THE DEVELOPMENT PERIOD

A. BACKGROUND & ACCOMPLISHMENTS

During the period of 10/76 to 10/77 the EIES system underwent pilot use by approximately 200 individuals. Except for those involved directly in the EIES development effort, all the users were invited to use the system and were under no compulsion to do so. They do not represent, therefore, a population seeking to utilize this form of communication, as is now occurring under the NSF announcement inviting proposals for the use of EIES. However, the statistics that are examined in this section do provide certain items of useful information for understanding the behavior of users on this system and for evaluating some aspects of costs and benefits. This report utilizes the monthly statistical reports generated during the trial period to look at basic considerations of throughput and usage patterns as a function of user experience.

We will begin with the basic statistics collected by the monitor routine on gross traffic through the system -- total number of users, time on, items sent and received, etc. We will then refine and interpret these statistics in order to make inferences about user behavior patterns and to derive measures of cost and benefit that will be necessary in order to compare this medium of communications to alternative media. The basic strategy in the second part of the analysis is to extract a User Sample which excludes programmers and others whose behavior distorts the data in terms of its representativeness of actual users. The next step is to divide this user sample into classes based upon total amount of use, so that we can determine changes that occur as experience is gained on the system.

Utilizing the data derived on such factors as average time invested per item received and words per minute input rate, we will then attempt to make a comparative analysis of the costs of sending information to a group using EIES vs. alternative media. Contrasts between observed behavior on EIES and that

on other computer-mediated communication systems will be included in the section on comparative analysis. Finally, we will summarize the observations and interpretations we have made using the EIES statistics, as a set of hypotheses. We hope in the future to be able to have fuller and more comparable data on the various communication modes covered, in order to be able to test these hypotheses, which were derived by induction from the data presented here.

Before embarking on this exercise or presenting the measured and derived statistics on user behavior, however, we would like to summarize the kinds of changes which took place during the development period, largely as a result of feedback from these pilot users. In other words, the main benefits derived during this period, from the point of view of the development effort, were the many changes made in the system as a direct result of user experience. Among these are:

Enhanced Text Editing

The desire of users to dress up items of a more permanent nature led to major extensions in text editing and refinement of existing features. The incorporation of these features may be related to the fact that EIES text items have a significantly larger size than is typical of either other message systems or conference systems not having well integrated and powerful text editing features.

Message Control

The design philosophy for the handling of messages underwent considerable change as it was realized that users seemed to have a need for a number of months to refer back to or obtain messages that had been previously delivered. EIES now maintains a centralized common file of the last 30,000 messages, which is always available for retrieval by senders or recipients of a message. This approach is considerably different than that of other systems, such as the ARPANET message service, and leads to a very different psychology on the part of the user for the handling and use of messages.

Text Manipulation

EIES now incorporates a completely lateral ability to transfer, copy, merge and generally manipulate text items which cuts across the standard division of messages, comments and pages. As a result, the experienced user has the facility to deal with common subject matter he or she has written or received, regardless of how it was initially originated in the system. The current ability to do this is considerably more flexible than what was conceived in the original design specifications. To a large extent this is due to the feedback of users.

Convenience Features

A number of special features resulted from both direct suggestions of users and indirect evaluation of user problems. Typical of this was the "information overload" problem users found upon receiving large amounts of new material at any session on the system. As a result each EIES user now has available his or her own private file of one line reminders that can be used to log and reference items received on the system which the user wants to delay responding to until a more convenient or appropriate moment.

Terminal and Formatting Control

Experience with a wide range of differing terminals led to much sharper distinctions between formatting control of text items by receivers and writers and the ironing out of consistency and priority relations between these. There is now a fairly flexible ability of a receiver to control the form of his output independent of the writer's compositional choices.

Statistics

As a result of experience, refinement has taken place in the statistics that are now gathered on EIES use. Because of the richness of EIES one could consume the resources of the computer in merely measuring what is taking place. As a result it becomes necessary to have some balance between hypotheses or models of what is taking place and an understanding of what statistics would be of use in establishing the validity of the hypotheses. We do believe the collection of statistics in the EIES system has to be an evolutionary process.

Advanced Features

A small but significant number of EIES users did evolve to the point where they have been tailoring and designing their own interfaces and methods of interaction with the system. This has been a result of a decision made during the development phase to incorporate the availability of a programming language within EIES text. EIES now allows a considerable range of modifications the user can make from a simple way to tailor his or her own commands to full scale programs capable of gathering information in an organized manner from other users--questionnaire and form design. Some of this resulted from considerations of what would be desirable for those conducting research or evaluations on EIES. Another potential use is soliciting material from a group of people engaged in specific secondary scientific support objectives, such as standards setting.

User Consultants

The trial period led to the establishment of individuals independent of the EIES development group who act as educators or on-line consultants for those users having difficulty following the written documentation or seeking to learn advanced features. User consultants on EIES are volunteers drawn from active EIES users who receive no pay for this activity but do receive free time for use of the system. It is assumed, and appears to be borne out by other types of interactive systems, that users may feel freer about discussing problems with the user consultants than directly with those involved in the EIES effort. A file is kept of problems brought to user consultants that has been a very useful form of feedback. Also, the user consultants appear to aid in building up a community or group feeling among users for the exchange of information on new ways to do things or developing norms on styles of communication and writing.

Feedback Refinement

It has become quite evident that evolution of the design of such systems must function as a result of a balanced feedback program which is likely to involve systematic questioning of users, observation of user behavior both statistically and in terms of participant observation, and indirect feedback via individuals acting as intermediaries. As the current statistics bear out, behavior on this type of communication-information system is not typical of either data base or other time sharing type systems. Since systems of this sort represent a completely new psychological and sociological environment for most users, the connection or relationship between user perceptions and design option decisions is not, in many cases, a clear or direct one. In fact, it appears desirable to involve those users who desire it directly in the process of design itself. We have, in fact, done this with a small number of users. While this has led, we believe, to a much better system, it does prove to be a more labor intensive effort with respect to the evolution of the system and a more demanding one with respect to the talents that must be present within the total feedback operations. The EIES effort has not only involved user participation in the design process but has incorporated inputs specifically from psychology and sociology into design decisions. We also believe this is a necessity for computerized conferencing systems and that these systems are breaking new ground with respect to user behavior. It also appears to us to be impossible to separate the technical design issues from these considerations or to completely standardize or freeze the design while the user behavior aspects undergo significant changes.

Educational Materials

As a result of user experience and user contributions, the educational material has undergone considerable evolution. Since most users of EIES will not have individual instruction and must rely on the written materials supplied, this is very significant to the long term success of the effort. The current user manual (Appendix) received considerable input from users and the primary authorship is by the EIES designer and two users. Interestingly these parties have never met face-to-face and are only acquainted through EIES itself.

B. BASIC STATISTICS

The interpretation of the following statistics cannot be divorced from the material gathered from questionnaires and interviews, as well as other feedback and observation. Some of the observations we will make about what the data mean are a result of the merger of these diverse sources.

The first five tables represent measured statistics obtained on a monthly basis. A user is a single individual, who in a few cases may have had more than one membership number when his or her reason for participation on the system changed. In such cases addition of statistics for the two memberships was done

to create one user. Special roles such as System Monitor, Operations Manager and Center Director were not included as users or added to an individual's participation. Some users represented more than one person, using the same ID, as per the example of a husband-wife professional team or a professor and one of his students. We have no way of breaking down these statistics and they were treated as single users even when we knew this had been taking place.

Tables one and two represent distributions of number of users. Approximately 17% of the 230 individuals invited to access the system never tried the system. We believe the reasons for this are brought out in the user feedback discussed in the evaluation section and are strongly tied to not having a pertinent topic of interest and a group present on the system that they wished to communicate with, as well as to the lack of convenient access to a terminal.

Another 28% never got past the learning stage of four hours of usage or less. While some of this is no doubt a result of some of the bad experiences with some of the system difficulties early in the operations, both with EIES and with TELENET, we feel that motivational factors brought out from the questionnaires are the more dominant reasons. The detailed data on users in this category, illustrated in Table 14, points out that many of them in fact did enter the system over a considerable span of months and could not have had difficulties every time. The detailed data show a very low comparative rate of sending any messages or composing anything for this class of users. While most low usage users did demonstrate that they could send a message or even write a comment, they seemed to have little motivation to do so compared to users who exhibited greater usage. This appears to confirm the view that the subject matter and the individuals available to communicate with are key to the motivation of an individual user. It would be our hypothesis that the groups motivated to respond to the NSF announcement will exhibit better distributions with respect to usage.

We also believe that the lack of user consultants and of an experienced body of users during the early months may have been a contributing factor to the low level of involvement of new users who did not enter the system with a specific purpose in mind. We feel that an experienced user community willing to exchange information may be crucial to the success of the operation. This relates to the effect of critical mass mentioned elsewhere, and to the lack of sufficient public material on the system in the initial months to give new users a variety of options. The existence of a user community and publicly available material also aids in overcoming the secondary learning phase, once the mechanics of the operation are understood. This phase involves an understanding of how to best use messages and comments and what sorts of writing styles are useful in what circumstances. We have observed specific norms and rituals to emerge over time on the system with respect to these items and some are summarized in the new user manual (Appendix). In particular we observe among experienced users many unique writing style features not common to letters or other forms of written communications.

The summer months of 1977 represented a gradual cutback of users who had access to the system and a period of major revisions to the features of the design, as is evident in Table two. Table three represents hours of actual usage. Our average usage on a gross basis was about 100 users who consumed about 10,000 hours over the year, or around 100 total hours per user. This is about one-sixth the current capacity of a 300 active user population. While this exhibits a planning figure of two hours per week per user a more detailed analysis in the later tables by usage categories shows that very active users exhibit more like 6 hours per week on the average. Currently, our best estimate for planning purposes is a range of 3 to 4 hours per week. We suspect the makeup of users under the announcement will shift our current two hour average

toward this range, because a much smaller percentage of them will turn out to be inactive users and a larger percentage should turn out to be active users, than was the case during this test period.

Table 1

USAGE DISTRIBUTION: Number of Individuals
by Category of Use & Total Time

/Category Hours of Use	200 Series	700 Series	800 Series	900 Series	EIES Effort	TOTAL
Never Used	23	8	7	2	0	40
1 hour or less	9	4	11	8	0	32
1 to 2 hours	5	4	2	2	0	13
2 to 4 hours	8	5	3	5	0	21
Subtotal: Learning Stage	22	15	16	15	0	66
4 to 8 hours	11	4	5	5	0	25
8 to 16 hours	7	7	9	8	8	39
Subtotal: Casual Use	18	11	14	13	8	64
16 to 32 hours	2	5	0	6	2	15
32 to 64	4	5	2	7	2	20
64 to 128	2	1	1	1	5	10
128 to 256	0	1	0	1	2	4
256 to 512	0	0	0	0	5	5
512 to 1024	0	0	0	0	6	6
Subtotal: Active Users	8	12	3	15	22	60
TOTAL	71	44	40	45	30	230

Table 1 represents a distribution of hours of usage from 10/76 until and including 10/77. Of the 230 individuals who were invited to have access to the system, 40 never made an attempt to get on the system. The 200 series of users represents, in large part, the Principal Investigators for Grants and Contracts of the Access Improvement Program of the Division of Science Information of NSF. The 700 series represents a special workshop project for the Division of Computer and Mathematical Science of NSF on future research directions in the area of human communication via computers. However, it should be noted that members of EIES in the 200, 800 and 900 series also participated in this workshop. Therefore, members of the 700 series represent only those invited in for this specific

task. The 800 series represented three test groups that were provided access as experiments. One involved project management on an HEW research effort that NJIT was involved in; one was a small group in Systems Dynamics and the other was a small group coordinating activities for a major professional meeting. The 900 series represented internal experimental use of the system made by NJIT students and faculty and represented such applications as coordination of related research in human communication via computers, graduate class discussions, controlled experimentation and coordination of the student ACM club activities. The EIES support represents both those involved in development and direct service to the users of EIES.

Table 2
NUMBER OF USERS
by
Month and Category

/Category Hours of Use	200 Series	700 Series	800 Series	900 Series	EIES Effort	TOTAL
Month						
10/76-1/77	40	21	29	14	19	123
2/77	32	20	18	30	21	121
3/77	32	23	17	31	22	125
4/77	29	26	19	31	24	129
5/77	22	24	16	19	25	106
6/77	25	21	15	19	27	107
7/77	24	19	9	15	27	94
8/77	10	16	5	13	27	71
9/77	12	13	3	7	27	62
10/77	11	11	1	7	24	54

Because the period from 10/76-1/77 represents a transitional one from no users we are lumping that period as one data entry on the monthly breakdowns in the above and succeeding tables.

Table 3
NUMBER OF TIMES ON and HOURS OF USE
Accumulated and Monthly

Month	TIMES LOGGED ON		HOURS OF USE	
	Accumulated	Monthly	Accumulated	Monthly
10/76-1/77	7,849	X	2,241	X
2/77	11,404	3,555	3,413	1,172
3/77	14,126	2,722	4,325	912
4/77	16,788	2,662	5,220	895
5/77	19,037	2,249	5,981	761
6/77	21,997	2,960	7,180	1,199
7/77	23,935	1,938	7,910	730
8/77	25,920	1,985	8,645	735
9/77	26,948	1,028	9,027	382
10/77	28,497	1,549	9,837	810

It should be noted that by the summer of 1977 the formal efforts on the system such as the NSF workshop were largely completed and only those users who had come to use the system on a regular basis for professional communication continued active. In September of 1977 the system was shut down for a significant period to allow change over to a new interface design. Much of the effort in October was concerned with debugging that interface and documenting new user materials.

Table 4
MESSAGE TRAFFIC
Number of Messages Sent and Received
Accumulated and Monthly

Month	NUMBER SENT Accumulated	Monthly	NUMBER RECEIVED Accumulated	Monthly
10/76-1/77	7,585	X	16,702	X
2/77	11,160	3,575	26,238	9,536
3/77	14,439	3,279	30,566	4,328
4/77	17,480	3,041	37,988	7,422
5/77	20,454	2,974	44,256	6,268
6/77	24,378	3,924	51,973	7,717
7/77	27,233	2,855	57,461	5,488
8/77	29,904	2,671	63,016	5,555
9/77	31,123	1,219	65,655	2,639
10/77	34,301	3,178	76,628	6,973

Table 5
CONFERENCES AND COMMENTS
Number of Comments Composed and Read
Accumulated and Monthly

Monthly	NUMBER OF CONFERENCES	COMPOSED Accumulated	Monthly	READ Accumulated	Monthly
10/76-1/77	26	727	X	9,546	X
2/77	35	1,267	540	16,061	6,515
3/77	39	1,604	337	29,768	13,707
4/77	43	2,057	453	36,017	6,249
5/77	52	2,539	482	38,568	2,551
6/77	72	4,218	1,679	39,340	772
7/77	85	4,798	580	41,432	2,092
8/77	87	5,486	688	46,543	5,111
9/77	87	5,691	205	48,604	2,061
10/77	87	6,251	560	50,491	1,887

In June a large number of conferences were opened for use as personal notebooks. Also, a number of people were engaged in writing up what had occurred in some of the activities during the prior six months. This we believe accounts for the fact that in June we observe many more comments written than read. It should also be noted that the life of a comment can be much longer than that of a message, in particular since it is common practice on EIES to introduce people to an ongoing discussion, in which case they will go back and read the conference transcript, often involving comments many months old. For this reason the monthly data are not particularly meaningful with respect to comparing the monthly number of items composed to those read, since a particular comment may be read much later by a newcomer to the conference. In fact, it is quite common for people to enter a conference that has been taking place for some time and to then catch up by reading the transcript that may reflect many months of discussion. The monthly data, however, do reflect the reading peak in March for the workshop conferences and the report writing peak in June for both the workshop and some other activities taking place at that time.

C. AVERAGES

Tables six through 8 represent a number of gross averages which will be refined later from the user sample. The concept we believe to be of particular concern for evaluating this form of communication is the investment in time a user makes per item received (table 6). This is a significant variable for comparison to other forms of communication and useful for looking at concepts such as "Exchange Theory" as a model for understanding the process. The time investment includes the composition time, as it is the total time of interaction divided by the items received. The figure of around five minutes given in Table 6 on a gross basis is misleading as we shall see from the sample data of Table 14. However, as we will also see, even this figure of five minutes is less than the equivalent investment in time that must be made using a phone to communicate the same amount of words. In that case there is a six minute investment. Table seven does exhibit a consistency for the average number of receivers per private message on an accumulated or monthly basis, which is slightly more than two.

The steady growth of items per conference in Table 8 is a reflection that certain conferences have exhibited a long term staying power. If we exclude those set up to accomplish a specific objective within a certain period, such as the group conferences for the Workshop, then we find the remainder fall into two categories. One, being a set of conferences that were set up but never really got going, usually because of the lack of someone willing to invest the time to act as facilitator; and, two, a set of informal conferences usually generated by a group that got together over EIES and seemed to feel they had topics they mutually wanted to discuss. These latter seem to continue on as long as the group is around and activity comes in peaks and valleys. A particular comment on a specific topic will often trigger a flurry of interaction which will slowly die out after a week or two. Then at some point a new topic or derivative of an

older one will rekindle the discussion. These conferences have no single moderator and tend to serve as both an exchange of views forum and a sounding board for concepts. Many of them exhibit a high degree of mutual trust among the participants in that people seem willing to take very far out positions; although, one wonders at times if this is not done as a stimulant to discussion rather than an exhibition of commitment to the ideas expressed. It is also common to see pennames used in some of these discussions.

Now that key words and associations are available it should be easier in the future to pin down patterns of discussion in the conferences. Conferences used as notebooks have led to a significant amount of paper writing with contributions and reviews offered by others. A number of joint authorship items have resulted, including the new users manual, the workshop reports involving eight principal authors, and some group proposal writing. In all the group writing efforts there was considerable geographical spread among those involved. The user sample data provides further insight into the tradeoff of the use of messages and conferences.

Table 6
INTERACTION AVERAGES

Month	Interaction Time (minutes)	Interactions per User		Hours per User	Time per Item Received
	Accumulated	Monthly	Monthly	Monthly	Monthly
10/76-1/77	17.1	X	16	4.6	5.12
2/77	18.0	19.8	29	9.7	4.84
3/77	18.4	20.1	22	7.3	4.31
4/77	18.7	20.2	21	7.0	4.23
5/77	18.9	20.3	21	7.2	4.33
6/77	19.6	24.3	28	11.2	4.72
7/77	19.8	22.6	21	7.8	4.80
8/77	20.0	22.2	30	10.4	4.74
9/77	20.1	22.3	17	6.2	4.74
10/77	20.7	31.4	29	15.0	4.79

The first two columns of Table 6 represent the total time on an accumulated or monthly basis divided by the number of sign ons. Since the final month was largely EIES support people and the very active users the monthly figure of 31.4 minutes is very indicative of heavy users of this type of system. The next two columns are defined by taking the number of users who were active in a given month to get an average of the number of sign ons and the number of hours of use. As we will see later, these averages are very gross when one looks at a finer breakdown by users with respect to their activity as casual or active users of the system. The final column represents the total number of items received divided into the total time. This, therefore, is the commitment in time by one individual per item received; however, it does include composition. For example, if one were to compare this to a three minute telephone call one would have to say the three minute telephone call represents an investment of six person minutes of time because there are two parties involved during the three minutes. That six minutes of person time is comparable to the 4.79 minutes of EIES time per item.

Table 7
MESSAGE AVERAGES

Month	Number of Receivers		Number Sent per User	Number Received per User
	Accumulated	Monthly		
10/76-1/77	2.2	X	15	34
2/77	2.4	2.7	30	79
3/77	2.1	1.3	26	35
4/77	2.2	2.4	24	58
5/77	2.2	2.1	28	59
6/77	2.1	2.0	37	72
7/77	2.1	1.9	30	58
8/77	2.1	2.1	38	78
9/77	2.1	2.2	20	43
10/77	2.1	2.2	59	129

The first two columns of Table 7 are based upon dividing the total number of messages received by the number sent on either an accumulated or monthly basis. Because messages sent in one month can be received in another the accumulated is considered a more reliable average. The final two columns are defined by dividing the number of messages sent and received by the number of active users in that month.

Table 8
CONFERENCE AVERAGES

Month	Conferees per Conference Accumulated	Monthly	Comments per Conference	Composed Comments per User Monthly	Received Comments per User Monthly
10/76-1/77	13	X	28	1	19
2/77	13	12	36	5	54
3/77	19	41	41	3	110
4/77	18	14	48	4	48
5/77	15	5	49	5	24
6/77	9	.5	59	16	7
7/77	9	4	56	6	22
8/77	8	7	63	10	72
9/77	9	10	65	3	33
10/77	8	3	72	10	35

Column one of table 8 is the average size of a conference and reflects from June on the growing use of conferences as personal notebooks. The monthly peak in March represents the peak activity in the NSF workshop. The number of comments per conference on the average reflects a steady growth. There were a sizable number of conferences opened up that never got used by those that requested it and a sizable number that went to over 400 comments so that there is a high variance for this average. As we shall see the averages of comments composed and received per user will be better explained when we exhibit it by type of user.

D. TEXT LINES & ITEM SIZE

Table nine summarizes a dianostic of the EIES file to determine item sizes. A conference comment on EIES averages 296 words as compared to 173 words for a message. The upper limit on a text item in EIES is 684 words. While comments represent about a quarter of the items written they are over half of those received, as evidenced in Tables 10 and 11. Also text items, whether messages or comments, are noticably larger than the 150 words or less that seems to be typical of other systems offering either messaging or conferencing. Since other systems such as IFF's Planet have seen subsidized use, we do not feel cost is a major factor (although most Planet users did pay for costs). We tend to believe that the richness of the design in terms of the editing and later possible use of the items over again or for new purposes contributes to the size. There is also the possibility that the fact that the active user population on EIES has a far greater percentage of social scientists than has occurred on the other systems and that they tend to emphasize descriptive material to a greater degree than the physical scientists and engineers, may be related to larger mean item size. The issue of what influences size is still an open one. We do think that the relative size difference between messages and comments is a product of the design of the system, to a major degree. It is our impression from observation that more care and think time goes into comments and that they are viewed as a little presentation to the group comprising the particular conference. Since reward or reinforcement is gotten in a conference by members commenting back on what you have said, there is the psychological pressure to be relevant to the discussion. People have more of a tendency to actually say they agree or disagree or that a comment was interesting. This has been hypothesized as a tendency to make up for the lack of smiles, eye contact and other non verbal language lacking in this environment. Messages tend to be of a more

directed and specific nature, or of a totally socializing nature. The analysis of the data from the user sample further confirms that messages and conferences are utilized very differently and play very different but complementary roles in the overall communication process that EIES attempts to provide.

Table twelve provides an evaluation of the effective human input rate in words per second, which as a gross average turns out to be 15 words per minute or about equivalent to hand writing speed. For a number of reasons given with Table twelve this is a lower limit on the actual speed and the user sample data averages about 20 words/minute for experienced users. These rates include the interaction time of the user making choices, imputing commands, etc. We believe this overall input rate is an important measure for relative comparison of keyboard oriented systems; however, it has not as a rule been reported upon in the literature. The difference between the real typing rate for the users and the effective rate can be accounted for in two components. One is the time lost to the interaction and the other is the think time about what it is they are writing. In some of our controlled experimental work on EIES, where users were observed through one way mirrors, there was a considerable amount of re-reading of items before finalizing responses. With the tendency to larger items we would also expect more use of think time. We believe this is beneficial to the quality of the material that may be produced in systems of this sort and should not be discouraged either by the design or by the charging policies used.

Table 9
TEXT LINES
File Sample
December 1977

ITEM TYPE	Number of Items	Text Lines	Lines per Item	Blocks 512 Chrs.	Characters per line
MESSAGES	15,012	216,049	14.4	26,580	63
COMMENTS (30 Group Conferences)	1,317	35,150	26.7	4,022	59
COMMENTS (55 Private Conferences)	1,656	38,469	23.2	4,314	58
COMMENTS (13 Public Conferences)	284	6,806	24.0	639	48
PAGES (25 Private Notebooks)	318	8,054	25.3	827	53

A sample of all existing items in the File was run in December to determine the size of item types. Over eighty percent of the sample represents items written during the trial period. The average size of a message was 14.4 lines of text and the average size of a comment was 24.7 lines. We adapt these averages for use in the calculations to follow, along with an average line size of 60 characters. The slight difference in line size between messages and comments is probably due to the tendency for users to do more outlining or structuring of material in comments than in messages. The significant difference in item size, we believe, is indicative of the differences in use of messages and comments and how they are perceived by the user. The data show about 173 words per message and 296 per comment. We also note that this is considerably higher than the results reported on other systems, such as the Institute for the Future's Planet, and may be a result of having more options for both the types of communication possible as well as the more flexible text editing capability. The average size of items, taking messages and comments together, is 221 words. The limit size

on an item in EIES is 57 lines or 684 words. Looking at the same sample data broken down by month in which the items were written, average message size ranges on a monthly basis between extremes of 12.2 and 15.7 lines; whereas, average comment sizes range between 19.4 and 41 lines. There was no observed trend on the monthly basis, and the fluctuations may be reflective of certain activities being more dominant at certain times during the test period. Direct observation seems to indicate certain individuals have definite trends toward shorter or longer items. However, the distinction between message and conference size is not an individually based difference.

Table 10
TEXT LINES COMPOSED

Month	Accumulated	Monthly	Proportion Comments
10/76-1/77	126,817	X	.14
2/77	191,365	64,548	.16
3/77	246,737	55,372	.16
4/77	301,491	54,757	.17
5/77	355,980	54,489	.17
6/77	453,118	97,135	.23
7/77	508,266	55,147	.23
8/77	563,378	55,112	.24
9/77	585,893	22,515	.24
10/77	654,208	59,315	.23

Table 11
TEXT LINES RECEIVED

Month	Accumulated	Monthly	Proportion Comments
10/76-1/77	471,521	X	.49
2/77	766,503	294,982	.51
3/77	1,160,535	394,032	.62
4/77	1,418,638	258,103	.61
5/77	1,570,631	151,993	.59
6/77	1,700,439	129,808	.56
7/77	1,830,092	129,653	.55
8/77	2,033,770	203,678	.62
9/77	2,121,648	87,878	.55
10/77	2,267,725	146,077	.54

Using the averages obtained from the data in Table 9 and the number of messages and comments composed and received from the earlier tables, Tables 10 and 11 provide the estimated number of text lines that have passed through the system during the trial period. The proportions are based upon the accumulated totals. We note that while the text lines composed for comments represent only 23% of the total composed lines, they represent over 50% of the received lines.

Table 12
OUTPUT AND INPUT TIME
and
EFFECTIVE INPUT RATE

Month	Time for Output (hours)		Time for Input (hours)		Effect Input Rate (wds/min)	
	Accumulated	Monthly	Accumulated	Monthly	Accumulated	Monthly
10/76-1/77	262	X	1,979	X	12.8	X
2/77	426	164	2,987	1,008	12.8	12.8
3/77	645	219	3,680	693	13.4	16.0
4/77	788	143	4,432	752	13.6	14.6
5/77	873	85	5,108	676	13.9	14.6
6/77	945	72	6,235	1,127	14.5	17.2
7/77	1,017	72	6,893	658	14.7	16.8
8/77	1,130	113	7,515	622	15.0	17.7
9/77	1,179	49	7,848	322	14.9	13.5
10/77	1,260	81	8,577	729	15.0	16.3

Table 12 assumes an output rate of 30 characters per second (6 words/minute) and uses the text lines received from table 11 to estimate the number of hours needed to deliver that output on both an accumulated and monthly basis. Using the figures on hours of use from Table 3 it is now possible to estimate how many hours were then available for input and interaction with the system. Using those hours and the text lines composed (12 words/line assumed) it is then possible to estimate the effective input rate of words/minute typed into the system. On the one hand this includes the interaction (e.g. use of commands, menu choices, etc), which would tend to make it less than the true average typing rate for a typical user; on the other hand, it would also include the use of the Copy functions for copying, editing and resending or transferring items, which would tend to make it higher than normal. However, it is only a small proportion of the user population that has yet made use of these advanced features and the effect will be demonstrated in the data that follows. Since through a good part of the operation we were experiencing delays through TELENET that produced output at considerably less than the theoretical 30 characters per

second, the Effective Input Rates are felt to be reasonable lower bounds for this period of the operation. It should also be noted that the input of 15 words per minute, representative of the total material put into the system, is a rate equivalent to handwriting.

E. USER SAMPLE

Table thirteen breaks down a sample of 129 users by categories of total usage, with each category being essentially double the total time usage of the previous one. Within each category the average values of the measured parameters are shown for those users that fall in that category. In a sense this also provides some insight into the stages of user development as a user achieves a particular level of experience with EIES. As will be shown in Table fourteen, there does seem to be a distinctive change in behavior patterns as users move to higher levels of usage.

Table 13
USER PROFILES:
AVERAGES BY USAGE CLASS

SAMPLE (129 Users)

USAGE CLASS (hours)	Number of Users	Usage (hours)	Times on	Months ACTIVE	COMMENTS Received	Sent	MESSAGES Received	Sent
1-2	8	1.3	7	2.9	21	.25	29	2.25
2-4	17	2.6	17	3.5	23	.41	42	4.7
4-8	22	6.0	37	3.4	54	.86	51	13
8-16	31	11.0	57	6.6	114	4	110	25
16-32	15	23.6	96	6.9	278	15	280	62
32-64	19	45	149	7.8	513	61	347	131
64 & over	17	231	693	9.2	1,475	254	2,370	1,408
	<u>129</u>							

The above sample is defined by eliminating EIES programmers, special service roles such as system monitor, and users who only had access to the system for a very short period (two months or less). The remaining 129 users were then grouped by the above categories involving the hours of total use they made of the system and averages taken of the parameters defined in the table within each

usage category. While users may have had access to use the system over three months or more, the average month of usage in the above table reflects the number of months in which they were actually active. The above data are utilized in Table 14 to develop comparative parameters which may be utilized to compare on a relative base the behavior across the usage categories.

Table 14
COMPARATIVE PARAMETERS
FOR PROFILES
Averages

/USAGE CLASS COMPARATIVE PARAMETERS	1-2	2-4	4-8	8-16	16-32	32-64	64 & Up
INTERACTION TIME (Minutes)	11	9	10	12	15	18	20
INTERACTIONS/ WEEK	.6	1.1	2.5	2.0	3.2	4.4	17.4
HOURS ON/ WEEK	.11	.17	.42	.40	.80	1.32	5.80
COMMENTS Received/Sent	84	56	63	28.5	18.5	8.4	5.8
MESSSAGES Received/Sent	12.9	8.9	3.9	4.4	4.5	2.6	1.7
ITEMS Received/Sent	20.0	12.7	7.6	7.7	7.2	4.5	2.3
ITEMS RECEIVED per Interaction	7.1	3.8	2.8	3.9	5.8	5.8	5.5
ITEMS SENT per Interaction	.36	.30	.37	.51	.80	1.30	2.40
PROPORTION of ITEMS RECEIVED which are MESSAGES							
by Items	.58	.65	.49	.49	.50	.40	.62
by Lines	.45	.52	.35	.36	.37	.28	.48
PROPORTION of ITEMS SENT which are MESSAGES:							
by Items	.9	.92	.94	.86	.81	.68	.85
by Lines	.84	.87	.90	.78	.70	.56	.76

Table 14 (cont.)
COMPARATIVE PARAMETERS
FOR PROFILES
Averages

EFFECTIVE INPUT RATE (words/minute)	6.4	8.0	8.6	10.7	14.4	19.3	27.7
ITEMS SENT/ MONTH	.8	1.3	3.9	4.3	11.3	24.7	182.0
ITEMS RECEIVED/ MONTH	18.6	18.2	30.3	33.8	80.6	110.5	416.0
TIME INVESTED/ ITEM RECEIVED (Minutes)	1.6	2.4	3.4	2.9	2.5	3.1	3.6
% UTILIZATION BY USAGE TIME							
For Sample	.2	.8	2.3	6.0	6.3	15.1	69.3
For EIES total	.1	.5	1.3	3.5	3.6	8.7	40.0

The sample represented in Table 14 is approximately 58% of the usage of EIES over the period. An additional 28% of the usage is accounted for by six programming members of the development group and the System Monitor. EIES allows programming of certain features of the system by the direct development of those items as text items in EIES. Therefore the behavior of the programming group when on line to EIES involves program composition, testing and debugging. The average interaction time of the programming group is 62 minutes as opposed to the range of 9 to 20 minutes for users. Also the investment in time per item received is 6.5 minutes or approximately double of other EIES users. Their ratio of items received to sent is 4.1 and somewhat typical of the user results, so in terms of communication use of EIES they do act like other users. Their large proportion of use of the total system during this test period does throw off the gross statistics significantly because of their programming activities while on the system. Therefore, for planning purposes the analysis of the sample data is more meaningful. Of the 14% of usage unaccounted for, approximately 9% is in other special roles dealing with administrative and user aid functions, and the remaining 5% represents short term users and some experiments and demo type applications.

First we note that the average INTERACTION TIME per session on the system hovers at about 10 minutes until users accumulate more than 8 hours and that it then rises smoothly to 20 minutes for the most active users. However, recall that each user category is approximately double the investment of total usage time of the previous one. In terms of INTERACTIONS/WEEK and the HOURS/WEEK, the two categories in the 1 to 4 hour range are very similar, as are the two categories in the 4 to 16 hour range. After that there is a significant increase for each of the remaining categories. Four hours is the order of magnitude of the mechanics of learning the system during the test period. We suspect that

somewhere around sixteen hours (10 to 20 hour range) is another threshold having to do with learning how to employ the system to its best advantage and learning the associated norms that have been built up.

The ratio of conference COMMENTS RECEIVED/SENT shows a steady decline from 84 for the lowest usage category to 5.8 for the highest usage category. The ratio of all ITEMS RECEIVED/SENT declines until four hours of usage; then it levels off at the interesting number of about 7 for three categories until 32 hours is reached; and then the decline continues to 2.3 for the most active category. The ratio of MESSAGES RECEIVED/SENT exhibits the most interesting behavior and corresponds to an intuitive model of user behavior. There is a decline until the 8 to 16 hour range of use is reached, where it levels off until 32 hours of usage, and then begins to decline again. Apparently what is happening here is that a new user largely concentrates on messaging until he or she has formed sufficient relationships or feels confident enough on the system to be encouraged to participate in a conference by writing things. At 8 hours as the message ratio goes up, the comment ratio goes down, and the item ratio holds constant, there is a shift of the same level of effort to conference activity. After 16 hours there is now a continued decrease in all the ratios and it would seem that the conferencing proves to be a mechanism for creating more message activity. This appears to be caused by the formation of new relationships among individuals who discover common interests via the conferencing. One must recall that the EIES population represented many individuals who really did not know one another before their participation. Our intuition with respect to this explanation is based somewhat on observation of what was taking place. As a result the model of the interaction of the message and conference component of EIES is:

Phase One:

Messaging is the primary communication mode: many conference comments are

printed out but not responded to.

Phase Two:

A conservation of effort but a shift to a greater degree of compositional participation in conferencing.

Phase Three:

A build up of effort in composition and increased initiation of messaging as a result of conference activity and the formation of new subgroups.

In a number of experiments of limited duration involving combined message-conference capabilities (e.g. Bell Canada's PDP 11/45 trials in 1976), messaging was used much more than conferencing. For systems where messaging was not available or flexible, the contents of a conference often seem to be largely message like in content. We believe that the limited duration of these experiments, in which a single user may never have accumulated eight or more hours of use, may have been a significant cause of many conclusions. We feel that the EIES experience does demonstrate very different functions for messaging and conferencing. In addition, the EIES message capability is more flexible than that offered on some of the other systems such as PLANET of the Institute for the Future, where a private message may be sent to only one person and there are no group messages as in EIES. Since EIES does have the multiply addressed message and the group message available, the contrast in the use of messages and conferences is more dramatic than for previous experiments on systems such as PLANET.

We have referred to the regular users as somewhat "addicted" to computerized conferencing. One thing that seems to be able to explain this addiction, in theoretical terms, is exchange theory. In its simplest form, as stated by George Homans, (Homans, 1958, 1961)* no person will continue to engage in any

*Homans, George, "Social Behavior as Exchange", American Journal of Sociology, 62, (May, 1958).

Homans, George, Social Behavior: Its Elementary Forms. Harcourt Brace Jovanovich, Inc., N.Y. 1961

behavior that is not profitable. "Profit" is defined as rewards for engaging in an interaction minus costs. Costs are, essentially, the value of other activities that have to be foregone in order to continue to engage in a particular interactional exchange. If we look at the RECEIVED/SENT ratios we see that in computerized conferencing, even the most active users, "profit"; that is, they receive back considerably more items than they send. The overall ratio for messages received to sent is 2:1 and for conferences it is 8:1. This is not possible in any of the traditional one-to-one communication forms such as telephone calls or the personal letter. Attempts at using the mail in this way (e.g. chain letters) always result in very low exchange ratios.

If the exchange ratios had been 8:1 and 2:1 for all users individually, this would represent equal participation of all members of the system. This occurred on the average for the 32-64 hour usage group.

The total of the ITEMS SENT and RECEIVED per INTERACTION stays around seven for the three most active user classes. It has been observed that human short term memory is seven plus or minus two items on the average and interactive systems designers are well aware of this (Martin, 1973).^{*} It could be that the number of items to be dealt with will stay in the psychologically comfortable range of about seven. One observation that would tend to confirm this is the moans and cries of "distress" from users who have been away from the system for a much longer time than usual for them and who sign on and receive notification of many tens of items waiting for them. Their vocalizations can be interpreted as signs of genuine "information overload". The system, in a sense, seems to condition the user as to how frequently he or she signs on to interact.

The PROPORTIONS of items or text lines which are messages further emphasizes

^{*}James Martin, Design of Man Computer Dialogues. Englewood Cliffs: Prentice Hall, 1973, p 337.

for SENT items the phenomenon of reduced relative use of messaging to conferencing, and then a relative shift back for the most active users. By these measures the relative shift back to messages does not occur until 64 hours of use. Once again we see that conference items received, when measured by actual amount of text, make up more than 50% of the received communication, even with the composition of conference items only around 25%.

The EFFECTIVE INPUT RATE shows a continual rise to 27.7 words/minute for the most active users. However, this must reflect for this user subgroup a considerable use of the copying and editing capabilities of EIES. This rate includes all interaction time with the system and is derived by merely taking out the time utilized to deliver items at an optimistic rate of 30 characters per second over TELENET. Therefore, these numbers are conservative. Actual measured typing rates by professionals over the PLANET system seem to lie between 20 and 25 words/minute. These did not include interaction with the system. Effective throughput of secretaries including setup time of pages is 16 words/minute as estimated by EXXON in a study of 300 secretaries. The fact that the system does allow this increase of facility with increasing experience is gratifying. However, the rates for beginning users are lower than one would like and we hope the new interface will show a significant improvement in those rates. Ideally we would like beginning users to be able to obtain handwriting speeds of 15 words/minute fairly soon after their introduction to the system.

While overcoming the initial learning curve problem is significant for any interactive system, another problem is the user saturation point, where over the long term a system is not sufficiently rich or flexible to keep up with the user's growing need for new abilities. The EFFECTIVE INPUT RATE may be an indication that we did a better job on that than we did on the lower end. To refer back to our "exchange theory" framework, this growing facility in the

leverage a user has over the system with experience can be seen as another reason why addiction occurs. The system is rich enough so that there are always new features to be learned to meet new needs, each of which makes communication quicker or richer. Thus, time on the system is continuously rewarded not only in terms of receiving more communications than are sent, as discussed above, but also in terms of large, observable gains in communications skill.

The ITEMS RECEIVED and SENT per month further emphasizes that we could have collapsed the categories to 1-4 hours, 4-16 hours, 16-32 hours, 32-64 hours and 64 & Up. It also points out the second threshold of user behavior changes or possibly learning effects somewhere after 16 hours. In terms of the interactive design of systems, we suspect this is the stage often referred to as the point where the user begins to integrate the system into his behavior patterns. Or as we often refer to it, it is the start of "addiction".

The TIME INVESTED/ITEM RECEIVED is much more interesting when broken down by the subgroups. The average (based upon % utilization of the sample) is 3.5 minutes and we will use this as the effective average for planning and analysis purposes. The programmers are largely responsible for the system wide average being 4.79 minutes. However, their use of the system is not going to rise in our operational phase while the user time is going to be much larger. Across the usage categories the initial rise indicates more message sending while the fall after eight hours is more conference activity until the messaging rises again after 32 hours.

The statistics for EIES do exhibit significant differences according to level of usage obtained. They also exhibit properties overall not shown in other experimental systems for either messaging or conferencing. While it is difficult to separate out what factors related to the user population produced these differences, as opposed to integral features of the design, we do feel that the

design as compared to other message-conference systems is a significant factor. The test period has opened up a number of issues and hypotheses so that evaluators of the EIES projects should have a reasonable starting point for their considerations.

F. ERROR FREQUENCIES

EIES keeps a count of how often various error messages are triggered. During the test period very few of the planned commands were actually working and as a result that was the most frequent error message. Because of the development work it was not unusual for some feature or command working for some time to suddenly not be working. However, these counts would include testing by the development staff, typos and communication noise as well.

Errors on EIES are not major penalties for the experienced user as they usually only require supplying a new answer or choosing a different option or way of doing something. For the new user they can be one of the major difficulties in adjusting to use of the system. The following table has a total count of 35,000 errors or 1.2 per interaction on the system. Hopefully the new user materials will go a long way toward reducing some of the trial and error activity that led to these large counts. It is interesting that 332 times someone tried to get on with a valid access code which was already being used. The system, by the way, triggers a message to the person on that someone has just tried to use his or her access code. This is an indication that some sharing of access codes occurs.

Table 15
ERROR MESSAGE FREQUENCY

8293	Invalid Command-please try again
4100	For further help type a question mark (?) or call . . .
3313	That name or number is not on file. Please try again
2882	Invalid conference name or number
2342	Please type "?" for Help
2288	That code did not match. Check the Name or # entry and type a "+" if you need to correct it.
1591	The number that you have entered is not in a valid range
1379	Invalid Syntax
1000	Direct modification is not yet open for use.
946	Invalid Notebook name or number
769	Invalid Text number
728	Item non-existent
710	You are not in that conference
700	On processing .tabs the output became too long.
610	Please enter "Yes" or "No".
528	You are not privileged to access that item.
365	Due to a system error there is a message you cannot receive at this time. A message has been sent to someone who will correct this situation
332	Sorry, That ID is in use
247	Your time allocation has expired. However, we are granting you one hour's grace.
222	Invalid Name or #.
188	Improper sequence of commands
183	Error above arrow
175	No Items have been written yet
159	Invalid Key string
143	Invalid #-# form
132	Enter Yes, No or a Number
121	The following was in error
109	Connection Terminated. Bye!
101	That feature is not open for your use
95	Response is too long
83	You are not in that notebook
74	Attempt to set margin out of range
56	The following is not valid here
46	That item does not exist
36	You are not permitted to write to that item
36	Associations and Sequences are not yet implemented
22	Message System Bookmarks cannot be reset
22	Invalid form of Date/Time entry

G. COMPARATIVE COST AND VALUE CONSIDERATIONS

Our intention in this section is to look at the value of the EIES operation by a comparison to other alternatives. We will first consider different forms of communication before looking at other message-conference computer based systems. Our general observation is that there are no cheaper commercially based systems or options than can do the job EIES was designed to do. Of the experimental or research based systems EIES is unique in terms of its abilities, and we do not see a completely comparable alternative within our current knowledge of research systems in this area. This includes the work on the ARPA net message system, the University of Wisconsin message system, the Wharton School Message system, the University of Michigan's Conference system and the Institute for the Future's PLANET and FORUM systems.

Before we can proceed with the comparative analysis we need to summarize the cost considerations for EIES. Table 16 is summary of the size of the average yearly user population as a function of total user hours and average number of hours a user spends on line per week. The upper left hand corner of 10,000 hours per year and 2 hours per week of average use, with a resulting population of 100 users, is representative of the test period that has been discussed in the above statistical section of this report.

This test period represents the single biggest use of any conference system that has been reported in the literature. However, the OEP use of their EMISARI system over the past seven years may have produced an equivalent amount of usage. Unfortunately that experience has never been analysed and reported in the literature in terms of an analysis of statistics. The Institute for the Future's efforts over 18 months of usage of PLANET and FORUM amounted to 4,687 hours. It is important to note this as we are breaking new ground with respect to understanding the manner in which people use such systems as they gain

experience. Much of this knowledge is crucial to the further development of these systems. In the IFTF experience only 12 of their 500 users utilized more than 64 hours of time, as compared to the 17 out of the user sample of 129 reported for EIES. As yet we understand very little of the characteristics of active users and what we do understand or observe is based upon rather small samples.

The EIES facility is designed to operate during the first year at the 60,000 hour level. This would mean 50% utilization of our incoming lines over the scheduled hours, which are 12 per week day and 8 on Saturday. We suspect the average number of hours on line per week will be between three and four for the groups now coming onto EIES. This means a population of between 300 and 400 can be accommodated. By extending hours it would be possible to increase this level of usage by accommodating those who like to work late night hours and weekends.

Since our costs will be looked at as a function of total yearly hours of usage, Table 16 allows estimates of user population sizes possible with various combinations of total hours of operation and hours per week per user.

Table 16
EQUIVALENT YEARLY USER POPULATION

TOTAL HOURS YEARLY (1000's)	MONTHLY	HOURS USED PER WEEK PER USER				
		2	3	4	5	6
10	833	100	67	50	40	33
15	1,250	150	100	75	60	50
20	1,667	200	133	100	80	67
25	2,083	250	165	125	100	83
30	2,500	300	200	150	120	100
35	2,917	350	233	175	140	117
40	3,333	400	266	200	160	133
45	3,750	450	300	225	180	150
50	4,167	500	333	250	200	167
55	4,583	550	367	275	220	183
60	5,000	600	400	300	240	200
65	5,417	650	433	325	260	217
70	5,833	700	467	350	280	233
75	6,250	750	500	375	300	250

Table 17 provides an analysis of the cost of providing EIES based upon total hours for the year. The TELENET charge is figured on an average cost of \$3.50 per hour. This is consistent with our experience as the variable cost factor based on hourly use of TELENET averaged over all users, regardless of which individual TELENET rate they are using (low, medium and high density cities). The center cost is the operation at NJIT and reflects an interpolation between two data points: our test period with the 10,000 hours and the budget for the first operational year. Also, the operational costs do not reflect the money devoted to the purchase and supplying of terminals to some portion of the users. Currently, the center is budgeted to provide approximately 68 terminals distributed among its total population. While the variable cost factor of about \$250 per user in the Center's operation is linearized for the purpose of a comparative analysis, in practice it would be much more of a step function as it implies the hiring of additional people.

The total cost of the operation of the center and the TELENET charges is now divided by the number of hours to get a COST/HOUR. We see that for 60,000 hours with a user population range of 200 to 600 users we are still very much in agreement with estimates made in 1975 and published in the Proceedings of the Third Annual meeting of the Conference on Computers and Communications in 1976. That estimate was for \$8.00 per hour for a population of 300 users. However, we are not as accurate as one is led to believe. First of all, we have left out of this calculation the EIES development costs of approximately \$400,000 for hardware and software. This amortized over a five year period would add \$1.33 to the per hour cost. In addition, Telenet increased its effective rate by 50 cents per hour since that initial estimate. Therefore, our error in the per hour charge since 1975 is about 58 cents or within 7%.

Finally, we take the estimate of 3.5 minutes of invested time per user per

item received from the previous analysis and determine a COST per ITEM RECEIVED.

It is these two last factors, the hourly cost and the cost per item received, which provide the basis upon which we can make a relative comparison with other alternatives and options. One should keep in mind that \$3.50 of the per hour charge or \$.20 of the per item charge is the TELENET contribution, beyond the control of the operation of the center. The figures we derive are 8.08 per hour or \$.47 per item for a 60,000 hours per year level of operation.

Table 17
EIES COST ANALYSIS

YEARLY HOURS (1000's)	TELENET CHARGES (\$1000's)	CENTER COST (\$1000's)	TOTAL COST (\$1000's)	COST HOUR \$'s	COST ITEM \$'s
10	35.0	150.0	185	18.50	1.08*
15	52.5	162.5	215	14.33	.84
20	70.0	175.0	245	12.25	.71
25	87.5	187.5	275	11.00	.64
30	105.0	200.0	305	10.17	.59
35	122.5	212.5	335	9.57	.56
40	140.0	225.0	365	9.13	.53
45	157.5	237.5	395	8.78	.52
50	175.0	250.0	425	8.50	.50
55	192.5	262.5	455	8.27	.48
60	210.0	275.0	485	8.08	.47**
65	227.5	287.5	515	7.92	.46
70	245.0	300.0	545	7.79	.45
75	262.5	312.5	575	7.67	.45

* Observed levels or test period

** Budgeted level for facility operation 1977-1978.
The third month of the new operation had climbed
to the 25,000 yearly hour average at the time this
report was being finalized.

Now that we have the EIES costs we need to summarize some other items of data gathered from a number of sources.

- 1) From the paper "The Evolution of Office Information Systems" by J. Christopher Burns (Datamation, April 1977) we borrow the following values:

Cost of a page of Facsimile	\$1.97
Teletype Rate	\$2.42 per 66 words
Cost of Internal Memorandum	\$4.55
Cost of a letter	\$6.41

- 2) Care of N.J. Bell

Newark to Washington D.C. phone call (3 minutes, prime time)	
Station to Station	\$1.00
Person to Person	\$3.00

- 3) From a text processing study on 1000 professionals and 300 secretaries by EXXON and reported by Len Keating at the American Management Association meeting on the Automated Office of the Future, Dec. 5-7, 1977:

Cost of a professional person minute	\$.30
Cost of a secretarial person minute	\$.15
Effective Throughput of a secretary	16 words/minute
Professional handwriting speed	15 words/minute

With the above we can proceed to make some comparisons with the common non-computer alternatives to EIES.

- 1) Fast Written Forms:

For a 221 word item (the average size of EIES items) we have the following costs:

Facsimile	\$1.92
Teletype	\$8.10
Mailgram	\$3.96
(EIES)	(.45 - 1.08)

- 2) U.S. Mail

The secretarial cost of preparing a letter is \$2.07. We ignore professional time involved in initial drafting or dictation and checking as this would be expended on EIES anyway and at 15 words/minute for handwriting they would seem to be equivalent, based upon the average for the test operation. However, more experienced users are demonstrating 19 or more words/minute and one could make the comparison more favorable by factoring this in. Since average circulation

on EIES is 3 on a per item basis we must divide the \$2.07 for typing by 3 to get base costs of \$.69. The variable cost per item delivered is either 13 cents or 73 cents if a confirmation is made as exists on the EIES system. The confirmation of delivery of a message or the status reporting of how much everyone has read in a conference is an important part of the psychology of communication on EIES and has been noted by observation to be a triggering mechanism in creating new communications. In addition, a charge per copy of the letter to all three recipients must be included at 5 cents per copy with one copy remaining with the sender. This results in a comparative cost range for the U.S. mail for items sent to three people:

Low Cost= $.69 + (.13 + .05) = \$.87$ per item received

High Cost= $.69 + (.73 + .05) = \$1.47$ per item received

As we see, even the cost of mail is more expensive once EIES usage builds to 15,000 hours per year. As we have stated before this technology is today cost equivalent to the U.S. mail. True costs of mail are a lot higher when one factors in all the other associated costs of filing, storage, etc. and more reflective of the \$4 to \$6 dollar range found in the literature. EXXON, in looking at their typing of professional pages, found a true total cost per page of text in the area of \$20. Even without the inconvenience of mail and the impracticality of holding discussions through the mail, it would prove to be too expensive a mechanism to compete with EIES. Only if all the professionals were assumed to send Xerox copies of long hand written material would it be economically competitive. Furthermore, at many academic institutions the ratio of professionals to secretaries is 10 or more to 1 as opposed to the 3 to 1 common in industry. The secretarial support is not available in most universities to support a mass-mailing of items that tried to replicate EIES with typewritten, copied, mailed, and hand filed communications.

3) Telephone

At a speaking rate of 1.5 words/second we have 2.5 minutes of time needed to deliver 221 words (the average EIES item) over the phone. However this is an investment of 5 minutes of professional time (two people involved) as opposed to 3.5 minutes on EIES per item received. This adds 1.5 minutes of indirect cost or \$.45 to the basic 3 minute call. The cost of a station to station call is low because this assumes the party is there at the time the call is placed. We assume one and a half calls are made on the average to reach the other party. The person to person call would be a more realistic option for comparison to EIES and we take that as the upper limit and ignore lost professional time in placing calls that did not reach the other party. This results in:

Low Cost= $1.00 + .50 + .45 = \$1.95$ per item received

High Cost= $3.00 + .45 = \$3.68$ per item received

In theory we should multiply these costs by 3 to account for the circulation of an item on EIES, but the costs are already far in excess of EIES. Furthermore, it is very probable that to communicate the same material a lot more words would be needed in a telephone call. However, this latter point is still a conjecture without sufficient experimental backup to measure or estimate such effects.

We have used Newark to Washington D.C. as a typical long distance rate. One may make his or her own assumptions and include the factor of three for circulation and the basic observation will not change.

While we doubt the viability of the telephone for the types of discussions that take place over EIES and the resulting lack of written material or common file ability, even if this were not the case the phone would be out of the running on economic terms.

4) Face-to-Face Meetings

Since the average circulation was 3 items received for each sent on EIES, we will look at a face to face meeting of four people where 3 had to travel to the location of the fourth at a travel cost of 100 dollars (equivalent to Newark to Washington D.C.) and 50 dollars per day expenses. We assume they meet for a full 8 hours per day at a talking rate of 1.5 words per second or 43,200 words exchanged in a day. This is equivalent to 195 EIES text items. These assumptions result in the following comparison as a function of the length of the meeting in days.

	COST/ITEM with DIRECT COSTS				
Days of Meeting	1	2	3	4	5
Items Exchanged	195	391	586	782	977
Cost/Items(\$)	\$2.30	\$1.53	\$1.28	\$1.15	\$1.07

As we see the meeting would have to run for five days before it became cost equivalent to EIES at the lowest usage level. However, this comparison is not completely fair since a person on the terminal at our current rate of 3.5 minutes per item will receive only 137 text items in an eight hour period. Therefore, each person would have to invest 203 minutes every day to receive the additional 58 items over EIES. At 30 cents a professional minute this \$61 dollars per day per person must be taken off the face to face meeting as an indirect savings. Then again, the individuals waste travel time in getting to the meeting and for our simple case we shall assume 6 hours there and back total time of travel which is representative of a Newark, N.J. to Washington D.C. trip. If we now add this indirect cost back as well and estimate the cost per item received in the Face-to-Face example as a relative cost to EIES we have:

COST/ITEM with INDIRECT COSTS Or Savings Factored In

Days of Meeting	1	2	3	4	5
Cost/Items(\$)	\$2.71	\$1.12	\$.58	\$.32	\$.16

As we see at least a three day meeting is required to become cost competitive with the EIES test operation and a four day meeting is required to become cost competitive with the expected operational levels. This little exercise also assumes it is possible to break up the EIES exchanges into 4 person subgroup meetings and neglects the value of the written form. In addition, the trip used is somewhat optimistic with respect to costs of travel. Finally, it should be pointed out that long meetings (three days or more) are seldom practical or necessary; on the contrary, it is the meeting which lasts less than eight hours which is probably most frequent, and the shorter the meeting, the greater the time and cost per item for the face-to-face condition.

5) Theoretical Throughput Rates

We have been working with a meeting among four persons; in actuality most conferences involve a larger number of participants. At higher numbers of participants throughput becomes important.

As first reported in the 1972 paper "Party Line and Discussion: Two Computerized Conferencing Systems" (Proceedings of the 1st International Conference on Computers and Communications, ICC-72) there is a point where a high enough circulation rate or conference size over the computer provides a faster exchange of words than speaking and listening. There is a further point of circulation where the savings of time applied to the value of the person's time (using their salary) is sufficient to pay for the cost of the system. This only involves the effective input rate, output rate, circulation and talking rate. In other words when the time per unit word or item on EIES drops below the talking rate per unit word or item EIES is always a time saver. The formula for the throughput rate is:

$$\text{Time/Word Received} = 1/ (\text{C} \times \text{Input Rate}) + 1/ (\text{Output rate})$$

Where C is the average circulation or one less than the number involved in the discussion. This is summarized in the following table:

Table of Circulation
(Rates in words/minute)

Input Rate	Talking Rate	
	90	120
15	8(4)	12(5)
20	6(3)	9(4)
25	5(2)	7(3)

The first number is the circulation rate needed to turn EIES into a time saver over spoken exchange rates. The number in parentheses is the additional increment in circulation needed for the time saved at 18 dollars per professional hour to pay for everyone's use at 8 dollars per hour. While EIES overall circulation is only three and conferences eight on the average, when conferences were emphasized for specific projects during the first six months of operation, the circulation rate was more like 15 for conferences. We expect the higher circulation rates to be more typical of the EIES usage in the operational phase. The above tradeoff assumes zero travel time and zero travel costs so it is very conservative.

Ultimately, we do expect systems like EIES to substitute for a significant percentage of one to three day meetings. The estimates we have just exhibited illustrate that the economics are in favor of this proposition.

Finally we note that improving the output rate (360 words/minute) is not the factor through which the biggest economic gains are made. The circulation rate or the input rate are really the driving factors.

6) Summary

All the above comparisons only exhibit that on a strict cost basis this form of communications can be cheaper than other common alternatives under a wide range of reasonable assumptions. However, what is important is not the efficiency of the operation or its productivity in this narrow sense, but the quality of the resulting communication, which is a much harder factor to assess. For example, we view the message subsystem in EIES as vehicle to improve the nature of a conference. The private messages for individuals and subgroups represent a space where persons can "whisper" about the discussion in a conference. This ability is not very usable in a face-to-face meeting and can lead to disruption if used. The group messaging is a way of avoiding the cluttering of a conference with material that might otherwise interfere with the dialogue taking place. These intentions of messaging can potentially have an effect that leads to better discussion in the computerized conference than might have taken place in a face-to-face meeting. Obviously, this is a hypothesis for which we have no quantification as we have for the economic considerations. The determination of improved quality (or not) and the associated psychological and sociological impacts are ultimately the considerations that will determine the long term success or failure of these systems and whether people will actually use them.

The cost analysis does explain, however, why industry has taken an active interest the last few years in electronic mail. There is a growing realization that letters, mail and travel are not as inexpensive as they sometimes appear on the surface. However, that interest or awareness is still confined to "message systems" and the rather limited view that what one is talking about is a cheaper TWX or Teletype service. The concept of utilizing the computer to structure and facilitate group communications is still rather foreign in the

commercial applications environments and we suspect will remain so for a number of years into the future. It is very likely to take a good deal more research and development of a knowledge base on the impacts of such systems on things like quality of communications before we see commercial availability of computerized conferencing systems.

7) Message-Conference Systems

First we will examine a number of literature sources on costs of Electronic Mail to develop relative costs compared to EIES and then we will make a more detailed comparison with the experiences on the PLANET & FORUM systems of the Institute for the Future. This latter represents the only commercially available conference system to date, aside from the limited OEP Conference package which has been sold to a number of organizations via NTIS.

All electronic mail costs seem to ignore any long term storage costs as they assume delivery of an item is also the act of deletion of the item from storage. However, a conference type of operation must maintain a large file of transcripts of ongoing discussions. In addition we have found the storage of delivered messages for at least a couple of months after delivery proves to be of utility to the user community. It is quite common for comments in a conference or a later message to trigger the retrieving of an older message and reworking of it for further use. Currently EIES has over 250 million characters of storage of which 200 million is available for text item material. This represents a potential for over 50,000 items of text of maximum size. The cost estimates we have obtained for commercial time sharing storage charges range from 10 to 45 cents per 1000 characters of storage per month. To replicate the EIES storage capacity would cost between 240,000 to 1,080,000 dollars per year. At a usage level of 60,000 hours per year this would add between \$4 to \$18 dollars per hour to the costs we are about to look at for message systems.

In the paper "The Future of Computer Communications" by Vinton Cerf and Alex Curran (contained in Computers and Communications, AFIPS Proceedings of the Federal Communications Commission Planning Conference, Nov. 8 and 9th, 1976, AFIPS press) we find the following estimates based upon 1976 commercial message services:

1000 character message
sent 1 to 1 will cost \$3.25
sent 1 to 5 will cost \$1.11 or \$5.55 for all delivered

Since EIES has a 1 to 3 circulation average for the test operation and an average item size of 1105 characters, the interpolated cost is \$1.53 where \$2.95 went for composition and \$.64 to deliver each of three copies. This \$1.53 is significantly above the \$1.08 figure of the EIES test period and does not reflect, once again, storage costs.

In a paper by David Brown ("Teleconferencing and Electronic Mail", EDUCOM BULLETIN, Vol 11, No 4, Winter 1976) reviewing both analyses and experimentation conducted on the Hermes system of Bolt, Beranek & Newman (using both Tymnet and Telenet), I.P. Sharp's Message System, and Scientific Timesharing's Message System, the following conclusion is made:

"we have reason to believe that no unsubsidized commercially available electronic mail service can currently be used for an average of less than \$15 per hour."

The variance resulted in the observation that very short interaction times led to higher average per hour costs and very long interaction times led to lower average costs. On the \$15 per hour figure only 15,000 hours of usage is needed for EIES to be cheaper without considering storage costs. With any consideration of storage costs EIES was cheaper for the test utilization.

Tymshare has applied for a tariff to offer a regulated message service over their network and the comparative per item received costs for a message may

obtain the \$.70 to \$1.00 range. If the \$.70 is realized EIES would be cheaper at 20,000 hours of utilization without storage cost considerations.

Currently most commercial time sharing systems base their rates on a set of functional charges which are not always translatable on an analysis basis to a user transaction such as sending or receiving a message. To make estimates properly one has to actually experiment with the system concerned. It is for this reason we are relying on secondary sources for the above estimates.

The PLANET and FORUM systems of the Institute for the Future represent a system intended to provide conferencing capabilities. Under their research activities they have accumulated 4,687 hours of use over an 18 month period, a good portion of that operational on commercial time sharing systems such as Tymshare. A recent report ("Computer Conferencing in the Geosciences by Jacques Vallee, et. al., prepared by IFTF for the U.S. Geological Survey, September 1977) summarizes their experiences with a group of 141 geologists who utilized 1,100 hours of time over a 15 month period. The following data are taken from that report, with the exception of those marked with an *, obtained via a phone call to IFTF:

Hours = 1140
Sessions = 10,839
Messages = 4,825
Circulation of Messages = 1.00
Comments = 3,613
Circulation of Comments = 8.61*
Average Cost per Hour on Tymshare = \$16.45
Average Size of Message = 47 words*
Average Size of Comment = 63 words*

Using the data provided on individual users the following summary table was put together for a comparison with the EIES user sample.

SAMPLE		AVERAGES		
Use Range (hours)	Number of Users	Usage (hours)	Times On Number	Session (minutes)
64 & Up	2	88	865	6.1
32-64	6	46	421	6.5
16-32	14	21	196	6.4
8-16	20	11	121	5.5
4-8	9	5	65	4.6
2-4	25	2.5	23	6.5
1-2	20			
0-1	29			

Unfortunately there were no data on items received by individual and rounding in their table prevented carrying out averages on session length for those under two hours. The total in this sample is 125 users which accounts for the hours but not the 141 figure quoted from the beginning of the above report. PLANET is a very simple system to use so we suspect the learning time is under an hour, so that it would seem 29% may have not made it over the learning period. In the 1-2 hour range the same characteristic of almost no messages written is present in this sample as was observed in the EIES case. So another 16% did not really participate in a compositional sense. To this extent the results are similar to the EIES experience. However, a number of startling differences occur as we examine the rest of the data. One such contrast is that only two of the PLANET users spent 64 hours on line, even though they had a 15 month period of usage.

Based upon the circulation rate for comments and the fact that a private message can only be sent to one other person, we find the total number of items received is 35,932, of which 13% are messages. In the EIES experience 50% of items received are messages. It could very well be that the restrictive message capability leads to a lot of text items entering conferences that could have been better handled as messages. This may be one significant factor in the design which accounts for the closeness of the average sizes of messages and comments in the IFTF experiments. It may also be that the added message-like content, in the conferences, if true, detracts from the pressure to invest think time and preparation of comments and leads to generally smaller items than used in conferences on EIES. In addition the use of a double carriage return to end comments on a full duplex system and the inability to edit a stored comment may lead to a significant number of single statements inadvertently being broken into fragments.

The time invested per item received is 1.9 minutes. If we use the higher estimate of 63 words as an average item size this would indicate 6.66 minutes investment of time for an EIES sized item of 221 words. Using 6 words per second as output rate we have 105 hours necessary for output, which leaves 1035 for input of text. Since 8,438 items were written and still assuming the 63 word average, we have the effective throughput rate of 8.6 words/minute as compared to the 15 words/minute on EIES. However, the 8.6 rate is characteristic of the EIES users with about 8 hours of experience, which is about their average per user in this sample. The IFTF systems operate in a full duplex mode and the tradeoff between full and half duplex is a controversial subject among designers that is unclarified by any carefully controlled experiments. It is a good example of an issue that has not received the evaluation research it deserves. If the IFTF users on Tymnet had some of the slowdowns we experienced,

full duplex might have played a bigger factor in reducing the input rate for them than it did for us. We suspect that slow full duplex interferes more with think time in the composition process than does slow half duplex. What people usually neglect in considerations of interfaces is the impact of less than optimum conditions on the design.

Their average circulation factor is 4.25 and somewhat higher than EIES's factor of 3, a ratio of 1.42 between the two. However, when normalized for average item size the ratio reduces to .42. This latter comparison assumes there is a value to larger items being circulated. The differences here we feel are also associated with the design of their message subsystem and its relation to the use of the conferencing. However the time invested per word received is much closer to EIES because of the higher average circulation: 1.8 seconds/word for IFTF and 1.5 seconds/word for EIES.

The IFTF report did provide the total number of items sent per user which allows us to calculate the following averages:

USE RANGE (hours)	ITEMS SENT/ PERSON	ITEMS SENT/PERSON & SESSION
64 & Up	1004	1.2
32-64	290	.7
16-32	151	.8
8-16	67	.6
4-8	26	.4
2-4	12	.5
1-2	2.9	
0-1	.3	

The above is not dissimilar from the EIES distribution but represents a narrow spread and less participation at the higher end of the usage range. The characteristic of less composition activity for lower usage users is also common to both systems.

One must consider that the users on EIES were self selecting in that there was no requirement for the majority of them to participate. In the IFTF case the majority belonged to a single organization and may in some individual cases have had to make a show at participating when there was no real personal motivation to do so. Another potentially important difference is the lack of a charge for time on line during the pilot EIES period.

The above data allows us to construct the following comparison table:

	IFTF	EIES TOTAL	EIES SAMPLE
ITEMS RECEIVED/ SESSION	3.3	4.3	5.4
ITEMS SENT/ SESSION	.8	1.4	1.8
TOTAL TRANSACTIONS/ SESSION	4.1	5.7	7.2
SESSION LENGTH minutes	6.3	20.7	18.1
SESSION RATE (words/minute)	41	61	88
ITEM SIZE (words)	63	221	221
CIRCULATION	4.25	3.00	2.93
EFFECTIVE INPUT RATE (words/minute)	8.6	15	24
TIME/WORD RECEIVED (seconds)	1.8	1.5	1.0

In the above table the SESSION RATE is a figure derived from the number of transactions per session times the average item size divided by the session length. For face-to-face or spoken conversation the session rate is 90-120 words per minute.

The fact that the EIES andd IFTF approaches to computerized conferencing start from two very different philosophical bases is expressed in the following quote from a recent IFTF report (Johansen, et. al., 1977)*

There are differences of opinion, however, over what comprises "computer conferencing." In the New Jersey Institute of Technology system, for instance, computerized conferencing is combined with other computer resources, such as a journal system, a text editor, and even a kind of management information system. While such a system provides more computer power, it does so at the expense of the simplicity of operation we felt was necessary for an initial exploration of the utility of small group communication through computers. PLANET is a simple system which enables social scientists to explore the potentials of computer conferencing without requiring that they control for the effects of peripheral elements involved in more complex computer services. Our approach has been to base our assessments of computer conferencing on this basic system for group communication through computers.

The philosophy of design that underlies EIES has always been that the objective of computerized conferencing is to utilize the computer to tailor communication structures and to build as an integral part of such communication structures any computer aids or functions that would act to facilitate the communication process. Therefore, EIES, as a system designed for long-term use by scientists, is designed as a rich and complex system to meet what are felt to be a diversity of needs. It is actually very useful that the two major efforts in this area today have approached the endeavor from two very different directions. The state of the art is such that a diversity of views and directions should be taken. It is quite clear from the results to date that there are very distinctive differences in results. Out of diversity often emerges knowledge.

There are many possible explanations for the differences between the IFTF experience and that of EIES. Since the majority of their users were with one government agency, organizational factors and roles could have played a signifi-

*Johansen, Robert, et. al.: Group Communication Through Computers Volume 5; Effects on Working Patterns, Institute for the Future, Nov. 1977, Report SR-96

cant part. A significant number of the text examples in their report applications were of a project management or coordination nature. From the experience at the Office of Emergency Preparedness project coordination does tend to lead to fairly short text items as they are often statements of status, actions taken and requests for information. It would have been interesting for their application to have looked at the relative rank or position in the organization of persons and whether that had any correlation to activity. The experience at OEP was that the higher up one went the greater the tendency toward receiving a lot more than sending. Also, the report indicates that a significant number of simultaneous sessions were held and that the average item size during simultaneous sessions is significantly smaller than for the more normal non-coincident use. This would conform to observations of the few simultaneous sessions held on EIES.

However, we also believe the design is a key factor and that the structure of EIES encourages people to think off-line a lot more about conference comments before responding to what is new in a conference. We strongly suspect IFTF conferences take on some degree of message-like content which would in turn create a pressure for immediate answers and result in smaller items overall. Encouraging simultaneous use has a similar effect.

The more or less constant length of session regardless of level of usage indicates that users have mastered the system at a fairly low level of usage. This has its merit but it also represents a limitation on the options available to the users by decreasing the functions to which they can apply the system. IFTF chose to design a system that would provide the conference capability as simply as possible, whereas in EIES we have chosen to design a system capable of encouraging a great deal more composition and communication alternatives.

In addition, there is no centralized directory in the IFTF systems through

which users can form their own groupings and no complete freedom to form their own discussion groups via private conferences. While the FORUM system does allow more flexibility in terms of voting and Delphi-like options, it would also be more expensive to run on a commercial basis than the \$16.45 quoted for the PLANET operation. Some use of voting was reported for that part of the operation that used FORUM. However, FORUM still has the same message and text editing and copying limitations that PLANET has.

We do feel that EIES has exhibited significant differences from the PLANET-FORUM experiments as well as the use of other Message or Conferencing systems. A complete understanding of why is still a matter of conjecture. The test operation has raised, however, a rather rich set of hypotheses about what might be the underlying causes of some of these distinctions and it is hoped that the operational trials will be able to shed more light on these issues.

SUMMARY HYPOTHESES

The statistics alone are insufficient to explain what is taking place and must be supplemented by other direct forms of data collection and analyses such as surveys, interviews and controlled experimentation.

The most interesting of the observations from EIES during the test period and the cost comparisons with other media might be summarized as a list of hypotheses.

NEW USERS

1. A new user is usually passive in terms of receiving a lot more than he or she sends relative to more experienced users. A new user is more likely to send messages than engage in conference activity.
2. A new user's motivation is likely to depend upon the availability of individuals he or she desires to talk to and the availability of interesting topics in on going discussions; (attractions). Barriers are the other aspects of new user motivation, in terms of access to terminals, inadequate user training materials, or system problems.

REGULAR USERS: CONTINUED LEARNING AND CHANGES IN BEHAVIOR

1. Users evolve specialized norms with respect to the use of the facilities and communications and writing style. The acquisition of these norms by individual users and groups appears to be an important learning process on such systems.
2. User participation in conferencing in an active sense of contributing items seems to require some degree of usage above the basic level of learning the mechanics. This may be a second level learning plateau involving the acquisition of norms established by the user communities.
3. Users will gain facility as time passes so that their input rates become higher than usual typing rates. For large groups, the time required to send and receive communications will drop below that required for other media, such as

telephone or face-to-face meetings.

4. The user's short term memory may be a factor in conditioning his frequency of interaction with the system. Users will tend to become conditioned to sign on the system so that, on the average, they have about seven items to send or receive per interaction.

5. In accordance with social exchange theory, no participant will continue to use a conferencing system unless their "rewards" are greater than their "costs". Among the factors which increase reward for users are

- 1) Ratio of items received to items sent. This increases with
 - a) size of active group
 - b) throughput rate of the system

2) Observable increases in skill and speed in using the system. This is related to the richness of the design in terms of advanced features available to users once they have mastered the basic mechanics.

3) Importance of communication with system members in comparison with communication with persons not on the system; relative cost in time and money of other modes for communicating with people on the system.

MESSAGES VS. CONFERENCES

1. There is a greater effort in the preparation, composition and think time devoted to comments than to messages.

2. A movement of new people into an ongoing conference is a common characteristic of this form of conferencing.

3. There are distinctive and significant differences between messaging and conferencing as used on EIES. Furthermore, the relative usage of the two is a function of the degree of user experience. Conferencing for the more active users seems to act as a stimulus to messaging activity.

INFLUENCE OF DESIGN

1. The design of a computerized conferencing system will affect such user behavior patterns as the average length of items entered. The ability to copy, edit and retransmit items, or move items freely between messages and comments or pages is an important factor in improving the effective throughput rate of the system and the ability for the user to incorporate this type of system into his or her daily communication behavior.
2. It may be important to have available for new users sufficient public material to stimulate interest, and to allow browsing which will develop common interest subgroups.
3. The EIES system is cost-competitive with the mails, and is cheaper than telephone or face-to-face meetings in most circumstances.

FUTURE OPTIONS AND DIRECTIONS

The development of and experimentation with EIES represents a particular implementation of a computerized conferencing system tailored to facilitate scientific and technical communications. As both a new medium of human communication and a new area of computer application, there are a number of future options and directions suggested as a result of this research effort. This section is intended to provide an overview of what are felt to be significant areas deserving further exploration.

The first category of exploration is to extend the population serviced by EIES to service aspects of science information beyond that of the exchange of recent research findings among scientific communities. However, all these extensions imply a greater emphasis on controlled experimentation, rather than the field trial atmosphere of the current EIES operation. The particular areas worthy of attention are:

Peer Review

The EIES system could be utilized for peer review of grant proposals and provide a medium where the reviewers can engage in a discussion among themselves as well as with those involved in making the proposal. There are several hypotheses which could be examined by careful experimentation as to the relative benefits or drawbacks of utilizing this form of communication for peer review compared to current practices. (See Hiltz and Turoff, 1978.)

Management and Sponsorship Involvement

Systems of this sort offer the ability to foster a closer involvement of sponsors and managers in the ongoing research process. It is not clear that this is desirable in all potential areas; and deserves rather careful exploration.

R&D Management, Technology Management, Standards & Research Planning

All these areas represent the management decision and problem solving process, as applied to science and technology. Very often they involve the extensive use of committees and in so doing lend themselves to comparative experiments utilizing the computerized conferencing environment.

Handicapped Scientists

What special terminals or interfaces would be useful for blind scientists or for others with physical disabilities?

Technology Transfer

The process of transferring technology across disciplines, from the laboratory to practice, or from developed to developing countries, all appear to be an open area for investigation.

Consulting

Not only does this medium provide an ability for consulting, but it offers

significant new options for group and team consulting as well as improving the ease with which those with problems and those with solutions can find one another.

Policy and Assessment Analyses

The exploration of the consequences of scientific research and technological development would appear to be one of those areas that is not dealt with adequately by current communication processes. The computerized conferencing environment appears to provide the "cool" sort of communication forum where parties representing widely different interests and views could perhaps confront one another in a more deliberative and informative manner.

In addition to the extensions into additional application areas there are a number of technological enhancements possible that appear to hold benefit for EIES type systems. Most of these require some degree of research in terms of user interface design as opposed to any technological development.

Interconnect

The members of a scientific group should be able to make available to members of their research community the information provided by the computer data bases and models they individually have available. NJIT has been exploring this, under a separate research effort, in the form of a microprocessor that can dial up a computer system and simulate a human's interaction. This allows the microprocessor to serve as an interconnection device between EIES and other computer systems. However, there is much design work and experimentation to be done in this area.

Translation

Can a bilingual or multi-lingual system aid international scientific commu-

nication? Might a multi-lingual interface (for example, English, German and French plus translated titles and keywords suffice?

Analytical Decision Aids

The use of computer abilities to process and analyze the subjective judgements of a group of humans is still a wide open research area in terms of the integration of these techniques into computerized conferencing environments. The extension of EIES to include R&D Management activities and such things as the rating and classification of goals, objectives, tasks, and the setting of standards, could well benefit from further emphasis on this area.

Equation & Photo Composition

There is no photo composition system today for producing equations which is meant for utilization by the end user and which allows the specification of equations so they may be used as a part of the communication process. The enhancement of EIES to allow the transfer of equations in a standard representation language for all conferees, and at the same time allow the production of a photo composed output, would represent a major extension of EIES to service a wider scientific audience.

Interface Tailoring and Forms Control

Capitalizing on other development activities at NJIT, the EIES system has the ability to tailor interfaces to particular individuals or groups. It also can allow for the soliciting of information by presenting on-line questionnaires and forms. However, the use of this technology still requires some degree of experimentation within specific application contexts.

The final area of consideration is the need for economic and policy analysis studies related to any ultimate widespread use of systems of the EIES

sort. The issue of ownership of information and/or authorship is one that deserves further investigation. It seems that we are still in the position of having laws and policies established in this area in response to current problems, with little forethought as to future implications of an experimental facility such as EIES.

Another area is the impact of alternative charging practices and the incorporation of royalties into systems of this sort. This issue is open to both analysis and experimentation. This also ties into the long term impact on journals, preprints and reprints, as well as to the function of professional meetings.

Conclusion

To summarize, we have implemented a system which represents a starting point in terms of communications features and methods for assessing their impact upon the scientific communication process. The system is a promising test bed for more controlled experimentation with specific features or augmentations, and for new kinds of applications. In addition EIES is capable of supporting controlled experiments and field trials in other areas of information exchange than that of scientific and technical information. The basic structures of messages, conferences and notebooks apply to almost all human information exchange activities.

Publications Containing Material on EIES Effort.

- Featheringham, Tom
1977a Present and Potential Value of Computer Communications in Information Science, The Value of Information. Proceedings of the ASIS 6th mid-year meeting. May 19-20, Syracuse University, Syracuse, N.Y. This paper reflects on several areas where computer conferencing systems might have greatest impact on future information systems users. Among these are the potential automation of the authorship, peer review, and refereeing activities of the normal scientific publishing process. Also, the coupling of computer conferencing systems with on-line storage and retrieval systems will provide the future information seeker manifold knowledge resources.
- Featheringham, Tom
1977b Teleconferences: The Message is the Meeting
Data Communications (July)
Computerized conferences have the potential for improving and radically altering the way business information flows, but are no cure-all for bad management.
- Featheringham, Tom
1977c --- Computerized Conferencing and Human Communication
IEEE Transactions on Professional Communication
(December) EIES systems characteristics are reviewed from the standpoint of human characteristics. Systems usage, the information overload phenomenon, and shifts in language styles are discussed.
- Hiltz
1977a Computerized Conferencing: Assessing the Social Impact of a New Communications Medium. Technological Forecasting and Social Change Volume 10, Number 3, 1977.
A description of the use of EIES for laboratory and field experiments on the group communication process. (Initially presented at the American Sociological Assn; New York, September 1976).
- Hiltz
1977b The Human Element in Computerized Conferencing Systems
Paper presented at the American Society for Information Science, Chicago, September 1977. Submitted to Computer Networks. This gives the results of the evaluation research effort as of the end of August, 1977, incorporating follow-up questionnaire responses from 54 of the EIES users during the pilot period.
- Hiltz
1977c The Impact of a Computerized Conferencing System Upon Scientific Research Specialties
Initially presented as a working paper at AAAS, Denver, February 1977. Forthcoming in Journal of Research-Communications Studies.
This paper describes in detail the quasi-experimental research design and hypotheses being tested for evaluation of the impact of EIES upon scientific user groups.

- Hiltz & Turoff
1977a
- Effective Communications Structures for Technology Assessment. Chemical Marketing and Economics (Reprints of that Division of the American Chemical Society), 1977 LC No 77-72678
This paper explores the potential role of computerized conferencing systems such as EIES in the process of Technology Assessment.
- Hiltz & Turoff
1977b
- Overview of EIES and Its Implications Transnational Associations No. 10, 1977.
This is a special issue of the magazine of the Union of International Associations devoted to computerized conferencing. It abstracted a significant amount of material by the authors from many of the above references.
- Hiltz and Turoff
1978
- The Network Nation: Human Communication Via Computer, Reading, Mass: Addison Wesley, forthcoming.
A comprehensive treatment of the history and future of computerized conferencing systems, including applications to such areas as scientific communication and public use design choices and economic factors; and social-psychological impacts. This book abstracts some material from published EIES reports.
- Turoff
1976
- The Cost and Revenues of Computerized Conferencing. Proceedings of the Third International Conference on Computers and Communications, August 1976.
This paper provides an analysis of costs and revenues for computerized conferencing systems, utilizing the data and experiences resulting from the EIES effort.
- Turoff
1977
- An On-Line Intellectual Community or "MEMEX" Revisited. Technological Forecasting and Social Change, Vol. 10, 401-412, 1977 (Originally presented at AAAS meeting, Feb. 1977)
This paper examines the long term implications for scientific communications resulting from EIES type systems.
- Turoff and Hiltz
1977a
- Meeting Through Your Computer. IEEE Spectrum, May 1977
This paper provides an overview of computerized conferencing efforts and some of the potentials for the applications of this technology. EIES is treated extensively as an example of current efforts.
- Turoff and Hiltz
1977b
- Computerized Conferencing: A Review and Statement of Issues Paper presented at the NATO Symposium on the Evaluation of Telecommunications Systems, Bergamo, Italy, September 1977. Proceedings to be published by Plenum.
Focussing on the policy implications of c.c. systems, this paper also reviews the history and near-future characteristics of these systems; potential applications; the problems of impact assessment.

Turoff, Vallee, and Smith
1976
Computer Conferencing - A New Medium. MOSAIC, Vol 7, Number 1, Jan/Feb 1976
An overview of computerized conferencing with a description of the EIES effort.

Turoff, Whitescarver, and Hiltz
1977
The Human Machine Interface in a Computerized Conferencing Environment. Proceedings of the IEEE, Man Systems & Cybernetics Conference, Washington, Sept. 1977.
An elaboration of the design principles behind the EIES interface design and some preliminary analysis of user reaction to the design.

HOW TO USE



ELECTRONIC INFORMATION EXCHANGE SYSTEM

by
Murray Turoff
Trudy & Peter Johnson-Lenz
and
numerous contributors and critics

September, 1977

Research Report Number 7

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WHILE THIS USER MANUAL IS FIFTY PLUS PAGES, THE FIRST NINETEEN WILL PROVIDE ENOUGH INFORMATION FOR SOMEONE TO GET STARTED AND LEARN MORE BY EXPERIMENTATION.

INTRODUCTION

This booklet is an introduction to the use of EIES, Electronic Information Exchange System. EIES (pronounced "eyes") is a very powerful computerized system that allows you to communicate with others on the system in a number of different ways. The intent of this booklet is to teach you the simpler parts of the system and to make you comfortable with using the one-page User's Guide For Electronic Information Exchange System. Later on, as you gain more experience with EIES, you may want to learn some of the more advanced features and tricks. EIES has been designed so that you have to learn only what you need.

It's just about impossible to learn how to use a computer system from a booklet without some direct experience with the machine itself. So, don't be discouraged if some of the parts of this booklet seem confusing or hard to understand at first reading. The best way to learn about EIES is to use the instructions in this booklet and try them yourself to see what happens. EIES has been designed to be "forgiving"; that is, if you make a mistake, nothing serious happens. You can't hurt the system, so don't be shy about trying new things.

After reading through this booklet, plan to spend thirty minutes to an hour practicing logging on and learning to send messages. Try to find a time when you will be uninterrupted, if possible. After this beginning practice session, and with the help of this booklet, you should know enough to begin "messaging" other people and participating in any conference to which you belong.

This booklet contains sections on:

- using your terminal
- TELENET
- getting into EIES
- sending messages
- message sending shortcuts
- text editing
- the EIES directory
- finding others in the directory
- participating in conferences
- getting printouts
- shortcuts for getting printouts
- special roles on EIES
- etiquette and hints for using this new communications form
- EIES terminology and jargon
- EIES checklist
- advanced features
- selected references

If all you want to do is learn how to get into EIES and send a message, read only the first four sections. Save the rest for later. Read what you need.

USING YOUR TERMINAL

There are many different brands of computer terminals. Each one has a slightly different set of buttons, switches, and keys, in addition to the standard typewriter keyboard. Examine your terminal to find the buttons or switches that control the functions described below. If there are people around who have used your terminal before, perhaps you can get some help from them. If you can't figure it out and you can't get help, call us at (201) 645-5503.

Power on: Make sure your terminal is plugged in, and then look for the power on/off switch.

Mode: There may be one or two mode switches. One switch controls what is called HALF and FULL duplex. It's not important to know what that means. To use EIES, set the duplex switch to HALF (or HD). The other mode switch you may have controls whether you are using the terminal without being connected to the computer (LOCAL) or with being connected (ON LINE). Set that switch to ON LINE (or REMOTE).

Speed: To use EIES, the speed switch should be set to 30 characters per second. This is the same as 300 baud, or high speed on a terminal with a high speed/low speed switch.

Keyboard mode: There may be a switch that sets the keyboard for upper case use only (TTY, which means teletype compatible), or upper and lower case. You would probably prefer to use upper and lower case letters, but all upper case (TTY) is also allowed on EIES. Upper and lower case may also be indicated by STD or ASCII on some terminals.

Parity: There may be a parity switch on your terminal. EIES pays no attention to the parity, so if there is an OFF position for parity or parity error reset, then set it to OFF or NONE.

Depending on the keyboard mode available to you (above), there may be some difference in whether you have to use the shift key or not for various special characters, such as +, *, #, =, -, :, ;, ^, <, >, (,), /, &. To test this, temporarily set your terminal to LOCAL (or turn off the ON LINE switch) and experiment.

On your terminal, there are several special keys you should identify. CARRIAGE RETURN (variously called CR or RETURN as well) is used when you have finished entering a line of information and want to transmit it to the computer. In this booklet, (CR) means press the return key. The BREAK key (also called ATTN/BREAK or BK) is used when you want to stop something that is happening and start over. The CONTROL key (CTRL) is used in combination with some other key for certain special non-printing characters. Its use will be described later as you need it.

In using the terminal, be sure you distinguish between the 0 (zero) and a capital O (letter o), as well as between 1 (one) and a lower case L. Also,

the minus sign (-) and the underscore (_) are different. If they appear on the same key, be careful.

To review: make sure your terminal is plugged in, the power is ON, it is set to HALF duplex and ON LINE, the speed is 30 characters per second (or 300 baud), it is set to upper and lower case (STD or ASCII), and the parity is OFF. Now you are ready to call up the computer.

TELENET

Rather than using long distance telephone lines to connect you with the EIES computer in Newark, New Jersey, EIES uses a less expensive high-speed communications system called TELENET. TELENET is specifically designed to carry digital data very efficiently, since it collects "packets" of information at each locality and sends them to the appropriate address by the quickest available route. From your point of view, it will seem that your communication to the computer and its communication back to you takes place very quickly -- within a few seconds.

TELENET offers its services through local telephone numbers in many cities in the United States, in major Canadian cities, and in some foreign countries. Look at the TELENET DIAL-IN ACCESS NUMBERS guide in your notebook. Find the TELENET telephone number closest to your location. If it will cost you more than \$15 per hour to call the nearest TELENET number, you should contact TELENET and make arrangements to subscribe to their INWATS or 800 number that may be called from anywhere within the United States. Telephone numbers for TELENET sales offices are included on the guide.

Now look at the yellow brochure called HOW TO USE TELENET: INFORMATION FOR TERMINAL USERS. Look at the list of Terminal Mode Identifiers to see if you need to use a special code to identify your terminal. If your brand of terminal isn't on the list, you probably don't need a special code. For future reference, write down the appropriate TELENET telephone number and terminal code, if any, on your User Access Information for EIES form, which you will find in your red notebook.

CONNECTING TO EIES

Check to see that all the switches are properly set on your terminal. Now dial the appropriate TELENET number. TELENET will answer with a high-pitched continuous tone or whistle. Place the receiver of the telephone securely in the cups on the back, side, or top of the terminal (or on the box that comes with the terminal called the acoustic coupler). There should be an indication of which hole or cup to use for the cord end of the receiver. Depending on what kind of terminal you have, a small light called the carrier may light up on the acoustic coupler attached to your terminal, or the on-line or signal light may light up on your terminal. This indicates that you have a good connection to TELENET. If it doesn't light up, you may need to dial the telephone number again, after making sure the receiver fits snugly in the cups.

If you are using a Dataphone, you will not need an acoustic coupler. After calling the appropriate TELENET number and listening for the high-pitched whistle, simply press the "data" button on your Dataphone to connect to TELENET.

Now press the carriage return key, a semi-colon, and the carriage return again. In this booklet, (CR) means press the carriage return key:

(CR);(CR)

TELENET should then identify itself. If you are using an IBM terminal or a non-standard ASCII (American Standard Code II) terminal, check the TELENET guide for a different procedure to use instead of the (CR);(CR).

TELENET will next ask for any special terminal code by typing:

TERMINAL=

If your terminal is indicated by a special code in the TELENET GUIDE, type it in. Otherwise, you may just enter a carriage return. A (CR) tells TELENET that you have a standard printing terminal that operates at 30 characters per second.

Next, TELENET will respond with an "at" sign (@), waiting for you to indicate where you want to be connected. Enter the letter C (for Connect), a space, and the EIES access number on the TELENET system, 201 25CC:

@C 201 25CC

You will also find the EIES access number on your User Access Information for EIES form in the red notebook.

If all goes well, you will receive a message that you are connected to the EIES access number, and from this point on, you will be interacting with EIES, as described in the next section.

201 25CC CONNECTED

However, you may get one of these messages instead:

- 1) a message that EIES is not available and why; in this case, try again at the time indicated
- 2) a message from TELENET saying the EIES address is NOT RESPONDING, which means that we have "gone down" (the system is not operating) for a few minutes or for scheduled maintenance. We usually inform users a week in advance of scheduled maintenance times, but if you are new to the system or if you haven't used it for a week or more, you may not know that we planned to be down.
- 3) a message from TELENET that the EIES address is BUSY, which means that all our lines are in use. This should occur only rarely. From time to time, a group may have scheduled a simultaneous conference on EIES which will tie up all the lines, but you should receive advance notice of these occasions.

If you have trouble connecting to EIES, call us at (201) 645-5503. If you are having trouble with TELENET (for example, their local phone number doesn't answer), you may call them collect at the TELENET Customer Service number listed on the TELENET brochure.

GETTING INTO EIES

After TELENET tells you that you are connected to the EIES address (last section), you will get the following message from EIES:

WELCOME
NAME OR #?

The computer then waits for you to enter either your name or your three-digit membership number exactly as shown on your User Access Information form, even if it is misspelled on the form. Be sure to press the (CR) key to transmit your name or number to the computer. This booklet discusses how to correct or change your name and other directory information in a later section.

Each EIES user has three unique identifiers: a name, a nickname, and a membership number assigned by EIES. You may change your name and nickname at any time, as described in the directory section below. When names are printed out at the top of messages or conference comments, they are in the form:

NAME (NICKNAME,###)

Next, the computer will ask for your access code or password. The computer will type the word CODE, followed by a series of overstruck characters so you can type in your access code without anyone else being able to read it. This protects your access to EIES. Enter the access code exactly as it appears on your User Access Information form, without any spaces. Later, you should also change your access code so that only you and the computer know what it is.

CODE?XXXXXXXXXX

If you have any trouble entering your name or number and access code, try again. If you make a mistake in entering the name or number, you may enter a plus (+) when the computer asks for your code to start over again with NAME OR #?. If you've tried several times without success and can't figure out what is wrong, call us for help.

If you are unsure about what to do when the system asks you a question, you may enter a single question mark (?) to get a one-line explanation of what response is appropriate. If you need a longer explanation, enter a double question mark (??).

In entering an answer or any other material you may choose to delete the last character typed by holding down the CONTROL key (CTRL) and hitting the H key. To delete the whole line and then retype it hold down the CONTROL key (CTRL) and hit the X key.

If you are successful at logging in, the system will answer with:

NJIT ELECTRONIC INFORMATION EXCHANGE SYSTEM
YOUR NAME (NICKNAME,###) ON AT 10/ 1/77 9:30 AM ON LINE 10
LAST ACTIVE: 9/27/77 9:22 PM

This will be followed by any special messages of general interest that the SYSTEM MONITOR (EIES,100) wants all users to see. The system will tell you when you were last active, or if you are a new user, when you were established as a member. This information is a useful check to see if anyone else has been using your number and access code to use EIES unbeknownst to you. If you have already seen the messages from the SYSTEM MONITOR, you may interrupt them by pressing the BREAK key on your terminal. If you have a terminal on which the BREAK key lights up when pressed and stays lit, you need to turn it off by depressing the key again.

Next the system will ask:

LIST THOSE NOW ON-LINE (Y/N)?

If you enter a Y, YES, or simply press (CR), the system will tell you who else is currently on-line and what time he or she logged in. Any time you are asked a yes/no question in EIES, you may enter a carriage return to indicate a yes answer. For more about (CR), see "Answer and Help Aids" on the back of the one-page User's Guide.

Incidentally, you may also find out who is on-line at any point in using EIES by typing in +ON when the system asks you a question, such as INITIAL CHOICE?, MESSAGE CHOICE?, OR CONFERENCE CHOICE?:

MESSAGE CHOICE?+ON

(the system then lists those on-line)

The +ON command also appears under "Answer and Help Aids" on the back of the one-page User's Guide.

Next the system tells you if any communications are waiting for you:

WAITING:

3 CONFIRMATIONS
4 PRIVATE MESSAGES
1 GROUP MESSAGE

A confirmation is a one-line message indicating that a message you had sent earlier to an individual has been received. It shows the message number, the receiver's name and number, and the date and time the message was received. A private message is one that has been sent to you (and perhaps others) named explicitly as a recipient. A group message is one sent to an entire group of people named only by group name or number.

Your User Access Information form will indicate the numbers of all the groups to which you belong on EIES. You must be invited to join groups on EIES; you may not simply join at will. (Group numbers are always two-digit numbers. Membership numbers are always three-digit numbers.)

If there are communications waiting for you, the system will ask:

ACCEPT ABOVE COMMUNICATIONS (Y/N/#)?

You may answer yes, no, or with the number of communications that you wish to receive. The confirmations are delivered first, then the private messages, and finally the group messages. Sometimes you may want to get directly to some other activity on EIES and you may not want to get any new messages that are waiting for you. Then you would answer NO or N. Sometimes you may want only some of the communications delivered to you, so you would answer with the number you want to receive. Once again, you may enter a (CR) to indicate a YES answer.

You may interrupt a long printout by pressing the BREAK key while the terminal is printing. The system will pause and then print <BREAK>. The system will then ask for the appropriate menu choice, such as INITIAL CHOICE?. (Menus are explained in the next section).

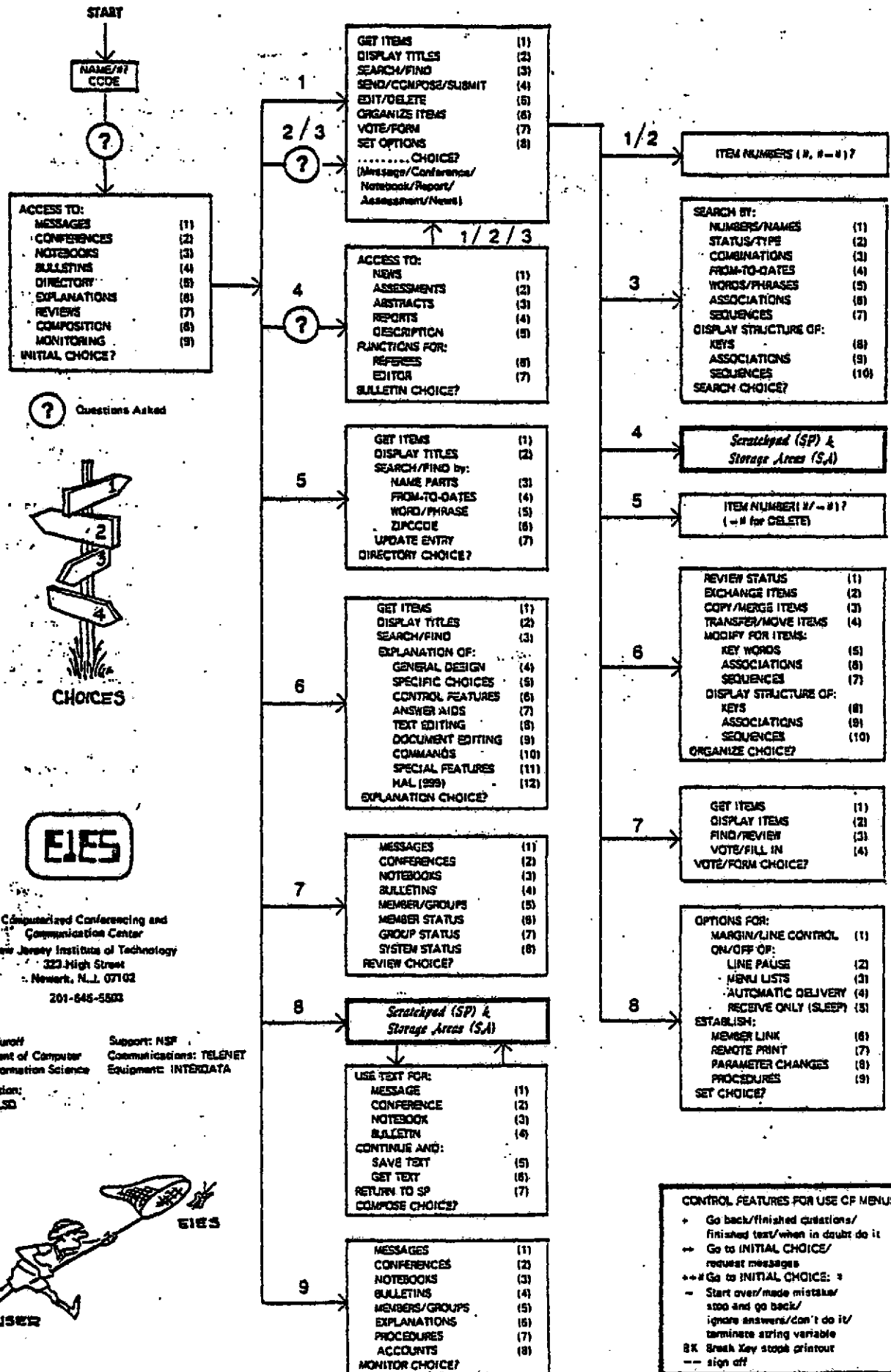
If you are using a CRT (video display) terminal, you will probably want to instruct the computer to pause after a given number of lines so you will have a chance to read the text before it moves-up and off the screen. To do this, use the +SLP # command (for Set Line Pause at the given # of lines). If you enter just +SLP, the computer will pause every 23 lines. To have it pause, say, every 11 lines, enter:

+SLP 12

To return to normal, enter +SNLP (for Set No Line Pause).

If you are a new user, there will probably be a message waiting for you from the OPERATIONS MANAGER, welcoming you to EIES and also probably suggesting that you try to send a private message to him or her so that the EIES staff will know that you have begun successful use of the system. Instructions for sending a message appear in the next section.

USER'S GUIDE FOR ELECTRONIC INFORMATION EXCHANGE SYSTEM



ANSWER AND HELP AIDS

Interaction Aids:

or Carriage Return used to end input line/Start menu/
Assumes YES answer/ Makes no change in what is there already

CTRL and X Line Delete (Cancel current line/Start over)

CTRL and M Character Delete (May also be: backspace/underscore/backspace/terminal dependent)

? short explanation provide

?# Explains CHOICE: #

?# detailed explanation

To get Human help:

??? message Send one line 'message' to console operator

??? #, message Send to Member #

+CM Tells who is on now

+LINK # Request terminal Link to member #

+CM Compose New Message

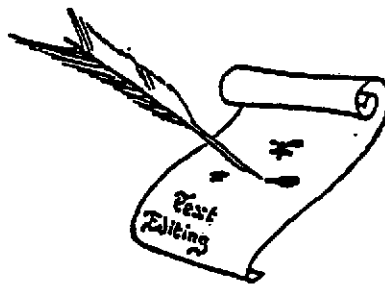
When all else fails phone 201-645-5503

Questions may be answered ahead utilizing:

separate answers
end multiple answers to one question
let this question be asked (-... Y)
equivalent carriage return
answer ACCEPT question YES

Line and Item Number Aids:

- # range of item or line numbers
#, # - #, # any combination from # until end from first till #
- # from first till #
- all lines or items



TEXT COMPOSE/EDIT COMMANDS

Used in Scratchpad (SP) starting with first character of line.
(# indicates line numbers/range)

+ text complete/finished

=# go to line #

= go to end of text

:# print lines indicated

:# print all lines as typed

:# print all lines after editing

:# do for lines #

:/word/ print first line with 'word'

:/word/s print all lines with 'word'

:/cat/ - /dog/ print from line with 'cat' to line with 'dog' in it

* deletes line printed above

* delete lines indicated

* delete all of SP

/old/new/ replace 'old' with 'new' in line printed above

/old/new/# do for lines indicated

/old/new/s all occurrences on line

/old/new/s# for lines indicated

/old/new/s- for entire scratchpad

! back up one line

* cat replace letters printed above with letters 'cat'

* *** delete letters above *

* cat * insert 'cat' at first up arrow

| blank this line

|# blank lines indicated

{text} fill this line with 'text'

{text}# do for lines #

{text}({#}) place text in columns #

< insert one new line here

<# insert lines indicated here

<< insert a series of new lines

> end insert of a series of new lines

&# copy lines #

:1 list blank lines

<1 insert blank line

=1 delete blank lines

:. print lines with indirect edits

= 3;<20;=13 Use : to do multiple edits

CONTROL COMMANDS

(May be entered any time)

Text Control Commands for Output:

+left # set left margin at column #

+left set left margin at column 1

+right # set right margin at column #

+right set right margin at column 72

+space normal line spacing

+space -1 eliminates all blank lines

+space # # blank lines between text lines

+trace # copy the next # lines of output into the Scratchpad (up to 100).

+trace # SA# copy into SA# instead of SP

Set Option Commands:

+SAM Set Automatic Message delivery

+SNAM Set No Automatic Message delivery

+SSM Set Short Mode of interaction

+SNSM Set No Short Mode

+SLP # Set Line Pause every # lines (For pauses on output at CRT's)

+SLP Set Line Pause every 23 lines

+SNLP Set No Line Pause

+SCM # Set Conference Marker at item #

+SAC code Set Access Code (up to 12 characters)

+SPEN name Set PEN name (up to 24 characters)

Alerting Control Commands:

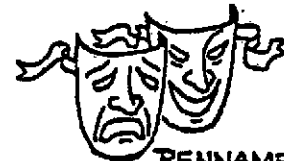
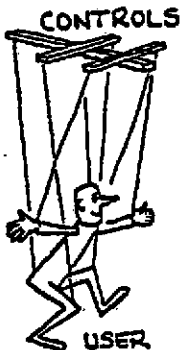
+sleep Terminal goes to sleep until new comment or message delivered

-sleep mm:ss Will print new items until time delay specified is reached

+sleep MGN Will sleep until member # gets on or off the system (break key negates sleep state)

+alarm mm:ss provides an alarm after time delay specified

-alarm MGN# provides an alarm when member # gets on or off the system (alarm discontinued when user gets off)



SPECIAL MEMBERS:

name (nickname, number)

SYSTEM MONITOR (EIES, 100)

CONSOLE OPERATOR (HELP, 101)

OPERATIONS MANAGER (REQUEST, 102)

CENTER DIRECTOR (BOSS, 104)

USER CONSULTANTS: 110-119

PUBLIC CONFERENCES:

name	number
PRACTICE	1000
PROBLEMS	1001
SUGGESTIONS	1002
IMPACTS	1003
NOTICES	1004
WISDOM	1005
TERMINALS	1006

SENDING MESSAGES

After you have had a chance to receive any waiting messages, you are at the first choice point in the EIES system. As a member, you have the following privileges on EIES:

- 1) You may SEND a MESSAGE to any other MEMBERS.
- 2) You may have one NOTEBOOK for your private writing or composing.
- 3) You may belong to one or more GROUPS.
- 4) You may establish one temporary CONFERENCE at a time with any set of other MEMBERS.
- 5) You may participate in any CONFERENCE to which you have access (to which you are invited), as well as any CONFERENCES declared PUBLIC.
- 6) You may peruse any BULLETIN in the system.
- 7) You may peruse public information (DIRECTORY information) about other MEMBERS.
- 8) You may also enter and modify the DIRECTORY information stored about yourself for the benefit of other MEMBERS. (See later section on the EIES Directory)
- 9) You may also enter and modify non-public information (your ACCESS CODE and PEN NAME). (See later section on the EIES Directory.)

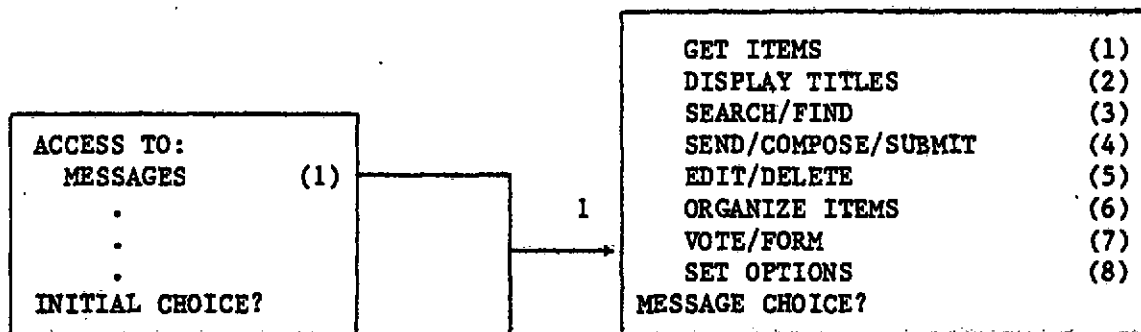
In order to do any of these things on EIES, you must let the computer know what you want to do by giving it the appropriate instructions. The basic structure for EIES instructions is contained in a series of MENUS. Each menu gives you a set of choices. In response to each menu question, you enter the number of the choice you want.

For example, after you have had a chance to receive any waiting messages, you are at the INITIAL CHOICE? point in the system, and you will receive the menu printed in the box at the top left-hand corner of the one-page User's Guide for Electronic Information Exchange System. This menu asks you if you want:

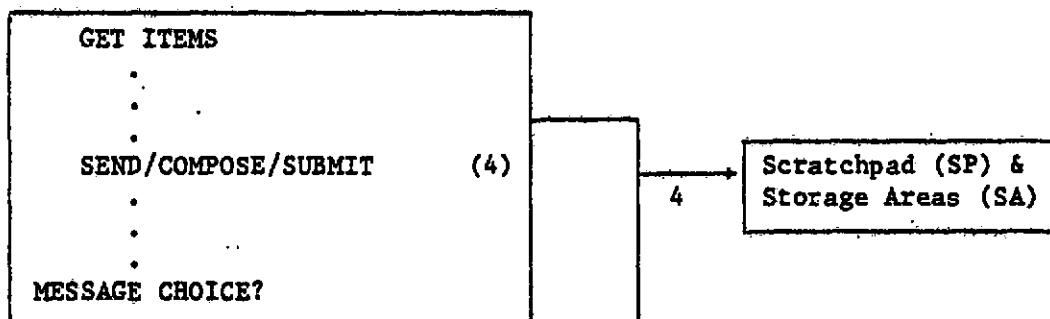
```
ACCESS TO:
MESSAGES      (1)
CONFERENCES   (2)
NOTEBOOKS    (3)
BULLETINS     (4)
DIRECTORY     (5)
EXPLANATIONS  (6)
REVIEWS       (7)
COMPOSITION   (8)
MONITORING    (9)
INITIAL CHOICE?
```

Any time you want to get back to INITIAL CHOICE?, enter a double plus (++) in response to any question or choice.

Suppose you want to send a message. Then you would want access to messages, so you would enter a 1 (the number 1, not a small L) when the system asks INITIAL CHOICE?. In response to that choice, the system then presents you with the MESSAGE CHOICE? menu:



Since you want to send a message, you would enter a 4 when the system asks MESSAGE CHOICE?. In response to that choice, the system will put you into your scratchpad where you may compose your message.



The scratchpad is the place where you may compose messages or conference comments before sending them to others on the system. As you enter your scratchpad, the system will say:

ENTERING SCRATCHPAD:
1?

At this point you are ready to enter your first line of text. At the end of each line, press (CR) to transmit the line to the system. Then wait for the computer to give you the next line number prompt (the line number with a question mark after it) before entering more text. If you don't wait for the prompt, you'll get ahead of the computer and have problems. Each line in the scratchpad is numbered, and you may use up to 57 lines for each message. (That's a maximum, not a requirement!) You may also use up to 72 characters in any one line. If you use more than 72, the line will overflow into the next line like this:

```

1?Pretend that this line has more than 72 text characters.
1:Pretend that this line has more than 72 text
2<characters.
LINE OVERFLOWED
3?
  
```

After the first line was entered and (CR) was pressed, the system printed out the portion of the line that fit within 72 characters without breaking any words in two, and then printed out the remaining overflow on the next line, followed by a message stating that the line overflowed. The word "characters" is the overflow. By using less than 72 characters per line for text (the limit of 72 does NOT include the line numbers and the question mark), this won't

happen. If you do exceed this limit, you can always edit your message to correct the overflow (see the section on text editing) or you can leave the line with the overflow in and just continue entering more lines.

The scratchpad is NOT automatically erased when you go to send a message, unless you made the choice to do so when you last left your scratchpad. The system will put you at the next available line if material was left in the SCRATCHPAD. If you are using the system for the first time, your scratchpad should be clean and the system will put you at line 1, indicated by the 1? prompt. However, if you had just sent a four-line message to someone, and then re-entered the scratchpad, the system would put you at line 5, unless you had cleared the scratchpad yourself. You can imagine the potential embarrassment of forgetting to clear your scratchpad and sending a new message that starts with a message you had sent to someone else previously! Get in the habit of always clearing your scratchpad before composing a new message. To do that, simply type in ** (two asterisks) at the beginning of any line in the scratchpad. The system will then ask if it is okay to delete the contents of your scratchpad. If you answer YES or Y, everything in your scratchpad will be erased.

ENTERING SCRATCHPAD:

4:appreciate your help. Thanks.

~~5?*~~

OKAY TO DELETE (Y/N)?Y

1?

Now compose a short message to the OPERATIONS MANAGER and CONSOLE OPERATOR or someone else you know on the system. Just a few lines are enough to give you the idea of how to compose and send messages. For now, don't worry about mistakes or typographical errors.

When you have finished composing your message, enter a + (plus) on the next line. This tells the system you have finished the text. The + must be the first character on a new line.

ENTERING SCRATCHPAD:

1?This is my first message on EIES.

2?So far I understand the system, but

3?being a beginner makes me nervous.

4?Am I doing this right?

5?+

Next the system will ask to whom you want your message sent:

TO (#'S/NAMES)?

You may indicate to whom your message is addressed by his or her number, name, or nickname. We would like you to send your first message to the OPERATIONS MANAGER (REQUEST,102) and the CONSOLE OPERATOR (HELP,101) so that the staff will know that you have begun using the system. You may send it to others, too. There is a group of user consultants on the system who are here to provide assistance when you need it. Their numbers are 110-119. You may wish to send your first message to one of them, too. You may also wish to send this first message to yourself, just to see how it looks when it is delivered.

So, when the system asks:

TO (#'S/NAMES)?

you may respond with

TO (#'S/NAMES)?101,102 (and any others, separated by commas)

or TO (#'S/NAMES)?HELP,REQUEST (and any others, separated by commas)

or TO (#'S/NAMES)?CONSOLE OPERATOR,OPERATIONS MANAGER (and any others, separated by commas)

Note that there is no space after the comma in this list. You may also mix and match numbers and names or nicknames. To send a message to all members of a group, you need only enter the group number, rather than all the individual members' numbers.

The system will then give you the full names of all of those to whom you want to send the message as a double check. Then, if more than one person is indicated as an addressee, it will ask:

CONSOLE OPERATOR (HELP,101)

OPERATIONS MANAGER (REQUEST,102)

ADDRESSEES INDICATED (Y/N)?

A yes response (Y, YES, or (CR)) will let everyone receiving the message know to whom it was addressed by putting a CC: or copy indication at the end of the message. If you enter N or NO, there will be no copy indication on the message (a "blind copy"). If the message is being sent to only one person, this question is not asked.

If you do not wish to answer any more questions you may use a plus sign (+) at any time to skip over those questions providing additional options; or, if you have decided not to send the message you can use a minus sign (-) to terminate the message sending procedure without actually sending the message.

Next the system will ask if there are any associated messages. This gives you the opportunity to link a particular message with a previous message on the same topic. The system will ask for the message number of the associated message.

ASSOCIATED MESSAGE (#)?

Since this is your first message, there are no associated messages so you may enter a (CR) to skip over this question.

Next, the system will ask if there are any keywords or phrases that you would like to assign to your message. This feature will be of great use later when you want to retrieve all messages indexed by a certain keyword or phrase. The system expects the keywords or phrases to be entered with slashes (/) in between.

KEYS (/word/phrase/)?

Again, since this is your first message, it is not necessary to add keywords, so you may simply enter a (CR). In general, you are not required to use associations or keywords or phrases with your messages or conference comments; this facility of the system has been designed to provide an easy and efficient way of retrieving messages at a later time, if you want to use it.

Finally, the system will ask you if it is okay to send your message to the people you have indicated:

OKAY TO SEND (Y/N/-)?

If you respond with a Y, YES, or (CR), the message will be sent and the system will tell you the message number, your name and number, and the date and time the message is sent:

MESSAGE BEING SENT

SENT AS:

M 12345 YOUR NAME (NICK,###) 10/ 7/77 3:45 PM L:35

The L:35 indicates this message contains 35 lines of text. Note the title includes the date and time and a unique identification for the message assigned by the computer.

If you respond with NO or N, the system will ask if you want to sign the message.

SIGNATURE (Y/N/PEN)?

If you respond to this signature question with a yes answer, the system will respond with REGULAR SIGNATURE USED and ask the OKAY TO SEND (Y/N/-)? question again. If you answer no to the signature question, the system will say NO SIGNATURE USED and ask the OKAY TO SEND (Y/N/-)? question again. If you say PEN, indicating that you want to sign it with your pen name, the system will respond with PEN SIGNATURE USED and ask the OKAY TO SEND (Y/N/-)? question again. There is more information about pen names in the section on the EIES directory. If you answer no to OKAY TO SEND (Y/N/-)? the second time it is asked, the computer will respond with MESSAGE NOT SENT and return you to MESSAGE CHOICE?.

If you enter a minus sign (-) the first time OKAY TO SEND (Y/N/-)? is asked, the message will not be sent, you will be asked no questions about signature, and you will be returned to MESSAGE CHOICE?.

After your message has been sent, the system will ask if you want to erase your scratchpad:

ERASE SCRATCHPAD (Y/N)?

If you respond with a yes answer, the text in your scratchpad will be deleted. If you answer no, the text will remain. In either case, the system will return you to MESSAGE CHOICE?.

If you have gone through this entire messaging procedure, CONGRATULATIONS!

To review, to message someone ("to message" or "I will message you" is BIES jargon for sending a message), do the following at each choice point:

INITIAL CHOICE?1

MESSAGE CHOICE?4

ENTERING SCRATCHPAD:

4:Am I doing this right?

5?*

OKAY TO DELETE (Y/N)?Y

1?Enter your message exactly as you want it,

2?with a (CR) at the end of each line of text

3?and a + as the first character of the very

4?last line.

5?+

TO (#'S/NAMES)?101,102 (or the appropriate member number)

CONSOLE OPERATOR (HELP,101)

OPERATIONS MANAGER (REQUEST,102)

ADDRESSEES INDICATED (Y/N)?Y

ASSOCIATED MESSAGE (#)? (CR) (or associated message number)

KEYS(/word/phrase/)? (CR) (or appropriate keywords or phrases)

OKAY TO SEND (Y/N/--)?Y

MESSAGE BEING SENT

SENT AS:

M 12346 YOUR NAME (NICK,###) 10/ 7/77 3:50 PM L:4

ERASE SCRATCHPAD (Y/N)?

In the next section, some of the techniques you can use in messaging are described.

MESSAGE SENDING SHORTCUTS

After you have sent a few messages on EIES, you may find that you don't need the system to show you the available menus each time. If you use the one-page User's Guide, it will show you the available choices at each choice point. If you want the system to stop giving you the menus, enter the command +SSM (for Set Short Mode). Commands like +SSM may be entered any time the system asks you a question, such as INITIAL CHOICE?, MESSAGE CHOICE?, CONFERENCE CHOICE?, etc. You may also set short mode by choice 3 in the SET CHOICE box on your user guide. If you are in short mode (without a menu), the system will just ask you the question appropriate to that menu. Those questions are the last items in the menu choice boxes on the one-page User's Guide.

long mode

ACCESS TO:

MESSAGES	(1)
CONFERENCES	(2)
NOTEBOOKS	(3)
BULLETINS	(4)
DIRECTORY	(5)
EXPLANATIONS	(6)
REVIEWS	(7)
COMPOSITION	(8)
MONITORING	(9)

INITIAL CHOICE?

short mode

INITIAL CHOICE?

To have the system print out the menus for you again, enter either +SLM (for Set Long Mode) or +SNSM (for Set Negation of Short Mode).

EIES has been designed so that you may give the system a series of answers all at once, thus anticipating the questions that the system asks. This feature speeds up the process of using the system. Each answer is separated from the others by a comma or a semi-colon. So, in order to get directly to the message system and to your clean scratchpad, you may enter the following when the system asks for your initial choice:

INITIAL CHOICE?1,4,**,Y

The 1 gets you to message choice, the 4 into your scratchpad, the ** indicates you want to erase the scratchpad, and the Y tells the system it's okay to delete the contents of the scratchpad. The system then responds with ENTERING SCRATCHPAD:

INITIAL CHOICE?1,4,**,Y

ENTERING SCRATCHPAD:

4:Am I doing this right?

1?

Here you are, ready to write in a clean scratchpad.

Similarly, you may anticipate the questions the system asks when sending a message after you have composed it. Suppose you wanted to send a message to the CONSOLE OPERATOR (HELP,101). At the end of the text in your scratchpad,

you could enter:

```
+ ,101; , ,YY  
or + ,101; + ,Y
```

Notice that there is a semi-colon (;) after the 101. You have to use a semi-colon after the last membership number to which you want your message sent to separate the numbers from the answers to the other questions. Otherwise, the system would think that the answer to the next question (a yes or no in response to ADDRESSEES INDICATED? if more than one addressee, or a message number in response to ASSOCIATIONS?) was supposed to be another membership number. In this example, no associations or keywords were entered, so these questions were skipped over by just entering commas. The Y at the end is a yes response to OKAY TO SEND?.

If you want to send your message to someone (or several people) specified by name or nickname, you must put a comma after the plus and before the name or list of names and a semi-colon at the end.

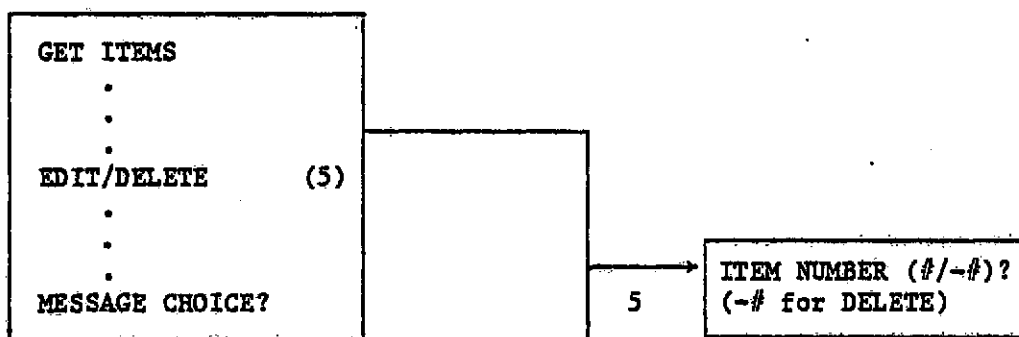
```
+ ,HELP,REQUEST;
```

These shortcuts are illustrated in the following example:

```
INITIAL CHOICE?1,4,**,Y  
ENTERING SCRATCHPAD:  
1?I seem to have figured out how to  
2?send messages now. If I need help,  
3?I know I can message one of the  
4?user consultants. Thanks for getting  
5?me started.  
6?+ ,101; + ,Y  
CONSOLE OPERATOR (HELP, 101)  
MESSAGE BEING SENT.  
SENT AS;  
M 12347 YOUR NAME (NICK,###) 2/28/78 12:01 PM L:5
```

The major potential dangers in answering ahead of the system's questions like this are that you may forget a question, and so all the answers after that will be for the wrong questions, or you might make a mistake in your list of people to whom you want your message sent, and the wrong person will get the message. If you answer the questions incorrectly, perhaps forgetting one in a sequence or answering in the wrong form, the system will tell you you have entered an invalid command. Just try again.

If you inadvertently send a message to the wrong person, you may delete it. EDIT/DELETE is choice 5 under MESSAGE CHOICE? -- see the top box in the middle column on the User's Guide. Choice 5 takes you to the fourth box down on the right-hand column, which asks for the item number you want to edit or delete. To delete it, you must put a minus sign in front of the item number.



```

MESSAGE CHOICE?5
MODIFY ITEM (#/-#)?-54321
M 54321 YOUR NAME (NICK,###) 3/15/78 9:37 PM L:55
OKAY TO DELETE (Y/N)?Y
MESSAGE CHOICE?
  
```

You could have done the same thing by entering 5,-54321,Y after the system asked for MESSAGE CHOICE?.

Composing messages is such a common activity on EIES that there are commands you may use that are even shorter. +CNM (for Compose New Message) is the same as ++1,4,**,Y; that is, it will take you directly to a clean scratchpad. Similarly, +CM (for Compose Message) is the same as ++1,4; here the scratchpad is not erased.

+CNM = ++1,4,**,Y (insures clean scratchpad)

+CM = ++1,4 (scratchpad not erased if it currently contains something)

These commands may be entered any time the system asks you a question or a menu choice. There is no comparable command for sending a message after it has been composed, since you must tell the system to whom the message is addressed, what associations or keywords to assign, and so forth.

After any message is sent, the system will return to the MESSAGE CHOICE? point. If you wish to see if there are any new communications waiting for you, enter a ++ to return to INITIAL CHOICE?. If any communications are waiting for you, the system will give you a chance to receive them before putting you at the INITIAL CHOICE? point. If you want to have your messages printed out automatically, without having the option of not receiving them or of only receiving a few, you may enter the +SAM (for Set Automatic Message delivery) command any time the system asks you a question such as INITIAL CHOICE? or MESSAGE CHOICE?. To return to the normal state, enter the +SNAM command (for Set No Automatic Message delivery). These commands are listed on the back of the one-page User's Guide under "Control Commands."

You can get back to INITIAL CHOICE? from any point in the system by entering two plus signs (++). A single plus (+) will move you back one level in the menus. You need to go back to INITIAL CHOICE?, finish a MESSAGE CHOICE activity or sign off each time you want to find out the number of messages you have

waiting. This is true whether or not you are using automatic message delivery. The minus sign (-) is used when you want to start over. It tells the system to go back to the beginning of what you were doing, ignoring whatever had been done before the minus was entered. A double minus sign (--) entered at any point will finish your session with EIES and sign you off of the system. Here is an example of logging off:

```
MESSAGE CHOICE?--  
NO MESSAGES WAITING  
YOUR NAME (NICK,###) OFF AT 4/15/78 5:37 PM  
TIME USED: :38  
CUMULATIVE: 2:45  
ALLOCATED: 25:00
```

201 25CC DISCONNECTED

@

The last two lines are from TELENET. They tell you that you are now disconnected from EIES (TELENET uses the EIES access number or address, rather than the word EIES). The @ sign means that you may enter another TELENET access number to be connected to another computer, if you like. At this point you may log back into EIES by entering C 201 25CC, or you may stop by simply hanging up your phone and turning off your terminal (and acoustic coupler, if you have one).

You will find a summary of the use of the +, ++, -, --, etc. in the box at the lower right-hand corner of the User's Guide under "Control Features for Use of Menus."

If you are in short mode (no menus) and you want the system to show you the menu for a particular choice, enter a (CR) when the system asks for your choice. If you want a short explanation at any point, enter a single question mark (?). If you need a more detailed explanation, enter two-question marks (??). If you get really stuck and need help in a hurry, enter three question marks (???) and a one-line message. Your message will appear on a special terminal in the conferencing center. The use of the ?, ??, and ??? is also explained on the back of the one-page User's Guide under "Answer and Help Aids."

THIS MIGHT BE A GOOD TIME TO TRY OUT THE SYSTEM BEFORE TRYING TO ABSORB MORE MATERIAL. YOU MAY WISH TO USE THE EIES CHECKLIST (Page 46).

TEXT EDITING

When you are sending messages, it's okay to have occasional typographical errors. But we would like you to enter your address, phone number, and a short description of yourself in the EIES directory so others can find you, and you probably want that to be letter-perfect. So, before the discussion of entering or changing your directory information that appears in the next section, here is a discussion of text editing.

When you are composing a message in the scratchpad, you may make a mistake in typing or want to change your words in some way. Text editing commands allow you to make changes in the text, and the system will automatically rewrite the text to include those changes. If you wish, you may also retype each incorrect line. All the direct edit commands discussed here work immediately after you enter them. They may be used any time you are in your scratchpad and when you are filling out the directory information.

If you are typing a word and you make a mistake, but you haven't yet pressed (CR) to transmit the line of text to the computer, you may simply backspace and type over the word, making the correction. Backspacing is done differently on different terminals: some use the backspace key, some a backwards arrow, some the underscore (_) and still others the control key (CTRL) held down while pressing the H key.... Experiment on your terminal to find out how to backspace. If you want to delete the whole line, hold down the control key and press X. If you delete a line in this way, the system will not give you a line number prompt. Go ahead and enter the line correctly, without waiting for the prompt.

If the line of text has already been transmitted to the computer with the (CR), then you need to use the text editing commands. These are triggered by special characters which are entered as the first character of a new line. If these characters are entered at any other point in a line of text, they become part of the text.

These special characters and their meanings are:

- = go to the line specified
- : print the line or lines specified
- * delete the line or lines specified
- / replace the error
- ^ image correct the error
- ! blank the line
- < insert a line
- & copy a line or lines

A summary of the text editing commands is found on the back of the one-page User's Guide.

Let's look at some examples of text editing to see how these special characters are used.

ENTERING SCRATCHPAD:

```
1?We beleive that oneof the most profound
2?impacts of computerized conferencing will
```

3?lie in it's capability to allow geographically
4?dispersed people to work together as if
5?same office.
6?

As you can see, there are a number of errors in this text. In this example, the system is currently waiting for text for line 6. If we want to go back to line 1 to correct the errors there, we must tell the system to go to line 1 with the equals character (=).

6?=1
1:We beleive that oneof the most profound
1?

The system responds by printing out line 1 as entered in the scratchpad and waits to find out what changes, if any, we want to make. Entering a (CR) at this point will keep the line as it is. However, we want to make some changes. We could simply retype the line correctly, or we could use text editing as follows.

One way of making the necessary corrections is to use replacement editing. That is, we tell the system which characters to replace and what to replace them with. Replacement editing takes the form:

/old/new/

So, to correct "beleive" to "believe," we would enter:

6?=1
1:We beleive that oneof the most profound
1?/beleive/believe/
1:We believe that oneof the most profound
1?

The system then responds with the corrected line and waits for the next instruction. It is not necessary to enter entire words for replacement editing. Just enter enough letters so the system can find the place you are indicating. The system will make the correction on the first occurrence it finds of the letter combination you put between the first and second slash marks (/), so be careful. To make our second correction in line 1, we would enter:

1:We believe that oneof the most profound
1?/eo/e o/
1:We believe that one of the most profound
1?

Incidentally, you may also enter the number of the line in which the editing is to occur after the slash marks, rather than having the system move to a particular line with the = character. For example:

5?same office.
 6?/beleive/believe/1
 1:We believe that oneof the most profound
 6?/eo/e o/1
 1:We believe that one of the most profound
 6?

Another way to correct mistakes is with image editing. Here, we can space over to the error and correct just the letter or letters that are wrong. Image editing begins with the up arrow character (). This is probably one of the characters above the numerals on your keyboard that you get by pressing SHIFT and the appropriate key. Here is an example of its use.

6?=4
 4:dispersed poeple to work together as if
 4?^ eo
 4:dispersed people to work together as if
 4?

Another example of image editing shows the use of the delete character (*):

4?=3
 3:lie in it's capability to allow geographically
 3?^ *
 3:lie in its capability to allow geographically
 3?

When the * is used with the image edit character (^), it means delete the character just above. If it is used as the first character in the line, it means delete the entire line last printed.

Finally, we seem to have left out some words in our text, so we need to insert a line. This is done as follows:

3?=5
 5:same office.
 5?<
 5?they were in the
 6:same office.
 6?(CR)
 7?

The system inserts the new line in front of or before the line indicated (here, line 5) and then renumbers the rest of the lines. By entering a (CR) on line 6, we indicate that we want line 6 to stay as it has been printed out.

At any point in the scratchpad, you may have the system print out a single line by entering a colon (:) and the number of the line.

6?:1
 1:We believe that one of the most profound
 6?

After you have done some editing, you may wish to have the entire text printed out again with line numbers to see if it is correct. To do this, enter a colon minus (:-) at the beginning of a line.

7?:-

1:We believe that one of the most profound
2:impacts of computerized conferencing will
3:lie in its capability to allow geographically
4:dispersed people to work together as if
5:they were in the
6:same office.
7?

To have the entire text printed out without line numbers, use two colons (::).

7?::

We believe that one of the most profound
impacts of computerized conferencing will
lie in its capability to allow geographically
dispersed people to work together as if
they were in the
same office.
7?

A common occurrence is to type in a longer line than is allowed. The system automatically takes the last whole word and uses it to start the next line. For casual messages most people just proceed to the next line or use one of the advanced features to provide automatic line adjustment on the printing of items (.TEXT). One may also go back and retype the line. However, a simple way to make corrections is through the use of the append form of the replace command as in the following example:

4?This line is too long and will cause an overflow condition
4:This line is too long and will cause an overflow---
5<condition
LINE OVERFLOWED
6?// that can be corrected quite easily.
5:condition that can be corrected quite easily.
6?

The best way to learn text editing is to experiment in your scratchpad with its various forms. All the direct text editing commands may be found on the back of the one-page User's Guide. Try them out yourself and see how they work. As long as you are in your scratchpad, no one else will see what you're doing. Once you like the contents of your scratchpad, you are ready to send the text to whomever you like. You may even send the message to yourself, just to see how it looks.

EIES is designed to handle both upper and lower case letters. The computer doesn't know that an r and an R are the same letter, so be careful in replacement editing to specify exactly the characters you wish to replace. The computer also thinks that a space or blank is a character, so /this/ is not the same as / this/.

With this introduction, you should be ready to do some beginning text editing when you need it. Since EIES is really a communications system, most users don't bother to correct their typos and other simple mistakes, as long as the idea they are trying to communicate is clear. We believe this informality is healthy for facilitating the general flow of communications between users.

If you would like to learn more about text editing, try EXPLANATION CHOICE? (8); that is, try ++6,8. Or message a user consultant.

THE EIES DIRECTORY

The purpose of the directory is to provide public information about members and groups using EIES so that people can find others with common interests and develop new relationships. The public information for members includes name, nickname, address, telephone, and up to five lines of description of your interests. For groups, the public information includes a description, a list of group members, and the name of the group coordinator. As a member, you may put your directory information into the system and you may modify it at any time. Group directory information is entered by the group coordinator.

In addition to your public information, there are two kinds of private information you may enter which may not be accessed by any other members. The first is your access code. When you first become a member, the EIES staff assigns an access code to you (like a password). However, you should change it soon after beginning to use EIES, and any time you think anyone else has seen it. The second kind of private information is your pen name. Each member is entitled to have a unique pen name to use for signing any item when you do not wish to use your real name.

Now that you have learned how to send and receive messages and how to do basic text editing, we would like you to fill in your directory information.

Start at INITIAL CHOICE?. You can get to INITIAL CHOICE? from anywhere in the system by entering a double plus (++). On the INITIAL CHOICE? menu, ACCESS TO DIRECTORY is choice 5, so enter a 5 in answer to the question.

INITIAL CHOICE?5

The system will respond by giving you the number of members and groups in the directory. Now, looking at the DIRECTORY CHOICE? menu (either given to you by the system or on the one-page User's Guide), you will see that UPDATE ENTRY is choice 7, so enter a 7 in response to that question:

DIRECTORY CHOICE?7

You could have done the same thing by entering your answers ahead of the system's questions. Suppose you were at the point where the system asked for your MESSAGE CHOICE?. You could have entered:

MESSAGE CHOICE?++5,7

At this point the system will give you a listing of the present information in your directory listing. After all the present information is listed, the system will ask:

MODIFY PUBLIC INFORMATION (Y/N)?

If you wish to add to or otherwise change your public information, enter a YES (or Y or (CR)). If you say NO, the system will then ask if you want to modify your private information.

Assuming that you say yes to modifying public information, the system will then ask:

FULL NAME (24C)?

You may use up to 24 characters for your name. It's not necessary to include middle names or initials. If you are satisfied with your name as already entered, leave it as is and go on to the next question by entering a (CR). You may use the (CR) in this manner in response to any question about your directory information. Next the system will ask:

NICKNAME (12C)?

You may use up to 12 characters for your nickname. This is meant to be a short name. Many members use their first names as nicknames. Your nickname should be easy for others to remember. Again, if you are satisfied with your nickname, enter a (CR).

Full names and nicknames are unique to each member on EIES. If the name or nickname you enter has already been used by someone else, the computer will tell you, and you'll have to think of another. Names and nicknames are assigned on a first come, first served basis.

Next the system will ask for your telephone number. Be sure to include your area code, too. With up to 40 characters allowed, you can put in both your home and work phone numbers if you like.

TELEPHONE/S (40C)?

Then it asks for your zipcode. Enter the zipcode that goes with the mailing address you will be asked to enter next.

ZIPCODE (8C)?

Then the computer will ask you to enter or modify your address. You may use up to five lines for this information.

ENTER OR MODIFY ADDRESS (5 LINES):

1?...You may treat this writing space like a five-line
2?...scratchpad. Any of the text editing commands
3?...discussed in the previous section may be used here.
4?...Do NOT include your zipcode here. End your address
5?...with a + in the beginning of the next free line.
WARNING ONLY 5 LINES MAY BE USED FOR THIS TEXT
6?+

The last item of your public information is a description of your work, your interests, or whatever else you would like to tell other EIES members about yourself.

ENTER OR MODIFY DESCRIPTION (5 LINES):

1?...Again, treat this space like a five-line scratchpad.
2?...Think about what kinds of information you would
3?...like to know about other EIES members, and enter
4?...that kind of information about yourself. Again,
5?...end with a '+' at the beginning of the next free line.
WARNING ONLY 5 LINES MAY BE USED FOR THIS TEXT
6?+

Now the system will ask if you wish to modify your private information.

MODIFY PRIVATE INFORMATION (Y/N)?

If you answer YES or Y, the system will print out your current access code and pen name and then ask:

ACCESS CODE (12C)?

PEN NAME (24C)?

As above, enter any new access code or pen name that you wish. If you are satisfied with either of these as they are, enter a (CR) in response to the question.

The system will then print out your new directory information in full for you to check over, and then it will ask:

OKAY TO MODIFY (Y/N)?

If you answer yes, the new information will replace the old. If you say no, nothing will be modified, and you will be returned to DIRECTORY CHOICE?.

If you are modifying only a portion of your directory information, or if you have made a mistake in answering some question, you might want to consider using the +, -, or ^ characters as the first character in a line to allow you to move in a special way through the directory questions. If you enter a + in response to any question except ENTER OR MODIFY ADDRESS and ENTER OR MODIFY DESCRIPTION, the system will make the modifications you have entered so far and then return you to DIRECTORY CHOICE?. Since the address and description are entered in a small 5 line scratchpad, a + entered there tells the system you have finished entering text there, and it will then give you the next question.

If you enter a - at any point while updating your directory information, no modifications will be made, and the system will return you to DIRECTORY CHOICE?.

If you enter a ^ in response to any question except ENTER OR MODIFY ADDRESS and ENTER OR MODIFY DESCRIPTION; the system will back up to the previously asked question and ask it again. If you enter a ^ at the beginning of a line while filling out your address or description, the system will back up to the line before.

FINDING OTHERS IN THE DIRECTORY

You may wish to use the directory yourself to find out who else is a member on EIES, the interests of someone with whom you have been messaging, or all those on the system with a particular interest. In the DIRECTORY CHOICE? menu, you will see that you may search for or find members by:

```
NAME PARTS      (3)
FROM-TO-DATES   (4)
WORD/PHRASE     (5)
ZIPCODE         (6)
```

Suppose you want to find a member, but you don't know exactly how he or she has entered his or her name in the directory. Then you would do a search by name parts. The system will ask you to enter the letters you want used for the search between slash marks (/):

```
INITIAL CHOICE?5
DIRECTORY CHOICE?3
NAME PARTS (/letters/letters/)?/tur/
```

The system will then print out all the full names and numbers of anyone on the system with the letters "tur" in his or her name or nickname. In this example, the system would print out:

```
MURRAY TUROFF (MURRAY,103)
```

You may request several searches on name parts at a time by putting together a whole string of letters between slashes:

```
NAME PARTS (/letters/letters/)?/tur/rox/elaine/

MURRAY TUROFF (MURRAY,103)
,ROXANNE HILTZ (ROXANNE,120)
ELAINE KERR (ELAINE,114)
```

Since the computer prints all names and nicknames in capital letters only, you may request the search for name parts in either upper or lower case. The computer will automatically change the letters to capitals.

The FROM-TO-DATE search choice (4) allows you to search for members who were last active on the system within a certain date and time range. You may also restrict the FROM-TO-DATE search to a specific set of members or to a specific group.

```
FROM (MM/DD HH:MM)?10/01 09:30
TO (MM/DD HH:MM)?10/31 09:30
MEMBER/GROUPS (##-#)?200-299
```

If you want to search for members who have a particular word, phrase, or part of a word in their descriptions, you would use the WORD/PHRASE search choice (5). The system will ask you for the word(s) or phrase(s) on which to search, as well as any particular groups or sets of members to which you want the search restricted.

WORDS/PHRASES (/word/phrase/)?/nuclear/transp/
MEMBERS/GROUPS (#/#-#)?72,74,200-299

The system will then print out the names and numbers of all those who have used the words "nuclear" or any word containing "transp" (such as "transportation," "transport," "transpire," "transpose," etc.) in their descriptions, AND who are in either groups 72 or 74 or who have membership numbers between 200 and 299. By combining words or phrases and membership or group numbers, the computer can be instructed to do a very refined search. If you want the system to search through all the members on EIES, rather than specifying a set of members or a group, simply enter a (CR) when the computer asks for MEMBERS/GROUPS (#/#-#)?.

The ZIPCODE search choice (6) allows you to find members in a given geographic area by specifying any portion of a zipcode, beginning with the first digit of the zipcode. For example, if you only specify the digit 0 (zero), you would get a list of all members in New Jersey, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, Maine, Puerto Rico, or the Virgin Islands. By specifying 071, you would get all those in the immediate vicinity of Newark, New Jersey. By specifying 07102, you would get all those at the New Jersey Institute of Technology (NJIT) and anyone else whose address is in that zipcode.

If you already know a member's name or number, you may find out the directory information for him or her by using DIRECTORY CHOICE? (1), which is GET ITEMS. GET, in EIES terminology, always means print out.

INITIAL CHOICE?5
DIRECTORY CHOICE?1
MEMBER/GROUP (NAMES/#'s)?103

MURRAY TUROFF (MURRAY,103)
NICKNAME: MURRAY
TELEPHONE: 201-645-5352
LAST ACTIVE: 10/ 2/77 8:27 PM

ADDRESS:
NJIT
323 High Street
Newark, New Jersey
07102

DESCRIPTION:
Concerned with the use of computers as a direct aid to facilitating the human communication process. Also, Delphi Design, Technological Forecasting and Assessment, Design of Interactive User Oriented Computer Systems and MIS.

GROUP MEMBERSHIP:
GROUP: (10)
TITLE: USER CONSULTANTS

GROUP: (98)
TITLE: EIES DEVELOPMENT TEAM

You may also get a list of all those members within a specific group or set of member numbers by using the DIRECTORY CHOICE? (2), DISPLAY TITLES. The system will not print out all the information in this case, but simply the names and numbers. For example, to find out the names of all the user consultants (those whom you may message for help in learning the system), you would enter:

INITIAL CHOICE?5
DIRECTORY CHOICE?2
MEMBER/GROUP (NAMES/#'s)?110-119

If you ask the system to display the title for a group, you will get the group number, the group name, and the name of the group coordinator. If you want the full membership list for a group, use DIRECTORY CHOICE? (1) instead.

PARTICIPATING IN CONFERENCES

Conferences are discussions among a group of people in which the computer stores the comments in the order in which they were entered into the conference. Each new conference entry is placed at the end of the list of conference comments that makes up the transcript of the conference. The computer may also be used to retrieve specific comments at a later time. On EIES there are three kinds of conferences.

A GROUP CONFERENCE is associated with a defined group of members on EIES, and it has the same two-digit identification number as the group. Other EIES members who are not part of the group may be added to a group conference by the conference moderator. The system keeps track of where each member is in the discussion. When entering the conference, the system will tell you how many items have been written into the conference and how many new items are waiting for you.

A PRIVATE CONFERENCE may be started by any EIES member, who may then invite anyone he or she chooses to participate. A private conference has the same three-digit identification number as the member who started it. This member also acts as the conference moderator.

In addition to group and private conferences, there are also PUBLIC CONFERENCES on EIES. A list of public conferences and their four-digit conference numbers is printed on the back of your one-page User's Guide. Anyone may read public conference items or enter new items. Unlike group and private conferences, there is no membership list for public conferences, so the computer does not keep track of which items you have already seen. You'll have to do this yourself. Here is a short description of some of the public conferences:

PRACTICE	1000	a place for practicing writing items into a conference
PROBLEMS	1001	a place to express problems users are having with the system
SUGGESTIONS	1002	recommendations for improving the design or usability of the system
IMPACTS	1003	an open forum on potential or real impacts or consequences of systems of this type
NOTICES	1004	news items of general interest to all members, including any changes or additions we are making to EIES
WISDOM	1005	philosophic views or observations of general interest
TERMINALS	1006	information for those using or attempting to use specialized terminals or local storage devices

You may read conference items and add new conference items to the discussion. First, let's find out how to get into a conference and receive any new items for reading and pondering.

Conferences are accessed through INITIAL CHOICE? (2). On your one-page User's Guide, you will notice that the 2/3 arrow to the top box in the center column contains a question mark (?), which indicates that the computer will ask you a question. In this case, it asks you in turn for the number or name of the conference, whether you want to know the status of conference members, and if there are new items, whether you would like to receive them.

```
INITIAL CHOICE?2
CONFERENCE (NAME/#)?55
CONFERENCE: APPLICATIONS (55)
THERE ARE NOW 2 MEMBERS ACTIVE.
CONFERENCE STATUS (Y/N/A/O)?A
  UP TO: CC123 ACTIVE MEMBER'S NAME (NICK,###)
  UP TO: 120 YOUR NAME (NICK,###)
117 ITEMS. CC123 WRITTEN ON 10/15/77 10:30 AM
  3 NEW TEXT ITEMS.
ACCEPT NEW ITEMS (Y/N)?Y
```

In this example, we are accessing conference 55, called APPLICATIONS. After entering the conference number, the system replies with the name and number of the conference and also how many members are currently actively working in the conference, either reading, writing, or modifying items. The number of active members always includes the person entering the conference (yourself).

Next, the computer asks whether we want to know the conference status of the members. A Y response will get a list of all the conference members and how many items they have received to date. An N response gets no list and goes on to the next question. If we enter an A, only those active in the conference at the moment will be shown. An O brings a list of all those conference members currently on-line, but not necessarily active in the conference.

After this, the system tells us how many text items exist (those remaining after deletions), when the last one was added, and how many new text items are waiting. If the number of items and the number of the last item written are different, it means that some items have been deleted. The system then asks if we want to accept the new text items.

Once again, you may answer the questions ahead of time, if you know the order in which they come. In this case, the system will only ask if you want to accept new items if there are any. To indicate an answer to a question that may or may not be asked, the answer goes in parentheses (). So, for this example we could have entered:

```
++2,55,A,(Y)
```

Just as there is a special command for composing new messages, there is also a special command for getting into conferences. If you want to get into conference 55, for example, the following command will do so:

```
+GC 55          This is equivalent to ++2,55
```

There are no membership lists in public conferences, so the system will not ask you the questions about conference status or whether you want to accept new items. However, if there are others currently active in the public conference, the system will ask whether you would like a list of those active:

MEMBERS ACTIVE NOW (Y/N)?

The system will also tell you how many items there are in the public conference and the date and time the last item was written. It will then ask:

WHERE DO YOU WISH TO START (#)?

After you enter an item number, the system will print out all the items from that number through the end. If you enter a (CR) instead of the item number, the system will ask at which date and time you wish to start. If you enter another (CR), nothing will be printed out, and you will be at CONFERENCE CHOICE?.

You may interrupt a long printout that you don't want by pressing the BREAK KEY while the terminal is printing. The system will pause and then print <BREAK>. The system will then ask for the appropriate menu choice (e.g., CONFERENCE, MESSAGE or NOTEBOOK CHOICE).

In order to add a new item to a conference, you must get into your scratchpad to compose it, just like sending a message. When the computer asks for CONFERENCE CHOICE?, you enter a 4, to indicate you choose to SEND/COMPOSE/SUBMIT, just as in messaging. Entering a 4 will then take you to your scratchpad, where you may write and edit text.

```
INITIAL CHOICE?2,55,N,(N)
CONFERENCE: APPLICATIONS (55)
THERE ARE NOW 2 MEMBERS ACTIVE
117 ITEMS. CC123 WRITTEN ON 10/15/77 10:30 AM
  3 NEW TEXT ITEMS.
CONFERENCE CHOICE?4
ENTERING SCRATCHPAD:
  6:same office.
  7?**
OKAY TO DELETE (Y/N)?Y
1?After clearing the scratchpad with the **, you
2?may now proceed to enter your new conference
3?comment. Just as in messaging, you must end
4?the text with a + so the computer will know
5?you are through.
6?+
```

Then the system will ask if there are any other items associated with this new item or any keywords or phrases you would like to assign to it. It might be very helpful if the members of your conference developed a consistent set of keywords during the conference. Otherwise, one member might enter "introduc-

tion" as a keyword to describe an item, while another might use the keyword "preface" to describe the same thing, thus making subsequent retrieval of both items more difficult.

```
5?you are through.  
6?+  
ASSOCIATED COMMENT (#)?16  
KEYS (/word/phrase/)?/scratchpad/conference comment/text/
```

Then the system will ask how the item or comment should be signed and whether it is okay to add it to the conference.

```
ASSOCIATED COMMENT (#)?16  
KEYS (/word/phrase/)?/scratchpad/conference comment/text/  
SIGNATURE (Y/N/PEN)?PEN  
OKAY TO ADD (Y/N)?Y  
ADDED AS:  
C55 CC124 WRITER 10/15/77 11:32 AM L:5
```

Here, the comment has been added under the pen name WRITER. In conferences, all items or comments are identified by the conference number and the conference comment number (here, C55 CC124).

After your new comment has been added to the conference, the system will erase your scratchpad. You will not be asked if it is okay to delete the scratchpad; the system erases it automatically, and there is no choice.

Once again, there is a quicker way to get directly into your scratchpad to compose a new conference comment. You may enter:

```
++2,55,N,(N),4,**,Y
```

This gets you to a clean scratchpad. Here, the 55 is the number of the conference.

There is also a special command for composing a new conference comment. If you are already in a conference, at CONFERENCE CHOICE?, you may enter the following to get you to a clean scratchpad:

```
+CNC This is equivalent to 4,**,Y.
```

If you are not in any conference, you must enter the conference number as part of the command:

```
+CNC 55 This is equivalent to ++2,55,N,(N),4,**,Y
```

After you have entered a conference comment, you may decide to make some change in it or to delete it entirely from the conference. To do this, use CONFERENCE CHOICE? (5), which is EDIT/DELETE. For this choice you will be asked to indicate the number of the item you wish to edit or delete. If you wish to delete an item, you should enter the item number with a minus sign in front. In this case the title of the item will be printed out and you will then be asked:

```
OK TO DELETE (Y/N)?
```


If you wish to edit a conference comment, after entering the number of the item you wish to edit, the system will take you to the scratchpad and then put the item you wish to edit into the scratchpad for you to modify using text editing commands. When you enter the + to terminate the editing in the scratchpad, it will ask you the ASSOCIATED COMMENT and KEYS questions and then ask:

OKAY TO REPLACE AS COMMENT # (Y/N)?

The # indicates the number of the item you are editing. A yes answer will replace the original item with what is now in your scratchpad and then return you to CONFERENCE CHOICE?.

Normally you can only delete or edit items you have authored. When someone else such as the conference moderator does this the title of the item will indicate both the author and the editor of the item.

Sometime you might be asked to join a conference that has been in progress awhile, and someone may have either sent you a transcript or you may have seen a fellow conferee's printouts. If this happens, you will want to change your conference marker so the system will know what you have already seen. A conference marker is like a book marker, and normally the system manages it for you.

To change your marker, use CONFERENCE CHOICE? (8), which is SET OPTIONS. Then use SET CHOICE? (8), which is PARAMETER CHANGES. Then the system will ask to which number you want your marker set. The system will then show you the new marker setting and then ask for another SET CHOICE?. Enter a + to finish, which returns you to CONFERENCE CHOICE?. Here's an example:

```
CONFERENCE CHOICE?8
SET CHOICE?8
MARKER (#)?182
LAST COMMENT SEEN 182
SET CHOICE?+
CONFERENCE CHOICE?
```

Once again, you could have done the same thing at CONFERENCE CHOICE? by entering:

8,8,182,+

There is also a command you could have used, too. +SCM 182 (for Set Conference Marker) is equivalent to 8,8,182,+

GETTING PRINTOUTS

EIES allows you to print out messages and conference comments without having to send, receive, or enter anything. This same facility can be used if you want to print out additional copies of messages or comments previously sent or received. This section describes the procedures you should follow in order to get such printouts.

GETTING PRINTOUTS OF MESSAGES

First, start at INITIAL CHOICE?. To get there, enter two plus signs (++). On the INITIAL CHOICE? menu, ACCESS TO MESSAGES is choice 1, so enter a 1 in answer to the question:

INITIAL CHOICE?1

The system will respond with the menu for MESSAGE CHOICE? if you are in long mode, or simply the question MESSAGE CHOICE? if you are in short mode. On the MESSAGE CHOICE? menu, you will see that GET ITEMS is choice 1, so enter a 1 in response to that question:

MESSAGE CHOICE?1

The system will then ask for the number of the message that you wish to print out. If you wish to have more than one message printed out, you may enter a series of message numbers with commas in between. If you wish to print out a series of messages with consecutive numbers, you may specify the first and last numbers with a dash in between. In response to the question MESSAGES (#/#-#)?, enter the number(s) of the message(s) you wish to print out. The system will then print out the specified message(s). You may access only those messages you have authored or received.

MESSAGES (#/#-#)?12345

(the system prints out message number 12345

MESSAGES (#/#-#)?

After printing out the specified message(s), the system will again ask for the numbers of any other messages you wish to print out.

As with any other part of the system, you may enter answers in anticipation of the system's questions. The message above could also have been printed with the following sequence:

INITIAL CHOICE?1,1,12345

GETTING PRINTOUTS OF CONFERENCE COMMENTS

Begin by entering two plus signs (++) to get to INITIAL CHOICE?. On the INITIAL CHOICE? menu, ACCESS TO CONFERENCES is choice 2, so enter a 2 in answer to the question:

INITIAL CHOICE?2

The system will respond by asking for the CONFERENCE (NAME/#)? after which it will give you the title of the conference, the number of active members, and then ask for CONFERENCE STATUS (Y/N/A/O)?. After printing out whatever status you ask for (see the previous section, "Participating in Conferences"), the system will tell you how many items are in the conference and how many new items there are. Then it will ask if you wish to receive those new items, if any. You should then accept any new items or not, as you like. After printing out any new items, the system will then ask for your CONFERENCE CHOICE?.

On the CONFERENCE CHOICE? menu, you will see that GET ITEMS is choice 1, so enter a 1 in response to that question. Below is an example of this entire interaction.

```
INITIAL CHOICE?2
CONFERENCE (NAME/#)?55
GROUP CONFERENCE: APPLICATIONS (55)
THERE ARE NOW 2 MEMBERS ACTIVE.
CONFERENCE STATUS (Y/N/A/O)?N
123 ITEMS. CC123 WRITTEN ON 1/15/77 10:30 AM

NO ITEMS WAITING.
CONFERENCE CHOICE?1
```

In response to CONFERENCE CHOICE? (1), the system will ask for the number(s) of the item(s) you wish to print out. As with messages, you may specify a single conference comment number, a list of several separated by commas, or a range of numbers by the first and last with a dash in between. So, you should enter the number(s) of the conference comment(s) you wish printed, and the system will respond by printing them out and again asking you for the numbers of any other comments you wish to print out.

```
CONFERENCE CHOICE?1
ITEMS (#/#-#)?3-6
```

(the system prints out conference comments 3, 4, 5, and 6)

```
ITEMS (#/#-#)?
```

Once again, you may answer ahead of the questions to speed up the process. The entire example above could have been done this way:

```
INITIAL CHOICE?2,55,N,(N),1,3-6
```

The (N) is included because we don't know if there will be any new items, so we don't know if the question ACCEPT NEW ITEMS (Y/N)? will be asked. The parentheses tell the system that we are answering with N only if the question is asked; otherwise the N is ignored.

SHORTCUTS FOR GETTING PRINTOUTS

There is an even simpler method for getting printouts of any text item in the EIES system. At any point during your interaction with the system, you may use the +GET command to get a printout of messages, conference comments, or notebook pages that you are privileged to access. A special system of abbreviations is used with the +GET command to allow you to access all of these kinds of text items with a single command. For example, to get a printout of message number 12345 you would enter the following:

+GET M12345

To get a printout of conference 55 comment number 14, you would use:

+GET C55C14 or +GET C55CC14

To get a printout of a notebook page (for example page 32 of notebook 118), you would use:

+GET N118P32 or +GET N118NP32

Note here that messages are identified with the letter M (for Message), followed by the number of the message; conference comments are identified with the letter C (for Conference), followed by the conference number, another C (for Comment), and the comment number; and notebook pages are identified by the letter N (for Notebook), followed by the notebook number, the letter P (for Page), and the page number.

After the desired text item has been printed out, the system will return you to wherever you were before the command was executed. For example, if you are at CONFERENCE CHOICE? and you enter +GET M12345, the system will print out message number 12345 and then return you to CONFERENCE CHOICE?.

SPECIAL ROLES ON EIES

The following are brief descriptions of the special roles certain people play on EIES and the associated responsibilities and privileges beyond basic membership.

GROUP COORDINATOR

The group coordinator can add members to or remove them from a group. He or she also has the responsibility for maintaining the description of the group in the EIES directory. The group coordinator may also be the person responsible for allocating time on EIES to individual group members. This role is similar to that of a club or executive secretary for a group, and he or she should help introduce new members to the group.

CONFERENCE MODERATOR

The conference moderator can edit or delete any item in the conference he or she moderates. The conference moderator can also direct the discussion in the conference by using certain organizational structures provided for conference comments. The degree of control exerted by the conference moderator on the discussion is established by the group.

BULLETIN EDITOR

The bulletin editor can select referees for items submitted to the bulletin and can decide if those submissions are to be accepted formally for public viewing as part of the bulletin.

There are also several EIES support roles. You may find out more about the individuals who fill these roles by consulting the EIES directory. Each of these individuals has a membership under his or her personal name as well.

OPERATIONS MANAGER (REQUEST,102)

Any requests for service should be addressed to the operations manager. These might include setting up a new conference, allocating time on EIES, adding new members, and so on.

CONSOLE OPERATOR (HELP,101)

If you need immediate help or a very quick response to a problem, and no user consultant is on-line, you may send a message to the console operator. If you are really having a problem, you may enter three question marks and a one-line message, which will appear on a special terminal at the conferencing center.

??? Am having problems. Can you help?

This feature may be used at any point in the system at any time.

USER CONSULTANTS (110-119)

If you would like to learn more about the system, or if you have a problem that doesn't need an immediate solution, you should message one of the user consultants instead of the console operator. Many of the user consultants have the background and experience with the system to help you use it very effectively for communicating with others. In addition, the user consultants

have expertise in their own individual fields, which may relate to your own interests or the purposes of your conference(s). Feel free to develop a relationship with a user consultant whom you like and to whom you relate well. Console operators are generally students who only know about the mechanics of the system, so for any but the most immediate problems, consult your friendly user consultant.

SYSTEM MONITOR (EIES,100)

The system monitor has the power to get, edit, and delete anything on the system. This is only done by special request by the author of an item (message or conference comment). For example, if you are away from your terminal and you realize you have sent a message to the wrong person, you may call the computer room, identify yourself by your access code, and ask the system monitor to delete the message. If you forget your access code, the system monitor can check it for you.

CENTER DIRECTOR (BOSS,104)

Direct any comments about unsatisfactory service or service above and beyond the call of duty to the center director.

EVALUATOR (EVA,105)

This person is not part of the EIES staff. The evaluator has the responsibility for collecting user comments and presenting a synthesis of the comments without revealing their sources. You should feel free to discuss your views about any aspect of EIES with this person. Your views will be kept in strict confidence.

ETIQUETTE AND HINTS FOR USING THIS NEW COMMUNICATIONS FORM

1. Informality

We have observed that people tend to treat messaging and conferencing somewhat informally. Minor typos and less than exquisite sentence structures are ignored, provided the meaning is clear. Since most of those using the system are casual or even hunt and peck typists, we feel that this should continue to be the norm. If you decide later on to use an item in a report or paper, it's easy to go back and edit it.

Most of the people on EIES have never met each other in person, so there is a great deal of "getting to know you" communication. This is very important, since it makes everyone feel more comfortable about communicating with others in this new way. We suggest that new groups spend some time at the beginning with introductions. In fact, a new group may even want to schedule a simultaneous on-line session where all group members may introduce themselves and explore possible areas of common interest.

2. Need for explicit responses

Since there are no non-verbal cues in computerized conferencing, such as nods, smiles, winks, and so on, it is very important to let others know explicitly whether you understand or agree or disagree with what they have said and to spell out your intentions or expectations. Lacking non-verbal cues, people who cannot hear your tone of voice may not recognize subtle humor or may misinterpret the most innocuous remark. If you need further explanation, you must send a message or enter a conference comment asking for it. It is especially useful to indicate your agreement or support for someone's comments. Otherwise, it's like talking into a tape recorder and getting no feedback at all. Metacommunication (communication about communication) is especially important in computerized conferencing. Metacommunication would include comments like "your second point really makes sense to me," "thanks for supporting my position yesterday," "I appreciate the time you took to look over my report," or "I like the direction you're going, but please clarify what you mean when you say the word 'network.'"

If you are not getting any feedback from others, perhaps it is because you are talking off the subject, or your style is too verbose or difficult to understand. If this happens, consider sending a message to a friend in your group or to the moderator, asking why people seem to be ignoring you.

If you are going to be away from EIES for a few days because of travel or because you are too busy, try to let your group know in advance so they will know not to expect any messages or responses from you.

3. Maintaining the privacy of private messages

If a private message is sent to you, it is considered a breach of confidence to copy it to another person without explicit permission from the author. Because it is very easy to copy to others the messages one receives, without this norm of asking permission to copy, one could never be sure that confidential messages would remain so.

If you send a message to someone like a conference moderator and you don't mind if it is copied into the conference or to other conference members, say so explicitly.

4. Recognizing authorship (credit where credit is due)

If you use something in an article or publication written by someone else on EIES, please treat it as you would any other intellectual property. Footnote it or otherwise give proper credit to the author. (We're not sure of the proper form for an electronic communication citation. Make up your own until the style manuals come up with a standardized form.)

5. Conference comments vs. messages

Conferences are generally meant for items that need to be reviewed or discussed later, or for items that should form part of the transcript of points raised in the discussion. Messages are for more temporary or private items. Since you may copy a message into a conference or turn a conference comment into a message, it is not too important to decide how to enter an item at first. You may always move it later if you need to. If you are unsure about whether to enter an item into a conference, you can always send it as a message to the conference moderator and let him or her decide. However, most people do not keep a copy of messages, so they may soon be "lost." Therefore, if an item is pertinent to the subject of a conference, first choice should be to enter it there. Items can also be deleted quite easily.

6. Preventing information overload

As you get more active in EIES, you may find yourself engaging in a number of simultaneous conversations with people on different subjects, as well as participating in various conferences. This aspect of computerized conferencing can be overwhelming at times, and for many, this is harder to learn how to deal with than the mechanics of the system. Because there is a need to respond explicitly to communications from other members, it is often difficult to stop or break away from a conversation if you have other things to do. Since there is a lag between the time you send a message and when someone receives it, you may be tempted to wait to get the response. This can go on for a long time! You need to develop your own style for dealing with the flow of messages in and out of your world.

The use of associations (items associated with the one you are writing) and keywords and phrases will help you and others keep track of the various threads of a discussion as it takes place. After something like one hundred conference comments have been entered, you may want to go back and list all the titles of the items (using the DISPLAY TITLES choice) to see what has been discussed. The title of an item includes the item number, author name and number, date and time written, date and time modified (if edited), and any associations and keys assigned to the item.

Sometimes the message traffic will be so intense that you will not have time to respond to everything you receive. It's easy to lose track of messages this way, so EIES has a feature that will allow you to enter reminders to yourself. Ask one of the user consultants how to use reminders to help you deal with this kind of information overload.

Different people have different systems for filing away printed copies of messages and conference comments. Some just fold or roll up the paper and put it away somewhere. Others cut the various messages and conference comments apart and paste them up or file them by person, topic, or whatever. Still others have developed color coding schemes. You will have to figure out what kind of system works best for you and your needs.

7. New sources of embarrassment and how to avoid them

Probably the most potentially embarrassing thing you can do on EIES is to forget to clear your scratchpad before sending a new message or writing a new conference comment. If you forget, you may find that a very private, confidential message ends up as the first part of a new conference comment or message. To avoid this, either use +CNM to get into a clean scratchpad, or always check to see what line you are on in your scratchpad before you begin composing. If you are not at line 1, use ** to delete the contents of your scratchpad.

You may also find that you have mistakenly entered a comment into the wrong conference. You can move it and delete it from the incorrect location. If you need help in doing this, ask a user consultant.

If you see that someone else has entered something in the wrong place, you might send him or her a private message asking if he or she meant to do that.

Since this is a written communications medium, people will probably keep copies of the messages and comments you enter. Consider the words you use when you want to make a strong statement to someone, since they are recorded for posterity.

Until you adjust yourself to the pace of computerized conferencing, be careful about responding immediately in a heated, emotional, or potentially controversial situation. One nice feature about computerized conferencing is that you can write your message, "sleep on it," and decide later whether or not to send it.

EIES TERMINOLOGY AND JARGON

There are a number of terms that are unique to computerized conferencing in general or EIES in particular. Here are some basic definitions:

EIES: Electronic Information Exchange System

MESSAGE (n): a private communication exchanged between (or among) individuals; each message is identified with a unique five-digit number, such as M12345

MESSAGE (v): to send a message (also, messaged, messaging, etc.)

CONFERENCE: a common space for mutual exchanges or discussions among members of a specific group; conference items or comments are identified by the number of the conference and the comment number (e.g., C70 CC115)

PUBLIC CONFERENCE: a conference in which any EIES member may enter or read material; public conferences are identified by four-digit numbers or names

NOTEBOOK: a personal space for private composition or mutual authorship; notebooks are identified by the three-digit number of the member to whom it belongs

PUBLIC NOTEBOOK: a notebook with a specific group of allowed writers but open to any member for reading; public notebooks are identified by four-digit numbers or names

BULLETIN: a public space accessible for reading by any EIES member; the content is the responsibility of a human editor

MEMBER: an individual who has been invited to use EIES; a member may belong to groups, may participate in conferences, may have his or her own notebook and/or temporary conference, and may send messages

GROUP: a set of members with a common purpose; a group may have its own conference and its own bulletin; members may belong to one or more groups; each group is identified by a two-digit number which is also assigned to its conference

MENU: a set of choices available at a particular point in the system

ITEM: a general word referring to any item of text in EIES, such as a notebook page, a conference comment, or a private message

GET ITEMS: message/conference/notebook/bulletin choice (1) on the menu; this instructs the system to print out the entire item or items specified

DISPLAY TITLES: message/conference/notebook/bulletin choice (2) on the menu; this instructs the system to print out only the title or titles of the item or items specified

TITLE: identifying information at the beginning of an item, including the message or conference comment number, author, date and time entered, date and time modified (if modified), and any associations or keywords specified

SCRATCHPAD: a space for composing and editing text items

STORAGE AREA: a place for storing already composed text (or fragments of text) before sending it or entering it into a conference or notebook

USER CONSULTANTS: a group of people (#110-119) who are available to help you learn the mechanics and the art of using EIES

EXPLANATIONS: an on-line file of instructions for how to use various parts of the system; access to the explanations file is available through INITIAL CHOICE? (6)

CC: computer conferencing; computerized conferencing; conference comment

INFORMATION OVERLOAD: receiving more information than one can handle at once; one of the hazards of computerized conferencing

FTF: face-to-face, as opposed to communicating via computer

ADVANCED FEATURES: a set of features and procedures for experienced users of the system; message a user consultant to find out more

EIES CHECKLIST

If the terminal doesn't work, or if you have problems getting connected to EIES, check to see:

- Is the power on?
- Is the telephone receiver placed snugly in the cups on the terminal or acoustic coupler?
- Is the telephone cord from the receiver placed correctly (one cup should say "c" or "cord")?
- Is the terminal on a solid desk or table so it won't vibrate? If the acoustic coupler is separate from the terminal, is it cushioned from vibrations?
- If you are using an extension phone, do others know not to pick up the receiver on other phones with the same number, or does your switchboard operator know not to check your line every so often?
- Are the switches on your terminal set correctly? For example:
 - Miniterm: mode half, speed 30, mode std, parity off
 - TI-733: half, 30, even
 - Datapoint 3300: half, 300, remote

If everything listed above is satisfactory and you are still having problems, try pressing the "clear" key if you have one on your terminal to release a possible "break transmission" condition.

If that doesn't work and there is no one around to help, call the conferencing center at (201) 645-5503. If TELENET is not behaving as it should, call your nearest TELENET customer service number: 202-347-2424 (main office).

To start:

1. Dial TELENET and listen for the high-pitched tone.
2. Put the telephone receiver in the coupler or press the data key if you are using a data phone.
3. Enter (CR);(CR) (CR) stands for carriage return
4. When TELENET asks for the terminal code (TERMINAL=), enter the appropriate code, or enter (CR) if you have a standard printing terminal operating at 30 characters per second.
5. When TELENET types @, enter C 201 25CC.
6. When EIES types
WELCOME
NAME OR #?
type in your name or membership number.
7. When EIES types
CODE?XXXXXXXXXX
type in your code over the dark area.

To finish:

1. Enter two minus signs (--).
2. The system will let you know if there are any communications waiting for you and ask if you want to accept them. After this, if you choose to accept any communications, it will ask SIGNOFF (Y/N)?, in case you

have changed your mind after receiving any new messages.

3. If there were no messages, or if you answer yes to the signoff question, the system will respond with the date and time you signed off, as well as how much time you used in this session, how much cumulative time you have used, and how much time is allocated to you.
4. Then TELENET will type 201 25CC DISCONNECTED on one line and @ on another, and you may hang up or enter the system again.

ADVANCED FEATURES

EIES has a number of advanced features that make it possible for you to use the system with great flexibility and even to design your own commands. In a sense, a communications system like this is a living, evolving thing, and it should adapt and mature in response to the needs of its users--the essence of co-evolution. Because of this, the advanced features are always subject to changes and additions, so there is no detailed instruction booklet to help you learn about them. However, there is a one-sheet guide to the advanced features, which follows this brief description.

You should learn about the advanced features only when you feel a need for a specific feature and you are ready to learn more about EIES. The one-sheet guide will give you some information, and those with prior computer experience may find the guide and a little experimentation sufficient. User consultants (#110-119) are also available to help you, and there is further information in the EXPLANATIONS file, which you may access through INITIAL CHOICE? (6).

The following are brief descriptions of the advanced features included on the one-sheet guide.

---COMMANDS (CHINESE-COMMAND MENU AND SAMPLE COMMANDS)

Instead of using the menus to interact with the system, you may rely on commands. With commands you can do everything included in the menus and more. All commands that are directly executed begin with a plus (+). You may use the Chinese Command Menu to create your own commands (pick one from the verb column and one from the object column). Normally users learn the commands for those things they do frequently, such as:

+CNM (Compose New Message)
+GC # (Get Conference #XX)

ADDRESSING OR SPECIFYING TEXT ITEMS

Although we humans see the text items in EIES as collections of messages, conference comments, notebook pages, and so on, the computer treats these as one large file of compatible text items. By specifying a text item by its type (M for message, C for conference, etc.) and by its number, it is possible to include in a command any text item you are privileged to read or modify. For example:

+G M12345 (Get Message 12345)
+D C55C123 (Display Conference 55 Comment 123)

REMINDERS (RM)

Each user has a private memo pad for leaving one-line reminders for later action. When there is a lot of message traffic, you may want to use the reminders to help you remember to respond to an item at a later time. To enter a reminder, use either the +CRM (Compose Reminder) or the +ARM (Add Reminder) command and one line of text. The system will assign a date, time, and number to each of your reminders.

SCRATCHPAD (SP) & STORAGE AREAS (SA)

Each user has five storage areas which are identical to the scratchpad.

Any time you are composing text in your scratchpad and you want to store it for further composing or editing later on, you may put the text into one of your storage areas. You may do almost any possible combination of inserting, copying, merging, and/or exchanging between your scratchpad and storage areas.

DOCUMENT EDIT AND CONTROL COMMANDS

These indirect edit and control commands may be included within text that you compose in your scratchpad. They are not executed until the message or conference comment is received. They are particularly useful for "dressing up" a text item to make it look good for formal purposes. With these commands, it is possible to include indirectly other text items within the one you are working with, as well as to design special tables and questionnaire forms. The .TABS command is particularly useful for writing something in tabular form and .TEXT will automatically indent and line up paragraphs. Note that these indirect commands all begin with a period (.), while all the direct commands begin with a plus (+).

ADAPTIVE FEATURES

The adaptive text features allow you to write text which will ask questions of the reader, and, based on the reader's responses, which will give the reader additional text material. This feature can be used to write questionnaires or interviewing processes that are quite sensitive to the respondent's answers.

STRING VARIABLES (SV) AND NUMERIC VARIABLES (NV)

These variables allow you to create your own personal commands or procedures to use on EIES. They have no effect on the rest of the system commands, and other users may create their own similar commands. With string and numeric variables, you may literally tailor your own user interface.

CHINESE COMMAND MENU

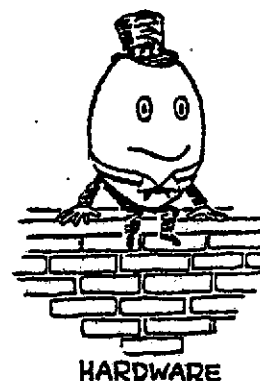
One may pick a verb abbreviation from column one and an object abbreviation from column two to attempt to form a valid command; no harm is done if not valid.

VERBS	OBJECTS
A Add	A Associations
C Compose/Send	B Bulletin
CA Copy & Add	D Directory
CY Copy	C Conference
O Display	CC Conference Comment
E Explain	F Forms
EX Exchange	G Group
F Find/Search	K Keys
G Get	M Message
L Let	MG Member/Group
M Modify/Edit	N Notebook
O Organize	NC New Comment
P Print	NM New Message
R Review	NP Notebook Page
S Set/Seed	NV Numeric Variable
SN Set Negative	RM Reminder
TA Transfer & Add	S Sequence
TR Transfer	SA Storage Area
V Vote	SP Scratchpad
	SV String Variable
	SS System Status
	T Time and Date
	V Votes

EIES

Advanced Features

Computerized Conferencing and
Communication Center
New Jersey Institute of Technology
323 High Street
Newark, N.J. 07102
201-645-8503



REMINDERS (RM)

- +GRM reminder Compose or Add to end of list
- +ARM reminder Display or Get all reminders
- +GRM/-GRM Only ones specified
- +GRM #/+GRM # Find reminder with "word" in it
- +RM/word/ Modify (delete -) reminder # and renumber others
- +MRM -# Replace reminder #
- +MRM # reminder Place a warning date on this reminder
- +ALARM RM # date

SAMPLE COMMANDS

- +GC name/# Get Conference
- +RMG name/# Review Member/Group
- +G item Get any text item
- +O item Display item title
- +GM # Get Message #
- +GM # Display Message #
- +GMG #/name Get Member/Group #
- +GMG #/name Display Member/Group #
- +MM # Modify Message #
- +MM -# Delete Message #

ADDRESSING OR SPECIFYING TEXT ITEMS

ADDRESSING OR SPECIFYING TEXT ITEMS

Building blocks:

M#	Message #
C#	Conference #
CC#	Conference Comment #
N#	Notebook #
NP#	Notebook Page # (or P#)
SA#	Storage Area #
L#	Lines #
H	Item Heading Only
T	Item Text only

Alternatives:

NP#.#	Equivalent NP#L#
#.#-#.#	ranges allowed for text items or lines
#A	Items associated with item #
##F	Items following in sequence from #

Any meaningful combination allowed:

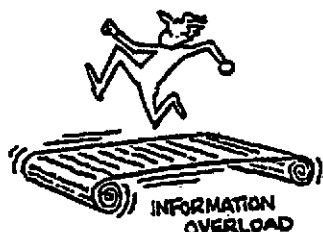
M1234L21-30
C72CCS8L1-30
M21455T

Sample Commands:

- +G item Get item
- +O item Display item
- +CY item<item Replace item
- +CY item<<item Insert or add
- +EX item><item Exchange items

Other Text Items:

MA# Member # Address
MG# Member Group # Description
GM# Group # Membership List



SCRATCHPAD (SP) & STORAGE AREAS (SA)

All text composition is done in the scratchpad; each user has one, as well as five Storage Areas to save different items of text undergoing composition. These are identified as:

SA1 SA2 SA3 SA4 SA5
While in scratchpad text may be moved back and forth as in the following examples:

Exchange SP with SA:

- &><SA# Exchange the contents of SP with SA #.
- &<>SA# Same as above.
- &SA#<>SA# Exchange Storage Areas

Copy into and Replace (<) SP from SA:

- &<SA# Copy from SA # into SP beginning at the line the command is entered.
- &<SA#L#-# Copy only selected lines from SA #.

Copy in and Insert (<<) into SP from SA:

- &<<SA#L# Insert lines # from SA # without replacing anything in SP

Copy Out of SP and replace (>) in SA:

- &>SA# Copy out SP into SA # beginning at line 1
- &#>SA# Copy out lines # in SP into SA #
- &>SA#L# Begin at Line # in SA # for copying.

Copy Out and Insert (>>) into SA:

- &>>SA# Add SP to end of SA #
- &>>SA#L# Insert beginning at line #
- &>>>SA# Add indicated lines to end of SA #

General Forms of Above:

- Copy out Replace (>) and Insert (>>)
- &>item Replace item with SP
- &#>item Replace item with some of SP
- &>>item Add SP to end of item
- &#>>item Add some of SP to end of item
- &>>>itemL# Insert SP at L# in item.

- Copy in Replace (<) and Insert (<<)
- &<item Replace from this point
- &<<item Insert from this point

Example Item Types:

SA# Storage Area #
SA#L# Only certain lines
M# Message #
C#CC# A Conference Comment
N#NP# A Notebook Page
NP# Your Notebook
SP# Scratchpad Lines #
C#CC#T Text only
C#CC#H Heading only

DOCUMENT EDIT AND CONTROL COMMANDS

Used in text at beginning of line. Applies when final item is printed (at output time). May be seen in SP after editing (use ::).

Indirect Edit Commands:

- . BLANK #
- . BLOCK # - #
- . NOBLOCK
- . CENTER text
- . EXACT
- . NOEXACT
- . FILL #
- . NOFILL
- . INDENT #
- . NOINDENT
- . LEFT #
- . LEFT
- . OVER # text
- . PAGE
- . RESET
- . RIGHT #
- . RIGHT
- . SPACE #
- . TABS # \$, NL, PR, NC
- . NOTABS

- . TEXT
- . NOTEXT
- . (text) (#)

+IMAGE

- . RIGHT # : . LEFT #

Indirect Control Commands:

- . CHAIN item

- . DELIVER # / CH / N #

- . DISPLAY item, item
- . EXEC command

- . EXDIS command
- . FORM #
- . NOFORM
- . GET item, item

- . END
- . INCLUDE text

- . QUESTION text

- . INHIBIT
- . NOINHIBIT

Print # blank lines here.
Block text following from column # to # until NOBLOCK encountered.
Center 'text' within margins.
Prints text as literally entered.
Ignore over indirect edits.
Replace symbol (\$) in text following with blanks.
Indent # space for each \$ (any symbol) encountered after column one (blank) in each line following until NOINDENT.
Set left margin at column #.
Set to default of column 1.
Begin 'text' over # spaces.
Generate a form feed character.
Reset all margins and spacing to default settings.
Set right margin to column #.
Set right margin to column 72.
Space # Lines between text

Tab output following based upon occurrence of \$ (any symbol) and space, Left, Right or Center justify within tabs.
Format paragraphs by filling unused blank areas on right of lines.
Indirect use of direct edit.

Convert what is in scratchpad to explicit copy of what edits produce (remove edits).
Semicolon used to separate commands on same line.

Will start print of another text item and not return to this one.
Take all answers supplied to FORM, QUESTION and ACCEPT (with variables) and send to members, groups, a notebook or a conference.
Printout titles only of items.
Execution allowed of most EIES commands when the text is utilized.

Executes and displays command.
Same as FILL but reader asked to supply answers in place of \$ symbols.
Print out items indicated here and return to next line of this item.
Return from a GET item if not end of text.
Deliver 'text' with reply, do not print with text of FORM, QUESTION, etc.
Print 'text' and accept and store variable length answer.

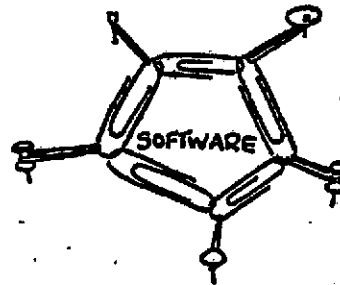
Inhibit execution of above commands while in Scratchpad.

ADAPTIVE TEXT FEATURES

(Abbreviations also shown)

- . ACCEPT:
- . A:
- . A: X#
- . A: X#
- . MATCH: S1, S2, ...
- . M: S1, S2, ...
- . TYPE: text
- . T: text
- . T: X#
- . TY: text
- . TN: text
- . JUMP: line/item
- . J: line/item
- . JY: line/item
- . JN: line/item
- . REMARK: text
- . R: text
- . USE lines/item
- . U: lines/item
- . NOPLOT
- . PILOT

Allow reader to answer a question asked just before.
Accept answer as a string variable.
Accept answer as a numeric variable.
Check if what reader put in matches any of S1 of S2 or ...
Type out 'text' but substitute whenever a string or numeric variable appears.
Type contents of string variable X.
Type 'text' if MATCH was Yes.
Type 'text' if MATCH was No.
Jump to line or item.
Unconditional jump.
Jump if MATCH was Yes.
Jump if MATCH was No.
'text' not printed out, but stored for benefit of author.
Use indicated lines or item and return to next line.
Inhibit execution of above commands while in scratchpad.



STRING VARIABLES (SV)

(letters A to Z)

+SSV A=string

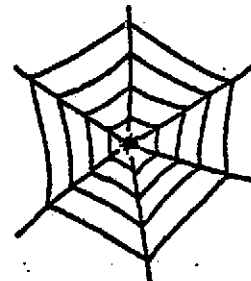
+GSV
+GSV A
+GSV
+FSV / string/
+A#

+MSV A/old/new/

+MSV -A
+SSV A=S1,+B#S2
+ASV A=string

Set String Variable A equal to 'string'
Get all String Variables
Get only SV A
Display letters used
Find SV with 'string' in it
Use SV A as input to EIES for an answer

Replace 'old' with 'new' in string variable A
Delete String variable A
Incorporating another string
Append this string on end of current A string
(128 characters allowed)



ORGANIZATION

NUMERIC VARIABLES (NV)

(letters A to Z)

Everything for String Variables applies to numeric variables substituting NV for SV in above and:

+SNV A=B, B, B

+A#
+DNV

+UNV A=B+C
+UNV A(B)=A(B)+1

Set A equal to a series of numbers separated by commas
Use NV A as input
Display letters used and how many numbers in each separated by commas
Math operation on NV
For single element (Let 1 be added to 3rd element)



EVALUATION

SELECTED REFERENCES

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Hiltz, Starr Roxanne. "Computer Conferencing: Assessing the Social Impact of a New Communication Medium." TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE, X, No. 4 (1977).

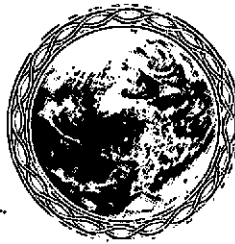
Hiltz, Starr Roxanne, and Turoff, Murray. THE NETWORK NATION: HUMAN COMMUNICATION VIA COMPUTERS. Reading, Mass.: Addison Wesley Advanced Books, 1978.

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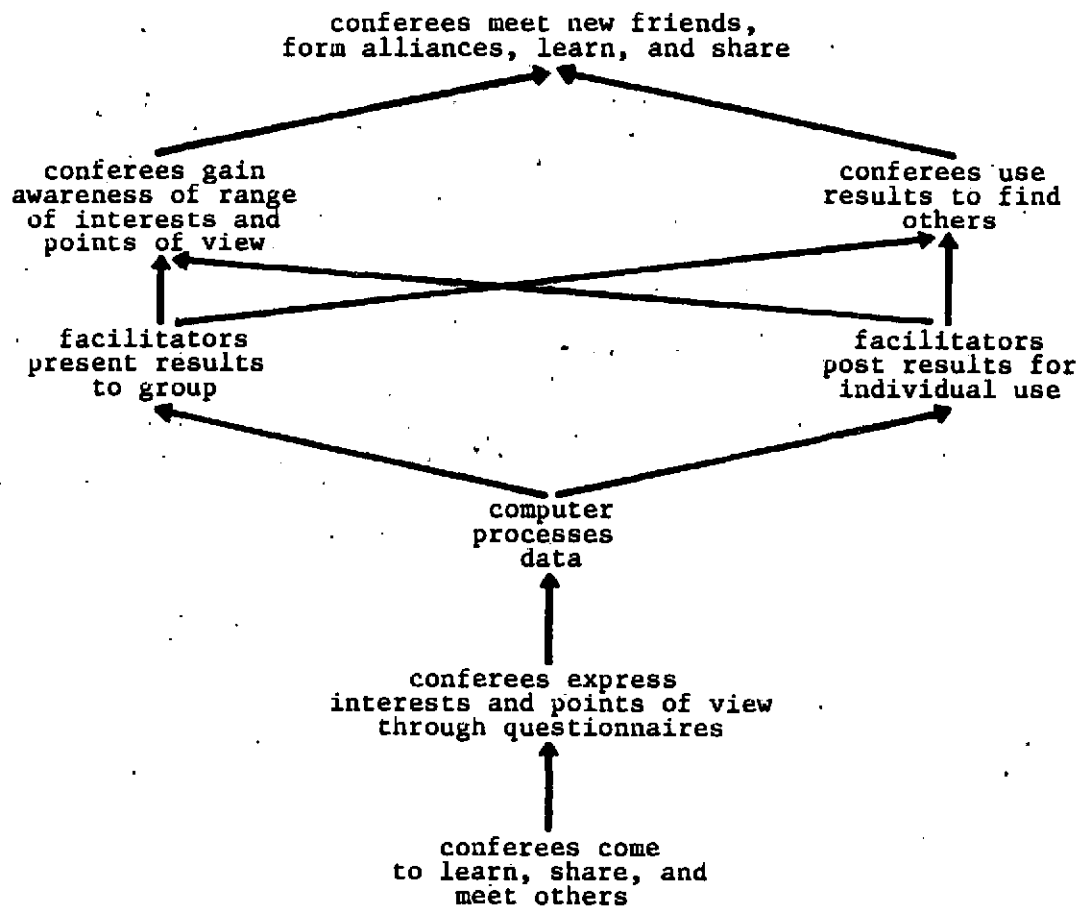
Turoff, Murray, and Hiltz, Starr Roxanne. "Computerized Conferencing: Meeting Through Your Computer," IEEE SPECTRUM MAGAZINE, May, 1977.

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CONFERENCE FACILITATION :
Computer-Aided Sharing



June, 1977

People who attend conferences, meetings, and workshops come to learn or to express themselves about a particular topic or issue. But each person brings to the gathering an individual, private view or mental model of the topic or issue. During the course of the session, an individual's mental model of the topic may change or stay the same. If individuals' models of the topic can be made explicit and shared in a simple, easily understood form, then the participants can find out more about how others think and how many people attending hold various points of view. This can promote greater understanding and empathy among participants. It can also lead to discussions of differences, dialogues, and the formation of coalitions of people with similar views, if desired.

Furthermore, if participants are able to find others in attendance with similar areas of interest, they can share common concerns and experiences with each other at the conference and even form alliances for action and support afterwards. Since people also attend conferences in order to meet and talk with other people, knowing which other participants share one's own interests can greatly facilitate sharing.

This paper describes some techniques for computer-aided sharing of participants' mental models and interest areas. These methods were used at the second Oregon Information and Referral Idea Fair and Workshops, held May 17-18, 1977 in Salem, Oregon. The Fair was attended primarily by information and referral people in human and social services agencies and programs. To illustrate these methods of conference facilitation, examples of information and referral models and keyword interest areas are included.

* MODELS *

Each of us uses models constantly. Every person in his private life and in his business life instinctively uses models for decision making. The mental image of the world around you which you carry in your head is a model. One does not have a city or a government of a country in his head. He has only selected concepts and relationships which he uses to represent the real system. A mental image is a model. All of our decisions are taken on the basis of models. All of our laws are passed on the basis of models. The question is not to use or ignore models. The question is only a choice among alternative models.

--Jay W. Forrester

We are what we think.
All that we are arises with our thoughts.
With our thoughts we make the world.

--the Buddha

The people who came to the second Oregon Information and Referral Idea Fair and Workshops work for many different kinds of organizations, from public welfare to cooperative food stores to community action agencies to legal aid. Since their experiences with (and models of) information and referral (I&R) varied so much, and since the Idea Fair was a conference devoted to new ideas and approaches, this was an excellent opportunity to use graphic representations of participants' models of I&R and a keyword interest exchange to bring everyone together. In building the models of I&R, we deliberately included a wide range of concepts, knowing that people would agree with some of them and not others. We did this to show the similarities and differences among various points of view, and we wanted to include everyone's ideas as much as possible. The process of building and sharing participants' mental models of I&R is described here, along with examples of the most common models. The interest exchange is described in the section on networking following the examples of the models.

Basic concepts of information and referral

We began by meeting with Jim Long, one of the organizers of the Oregon I&R Idea Fair and Workshops, who worked with us during this entire project. The three of us wrote an initial interview questionnaire which included such open-ended questions as:

What are the first few things that come to mind when you think of information and referral?

Why do communities and/or individuals need I&R?

What information needs do communities have?

How do or can I&R services benefit the overall community?

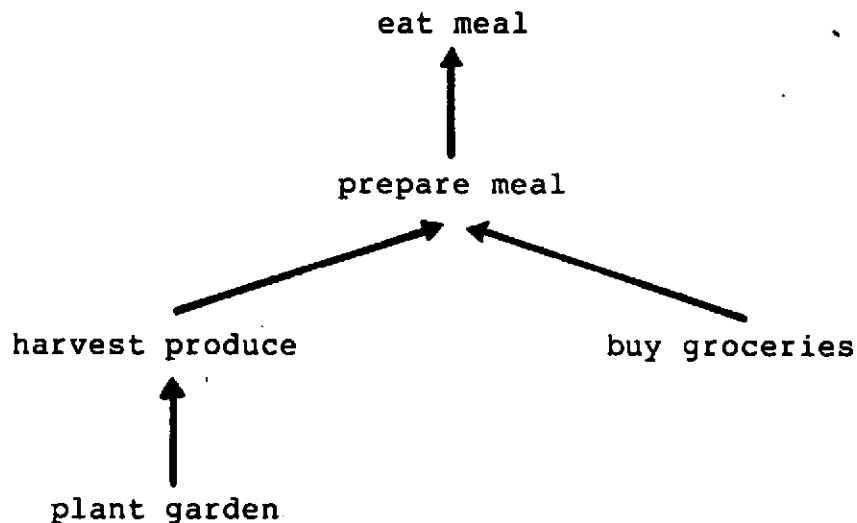
Jim used these questions to interview about a dozen people who had the variety of points of view about I&R that we expected to be represented at the I&R Fair.

After the interviews, the three of us met to organize the answers into groups of highly similar statements, according to our subjective judgements and understanding of I&R. This task produced a set of concepts about I&R as viewed by the people in our pilot sample. We then developed short labels only a few words long for each of the concepts--always using words which would be understood by the greatest number of participants at the Fair. This set of concepts was used in two ways: (1) as the basis for a list of elements of I&R that were used to construct models of I&R, and (2) as the basis for a list of keyword interest areas.

Developing the models

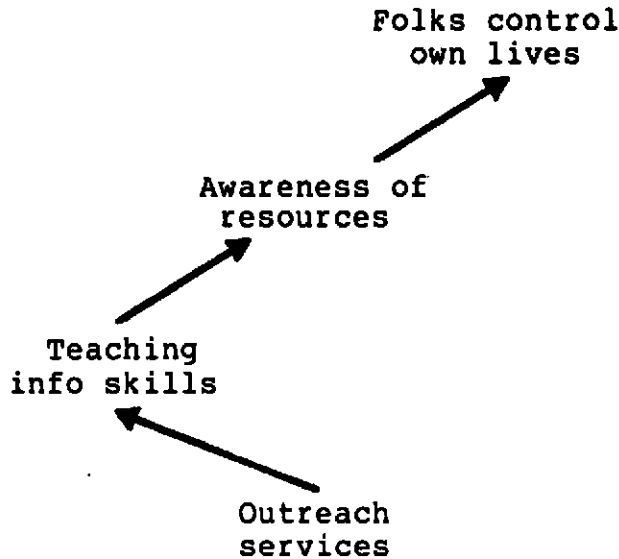
To construct models of I&R from the concepts/elements developed in the

first phase of our work, we attempted to organize the elements into a directed graph (or digraph for short) of aspects of information and referral. A digraph consists of elements and arrows among them that represent their relationships to each other. For example, suppose you were working with the following elements: plant garden, harvest produce, buy groceries, prepare meal, eat meal. If you were to use a relationship like "leads to" or "results in," these elements could be arranged in a simple digraph like this:



As it turned out, there were actually so many elements of information and referral that creating a complete model of all the relationships among all the elements was too demanding and confusing a task. So, we decided to develop several smaller models, each of which would highlight certain aspects of I&R and the interrelationships among the elements in that more limited context. One model contained elements of existing I&R services, the second some possibilities for expanding I&R services, and the third model sketched out some suggestions for improving the human and social services delivery system.

For example, included in our set of possibilities for expanding I&R were the following elements: (1) outreach--going into the community, rather than waiting for clients (called outreach services), (2) teaching people how to access information for themselves (called teaching info skills), (3) increased awareness of information resources (called awareness of resources), and (4) helping folks control their own lives (called folks control own lives). After a little experimentation, we found that these four concepts or elements could be organized into a digraph in this way:



The arrows in this partial model of I&R future possibilities can be read to mean "leads to." Outreach services lead to teaching information skills, which leads to awareness of resources, which in turn leads to folks controlling their own lives. In this way, we organized the thirty-one elements into the three separate models of information and referral. In the process we had to throw out a few elements that we could not fit into the framework, and we also had to clarify, modify, and rename other elements in order to make the picture more clear.

Refining the models

These digraphs represent temporary, subjective estimates of what certain people thought about certain aspects of I&R at a certain time--a snapshot at best. Since we were not in any position to verify the subjective validity of these models, we conducted a test session of the process we would use at the I&R Fair. We took our computer terminal and pilot versions of the final questionnaires to a gathering of local I&R people. We asked them to fill out the questionnaires, and we entered the results into the computer on the spot. During this pilot run, we got important feedback from these people about the questionnaires themselves and about the models built from them. We used the suggestions and criticisms to modify and extend our three master models of I&R.

Writing the models questionnaire

The models questionnaire contained three primary questions corresponding to the three models. Each of these primary questions described one aspect of I&R--existing services, future possibilities, or suggestions for improvements--and then listed a variety of elements/concepts that relate to that area. We asked people to check those concepts that they agreed with or that they thought were important. In this way, each person was asked to indicate

which elements in the master models of I&R were included in his or her personal mental model. The models questionnaire also included several other questions of particular interest to some of us on the design team. These questions were not involved in the modeling process.

Facilitating the I&R Idea Fair

The final questionnaires were included in the participants' registration packets at the I&R Idea Fair. We took our computer terminal to the Fair, asked participants to fill out the questionnaires (which are included in the next sections), and entered their responses into the computer during the day. Then we printed out graphic representations (digraphs) of the most frequent points of view and a master list of participants indexed by name as well as by interest areas. Examples of the lists are included in the section on networking.

That evening, using an overhead projector, we showed the four most frequent variations of the three basic models to a group of about seventy-five participants. We talked about the differences in the four digraphs of each model, and people asked questions and made comments. We also showed some of the lists of people in several of the keyword interest areas. The response was quite positive.

After the presentation, we talked to a number of people who were interested in getting their own copies of the digraphs and interests lists. One person wanted a copy of a particular digraph to hang on her wall because she said it really expressed her point of view! We posted all the digraphs and some of the lists so that participants could look at them at their leisure the next day. Following the Idea Fair, packets of these materials were sent to all participants who requested them.

It took us about seven hours to do all the work at the Fair, including data entry, editing, file processing, analysis, and printing of the results. We used about \$80 of computer time, at Oregon Museum of Science and Industry not-for-profit rates.

 * COMPUTER-AIDED SHARING: Graphing, Mapping, and Sharing Participants' Basic *
 * Models of Information and Referral *
 *

OREGON INFORMATION & REFERRAL WORKSHOP AND IDEA FAIR, May 17-18, 1977

At the Display of Oregon Information and Referral Systems at 7:00 p.m. on Tuesday, May 17th, there will be a demonstration of some techniques for sharing people's ideas or mental models of information and referral. We would appreciate your answers to a few questions about I & R. Your confidential answers will be a part of the demonstration. Come to the session Tuesday evening and see what you and others think about some of the aspects of I & R!

1. People don't always know where to go for help or information in solving personal problems. Which of the following elements do you think are important in existing I & R services? Check as many as you like.

- ☐ help in crisis situations--divorce, abuse, family disruption, etc.
- ☐ emergency aid--food vouchers, fuel vouchers, temporary shelter, etc.
- ☐ referrals to human services agencies and other helpers
- ☐ maintaining information about the client's needs and referrals made
- ☐ follow-through on referrals to help the client
- ☐ keeping information about available services up to date
- ☐ information services--answering questions
- ☐ making appointments for clients
- ☐ escorting or transporting clients to services
- ☐ other (please describe briefly): _____

2. If people knew where to get help or information when they needed it, they would have greater control over their own lives. Some people concerned with I & R think existing services should be expanded beyond solving clients' individual problems. Which of the following possibilities for expanding I & R services do you think should be pursued? Check as many as you like.

- ☐ more publicity about the availability of I & R services
- ☐ outreach--taking an active role by going into the community, rather than waiting for clients
- ☐ working with social networks so people can help themselves and each other
- ☐ teaching people the skills they need to find their own information
- ☐ social action advocacy
- ☐ legal advocacy
- ☐ giving clients information about their rights and how to make the system work for them
- ☐ other (please describe briefly): _____

3. Since there are many different organizations and agencies doing I & R, there are inevitable gaps, overlaps, and duplications of effort. Which of the following suggestions for improvements do you think would be effective in making the human and social services delivery system work better? Check as many as you like.

☐ agencies sharing their files of service information with each other
☐ agencies sharing their files of client information with each other
☐ keeping information about clients in a standardized format
☐ planning and decision making using data about clients and services
☐ joint case planning involving several agencies with follow-up to see that the client got all the necessary services
☐ multi-service centers
☐ a toll-free state-wide I & R telephone number
☐ widespread access to available community information (through resource directories, hotlines, local offices, schools, libraries, special section in the telephone book, etc.)
☐ one central clearinghouse of information
☐ a state-wide network of I & R agencies
☐ 24-hour I & R service
☐ other (please describe briefly): _____

4. Which of the following best describes the kind of agency or organization for which you do I & R? Please check only one, even if several apply. Pick the major one.

☐ federal
☐ state
☐ county
☐ city/town
☐ volunteer/non-profit
☐ church
☐ educational
☐ charitable
☐ other (please describe briefly): _____

5. Some people in Oregon are interested in developing a special section of the telephone book that would list public and human services--the "green pages." Would you like to see that happen?

☐ yes ☐ no ☐ don't know

Thank you very much for your answers. The demonstration is being presented Tuesday evening by Peter & Trudy Johnson-Lenz, Lake Oswego, Oregon. The Display of Oregon Information and Referral Systems was organized by Jim Long, Washington County Community Action Organization.

Examples of models

On the following pages there are four different digraphs of each of the three models of I&R, making twelve digraphs in all. The first four represent the most common viewpoints about important elements of existing I&R services, according to conference participants. Look at the differences among the first four digraphs. For example, notice that pattern 1 includes "make appts. for clients" and "escort services," while pattern 2 does not. Of the 104 people who filled out the models questionnaire, thirteen percent answered with pattern 1, seven percent with pattern 2, five percent with pattern 3, and four percent with pattern 4.

The second set of digraphs represents the most common views of future possibilities of I&R, and the third set shows different models of suggestions for improving the social services delivery system. There are also very interesting differences among the digraphs in each of these sets.

```

#####
##-----C O M M U N I T Y      I N F O R M A T I O N      S Y S T E M -----##
##-----SECTION 3:  GRAPHING AND MAPPING COMMUNITY POINTS OF VIEW -----##
##-----DEVELOPED BY PETER & TRUDY JOHNSON-LENZ -----##
##-----
##--- (C) 1976, BY OMSI, THE OREGON MUSEUM OF SCIENCE AND INDUSTRY ---##
##- 4015 SW CANYON RD., PORTLAND, OREGON 97221, ALL RIGHTS RESERVED -##
##-----
#####

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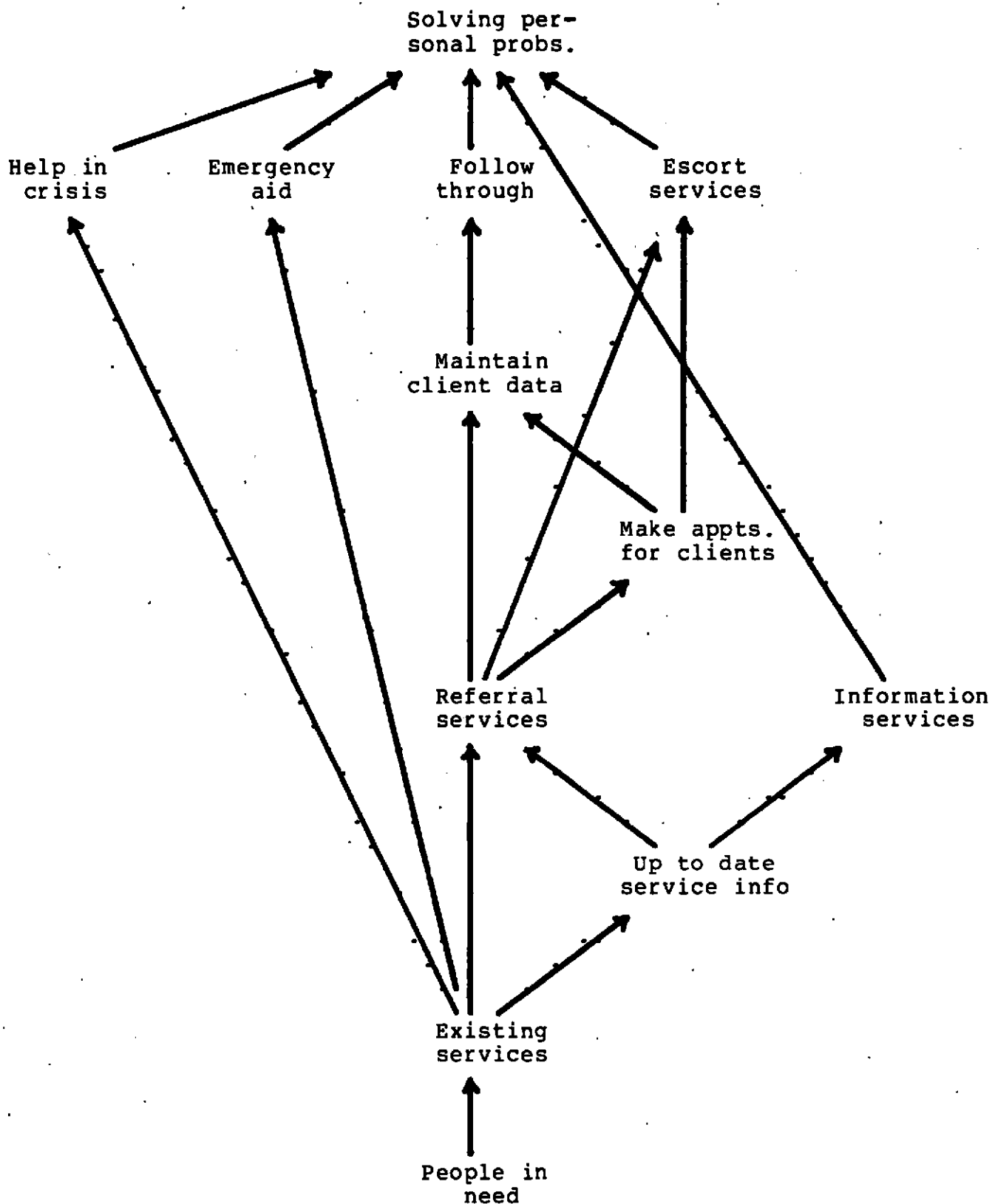
OREGON I&R IDEA FAIR AND WORKSHOPS, MAY 17-18, 1977

THE FOLLOWING VARIABLES ARE AVAILABLE IN THE I&R MODEL FILE:

HELP IN CRISIS	EMERGENCY AID
REFERRAL SERVICES	MAINTAIN CLIENT DATA
FOLLOW THROUGH	UP TO DATE SERVICE INFO
INFORMATION SERVICES	MAKE APPTS FOR CLIENTS
ESCORT SERVICES	OTHER EXISTING SERVICES
MORE PUBLICITY	OUTREACH SERVICES
SOCIAL NETWORKS	TEACHING INFO SKILLS
SOCIAL ACT. ADVOCACY	LEGAL ADVOCACY
INFORM FOLKS OF RIGHTS	OTHER POSSIBILITIES
SHARING SERVICES INFO	SHARING CLIENT INFO
UNIFORM CLIENT DATA	PLANNING USING DATA
JOINT CASE PLANNING	MULTI-SERVICE CENTERS
STATE-WIDE TOLL FREE #	WIDESPREAD INFO ACCESS
CLEARINGHOUSE	STATE-WIDE NETWORK
24-HOUR I&R	OTHER IMPROVEMENTS
KIND OF AGENCY	GREEN PAGES

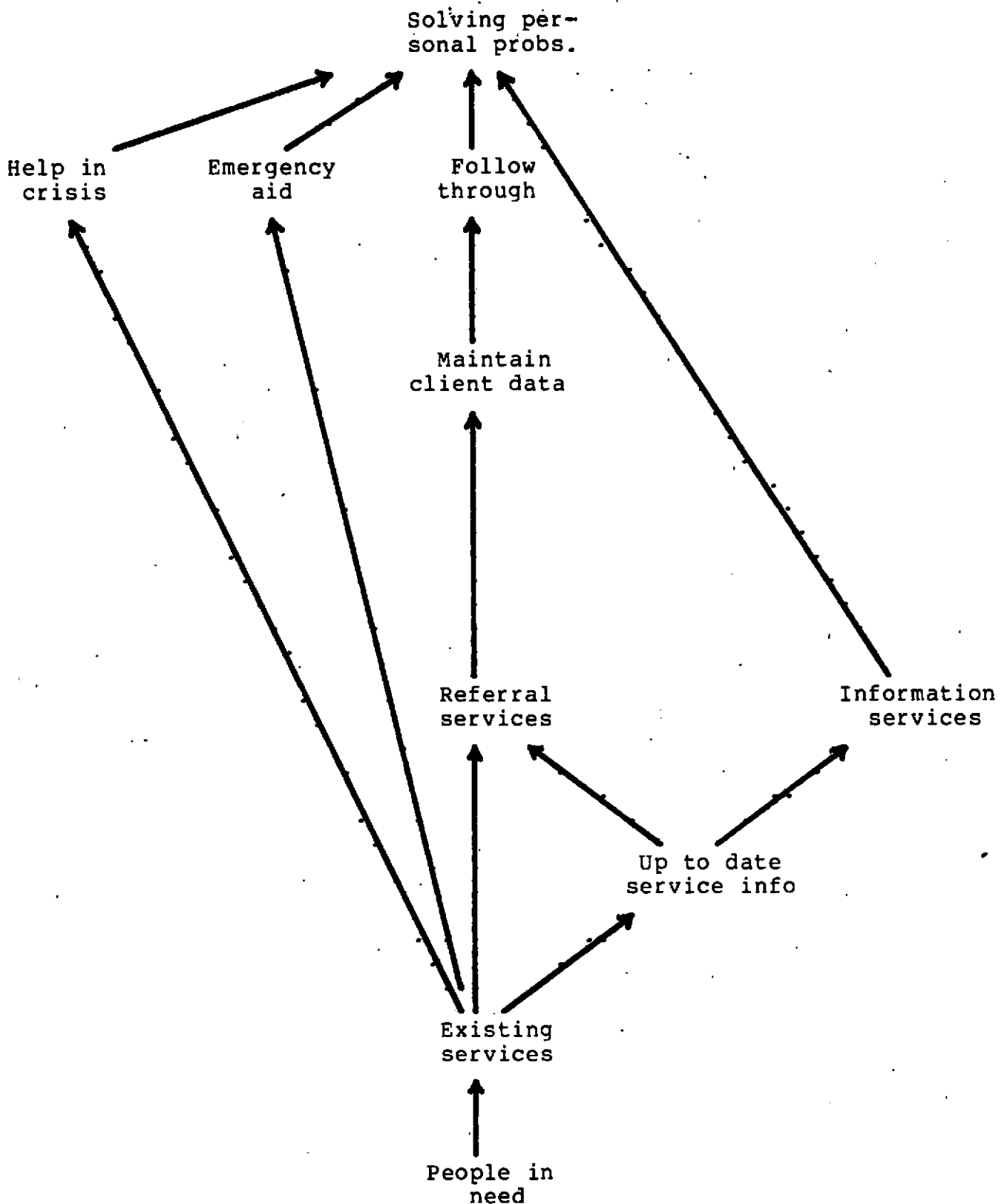
MODEL 1: Important elements of existing I&R services

Digraph of pattern 1, with 14 members (13%)



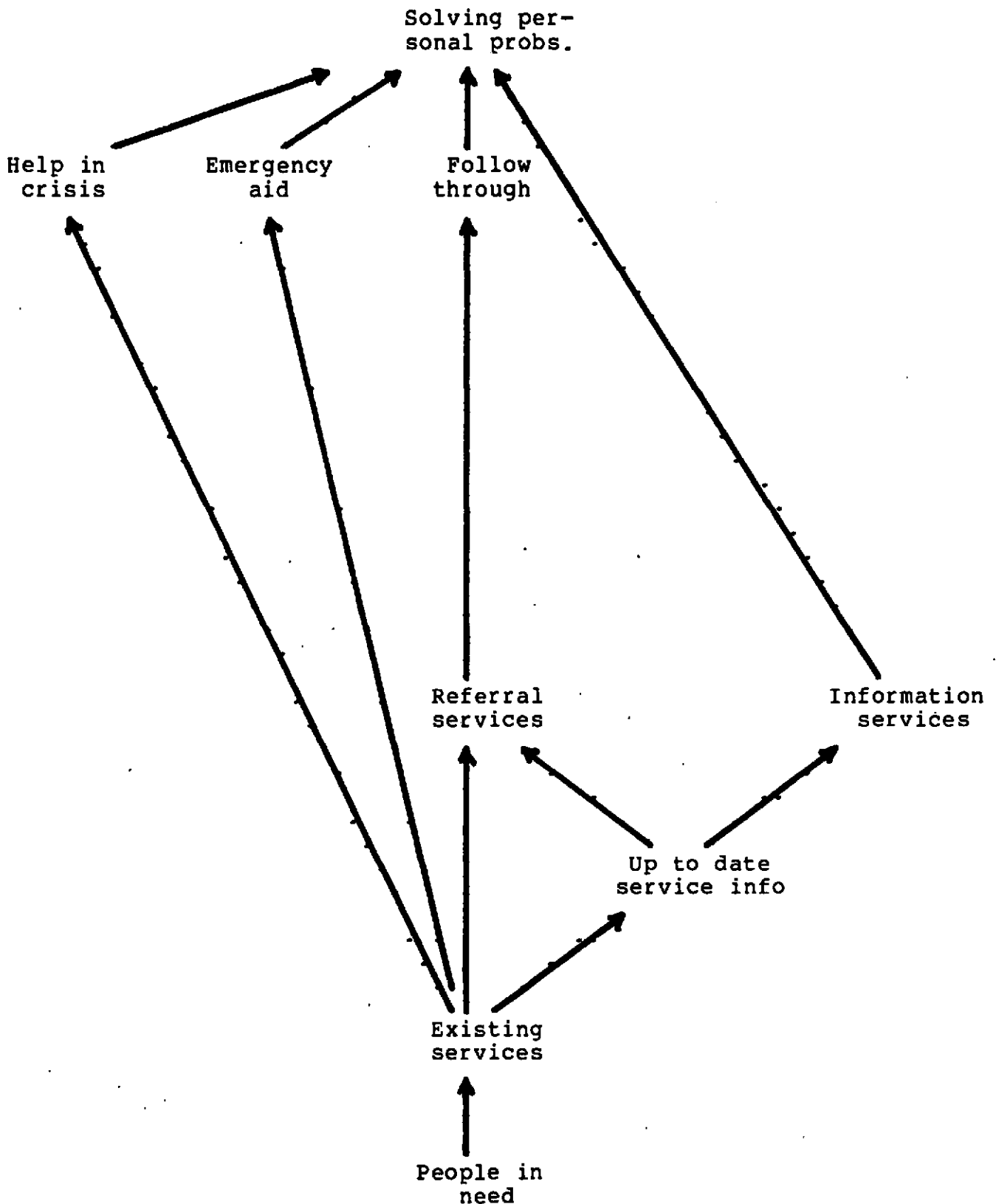
MODEL 1: Important elements of existing I&R services

Digraph of pattern 2, with 7 members (7%)



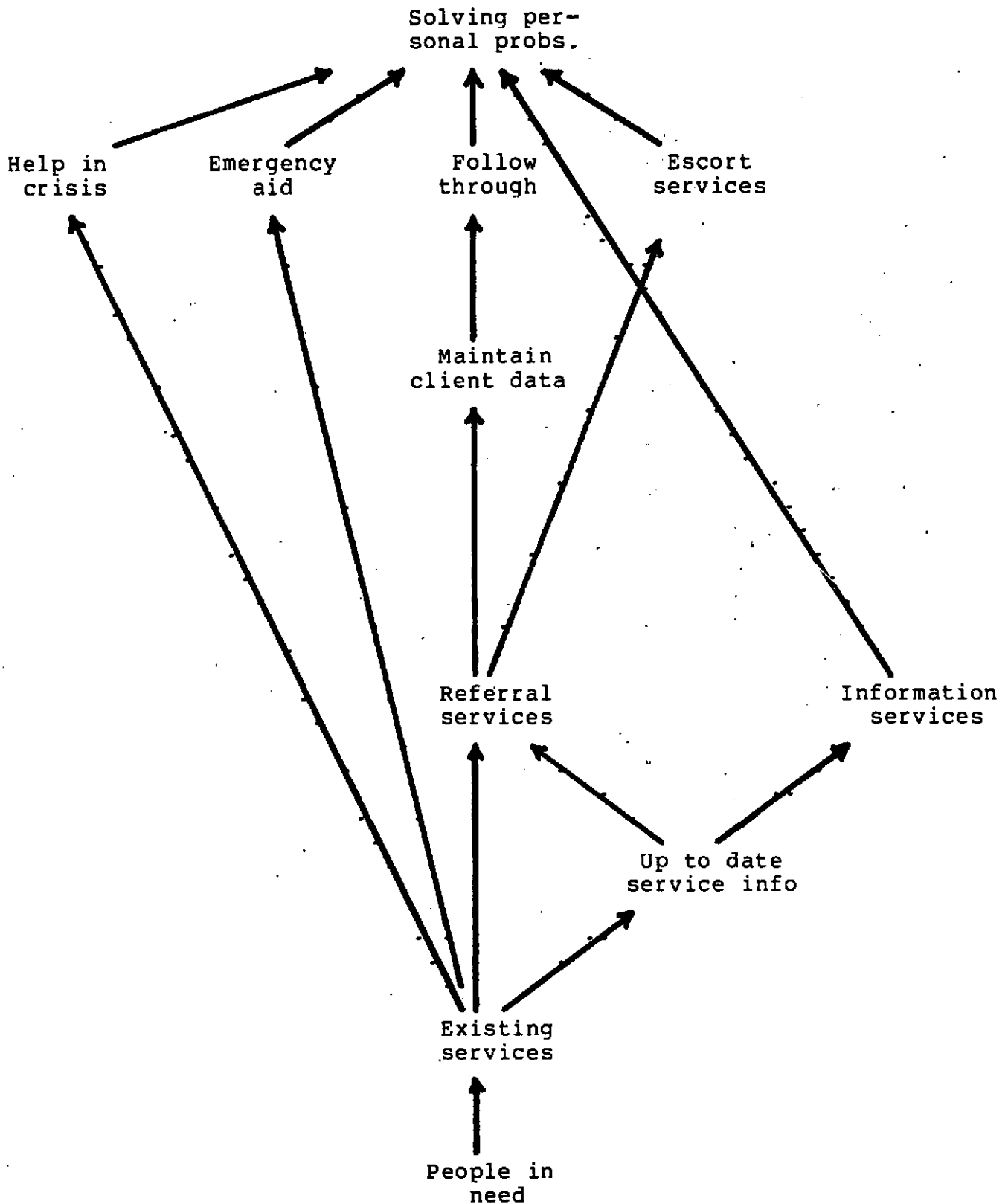
MODEL 1: Important elements of existing I&R services

Digraph of pattern 3, with 5 members (5%)

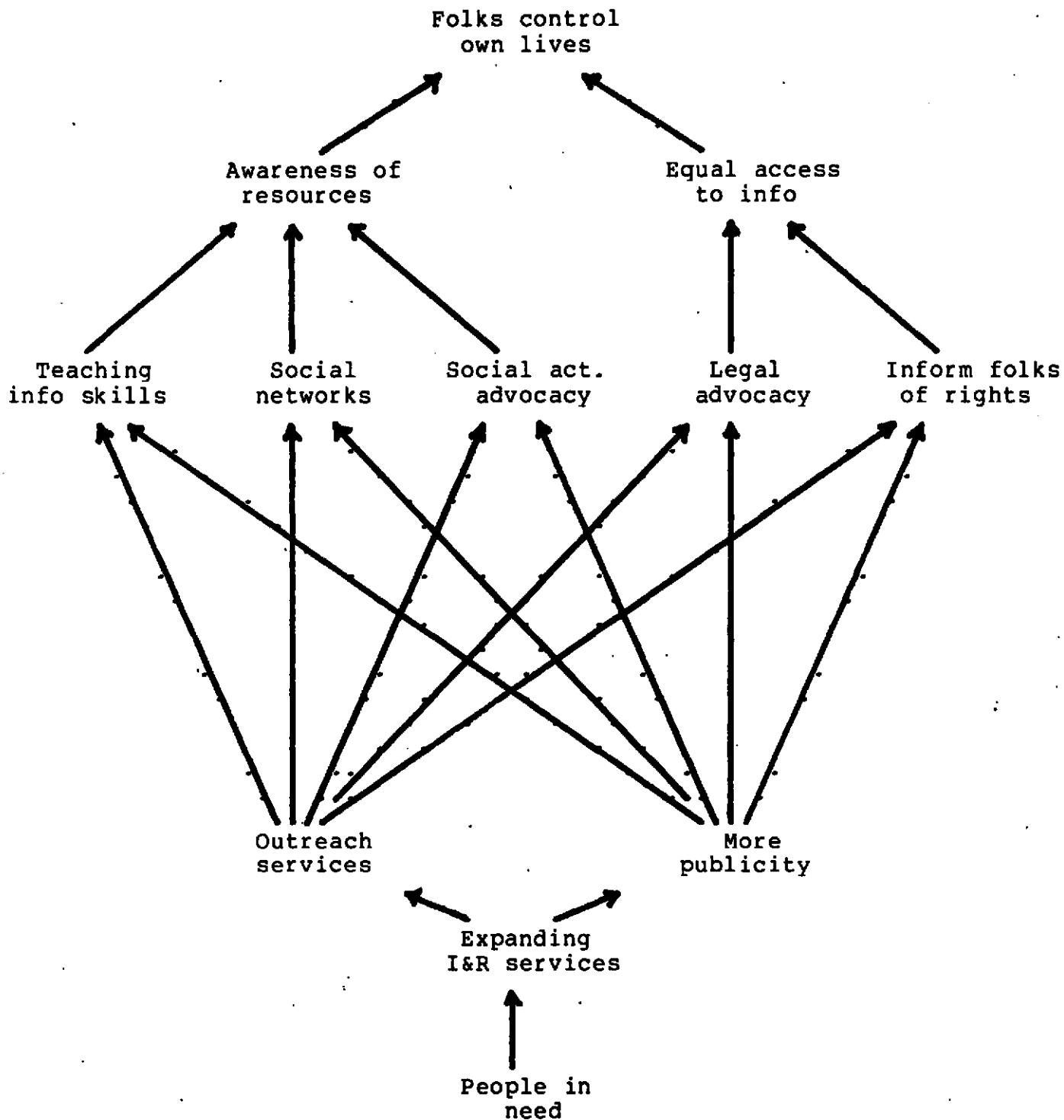


MODEL 1: Important elements of existing I&R services

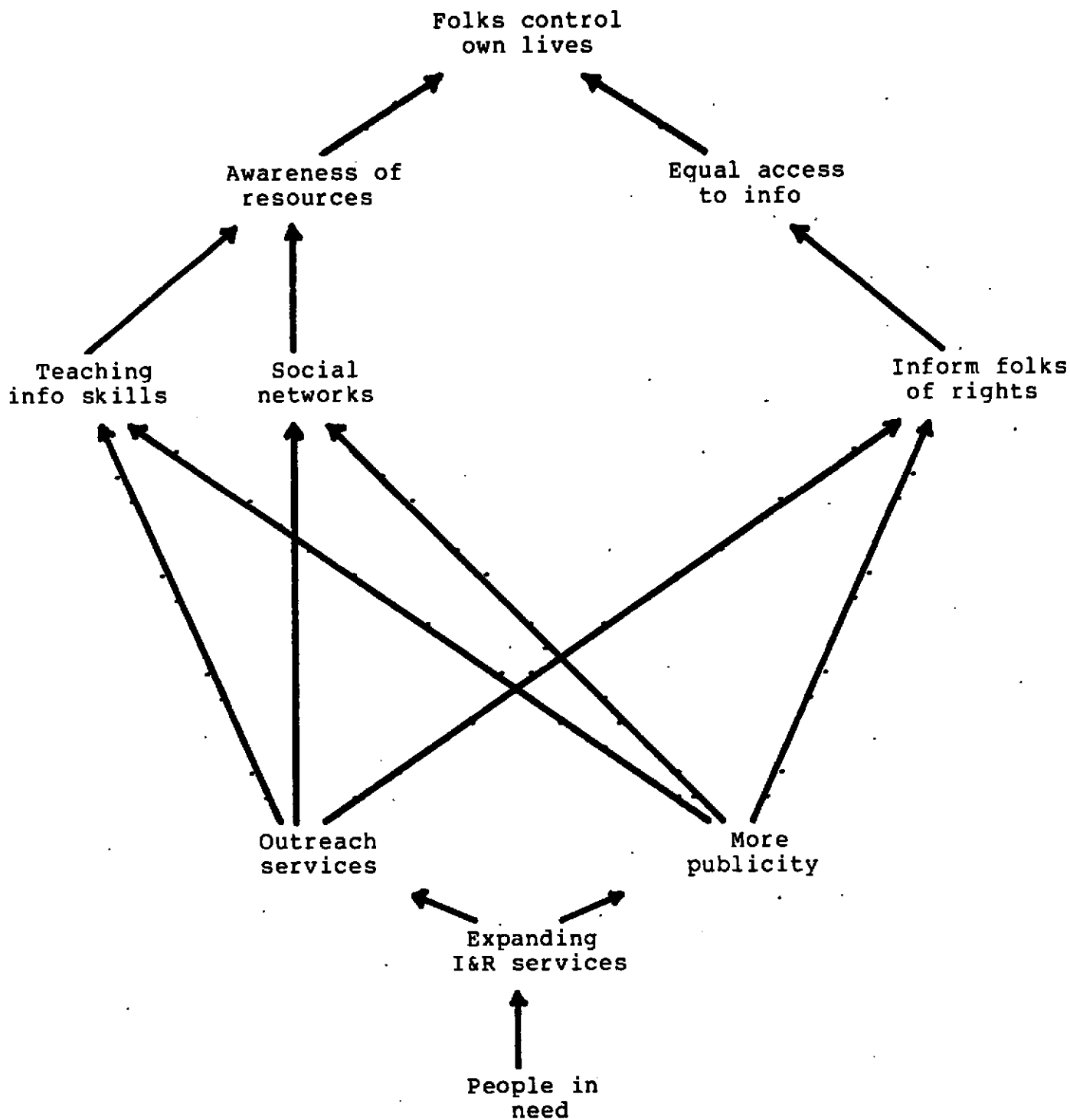
Digraph of pattern 4, with 4 members (4%)



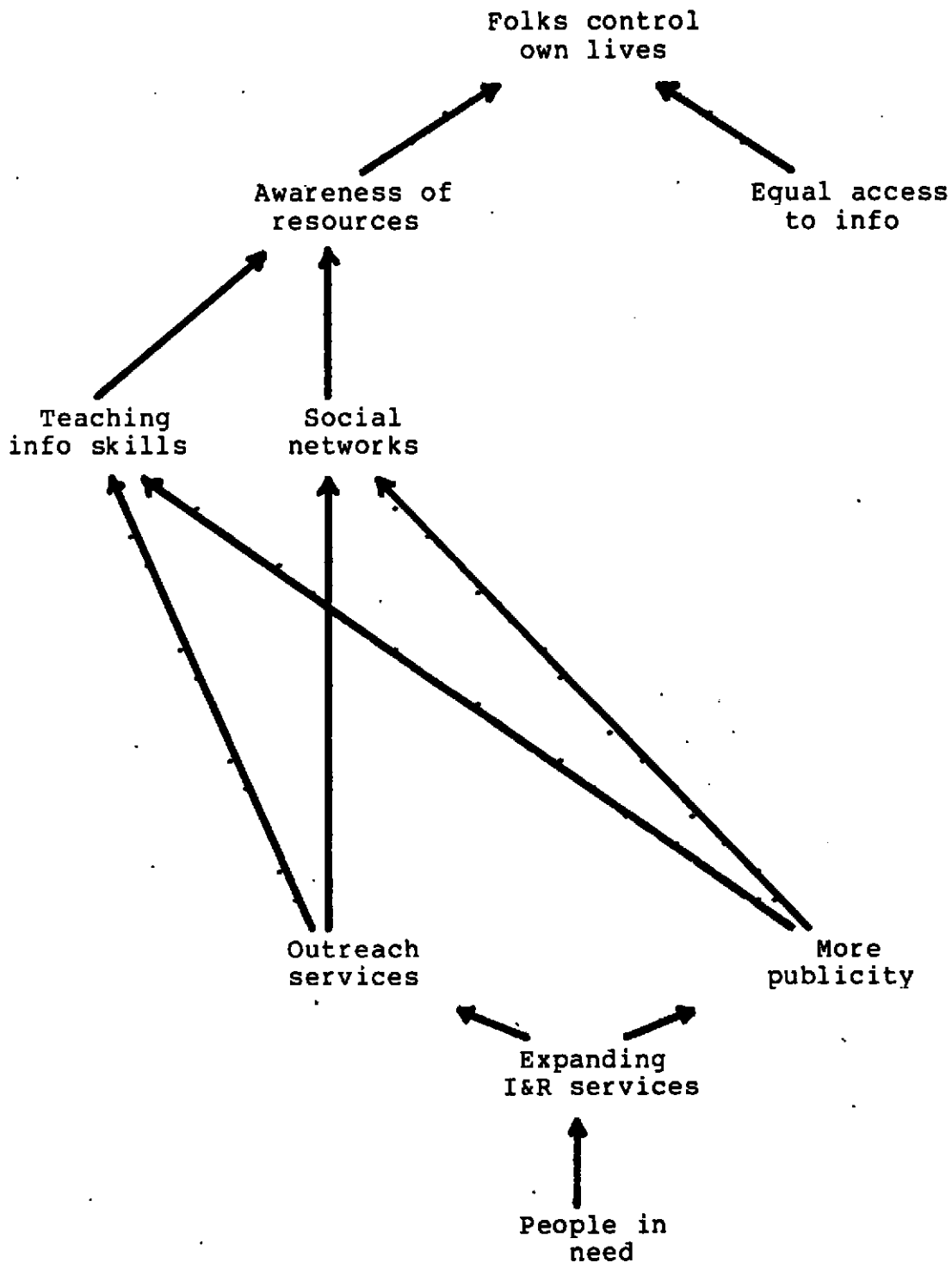
MODEL 2: Future possibilities for I&R
Digraph of pattern 1, with 24 members (24%)



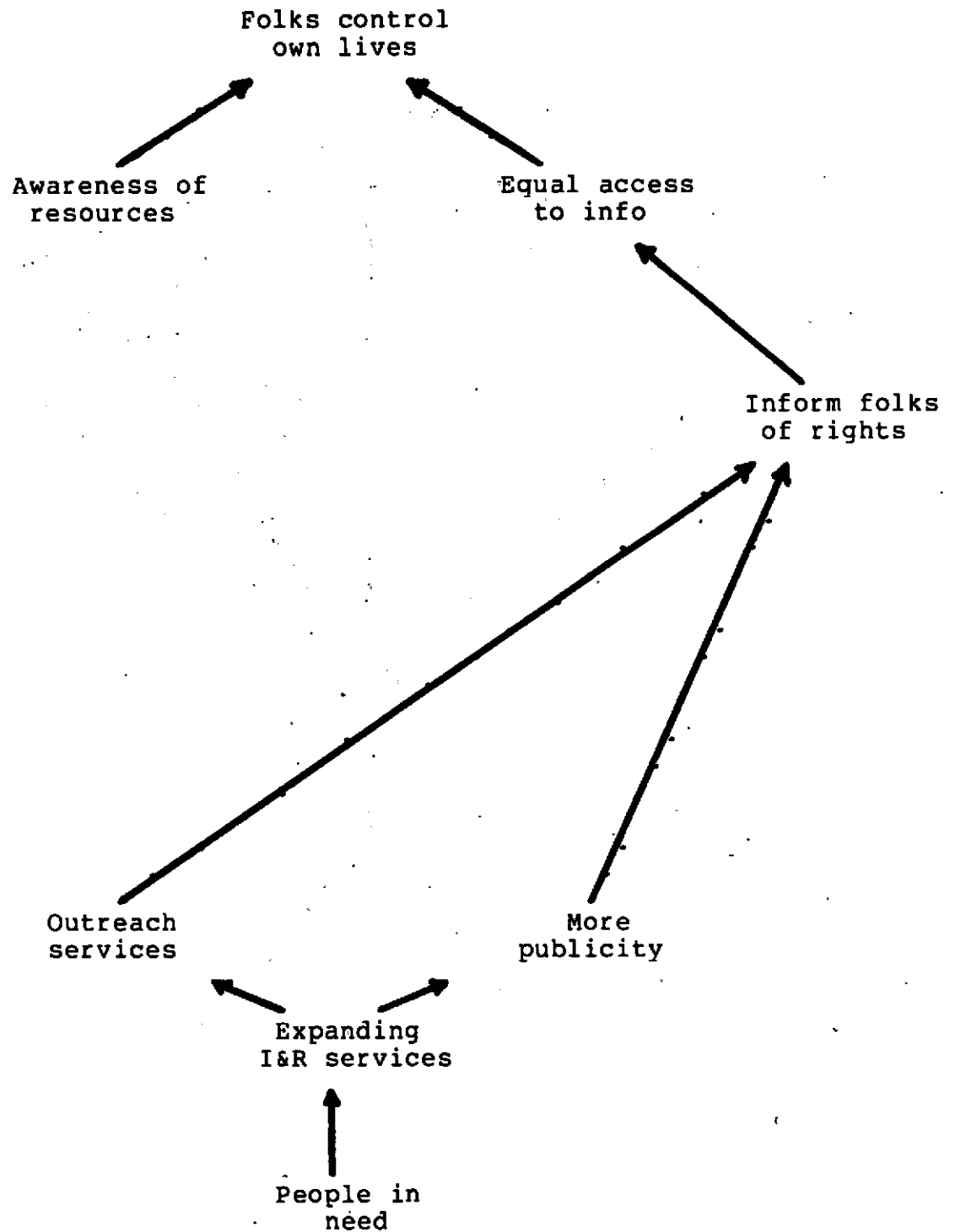
MODEL 2: Future possibilities for I&R
Digraph of pattern 2, with 7 members (7%)



MODEL 2: Future possibilities for I&R
Digraph of pattern 3, with 5 members (5%)

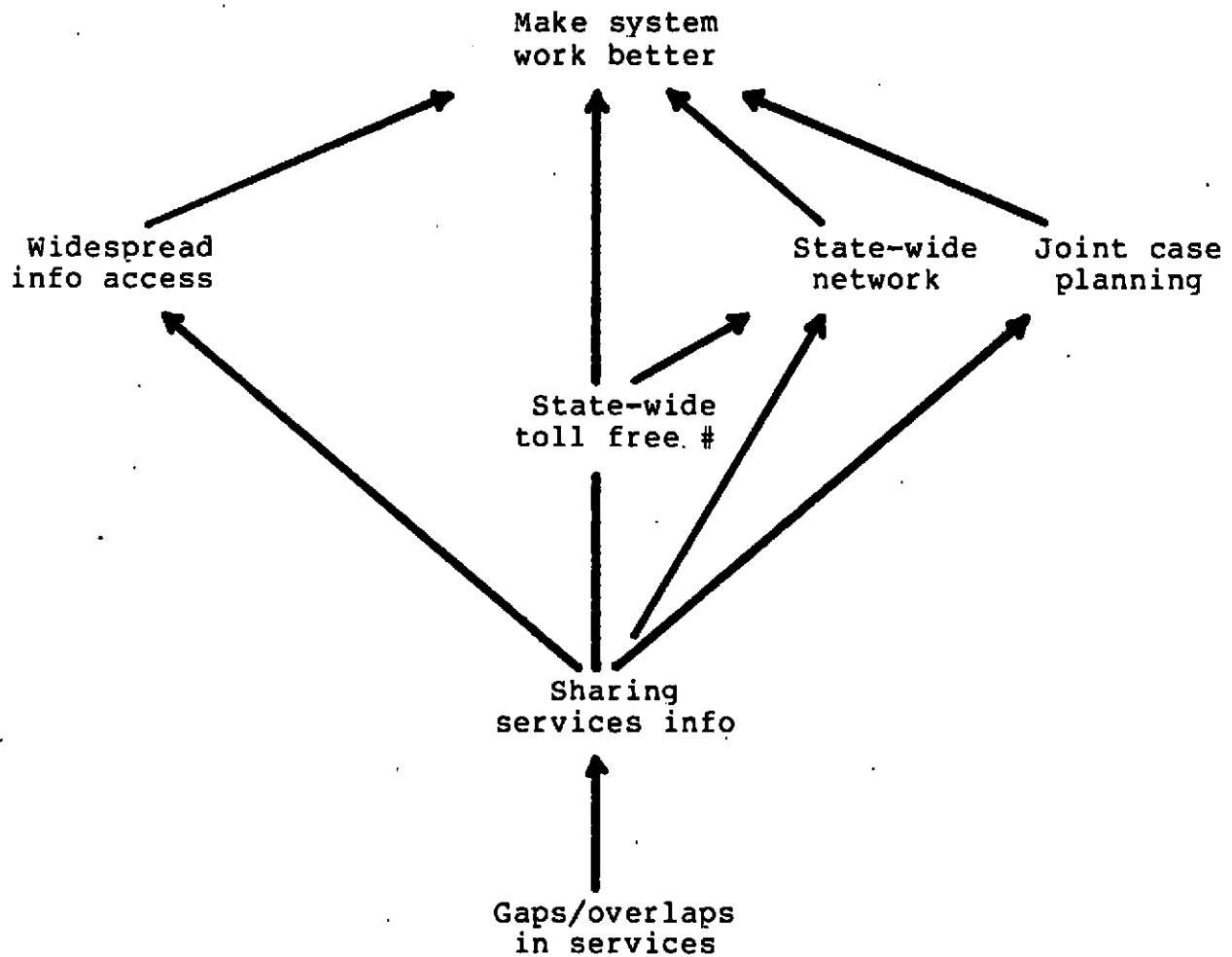


MODEL 2: Future possibilities for I&R
Digraph of pattern 4, with 4 members (48)



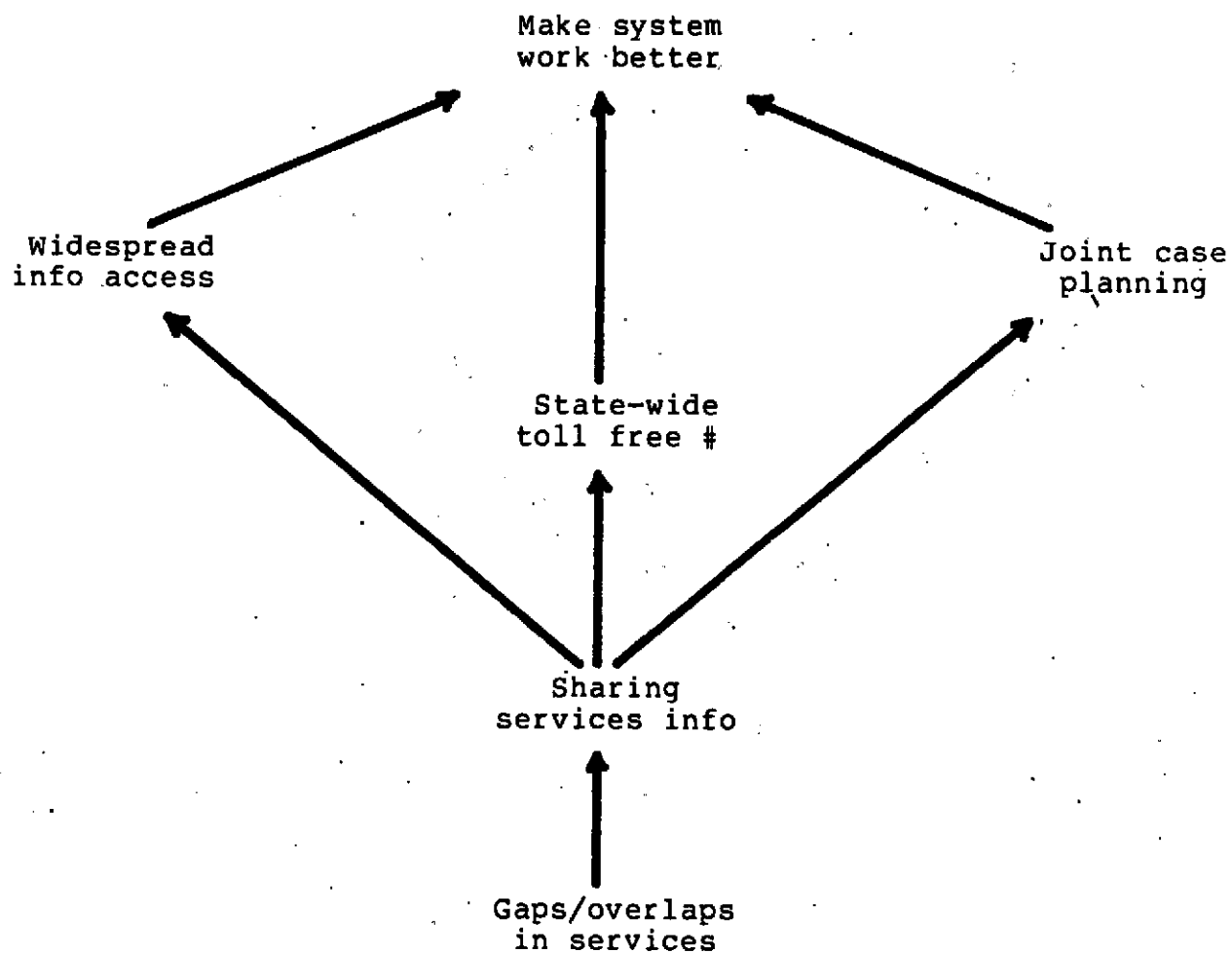
MODEL 3: Suggestions for improving the social services delivery system

Digraph of pattern 1, with 23 members (22%)



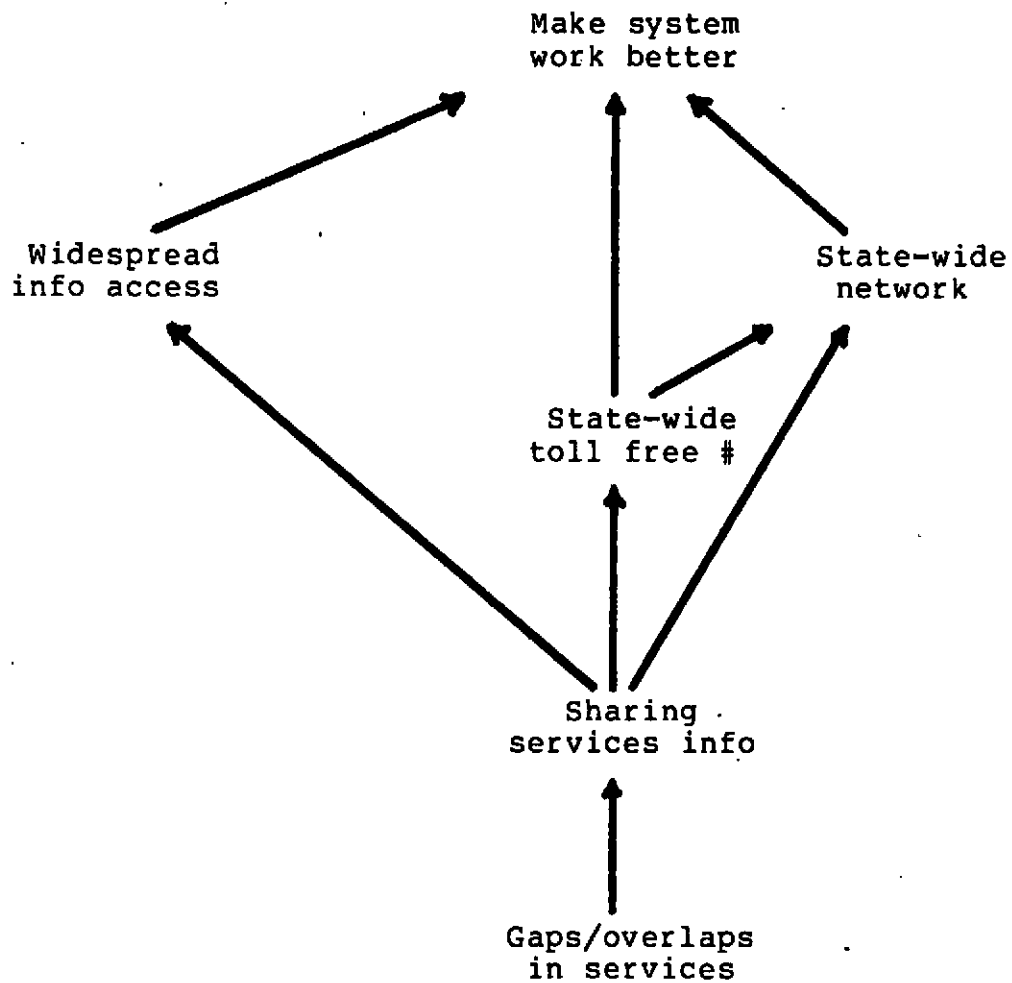
MODEL 3: Suggestions for improving the social services delivery system

Digraph of pattern 2, with 11 members (11%)



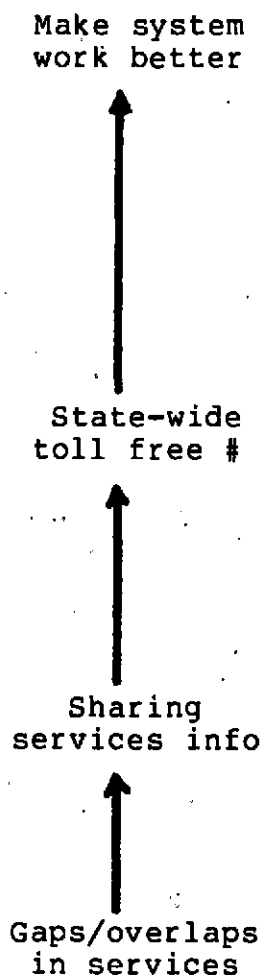
MODEL 3: Suggestions for improving the social services delivery system

Digraph of pattern 3, with 7 members (7%)



MODEL 3: Suggestions for improving the social services delivery system

Digraph of pattern 4, with 6 members (6%)



* NETWORKING *

Since you cannot find the universal and beloved community,--create it. . . Do whatever you can to take a step towards it, or to assist anybody,--your brother, your friend, your neighbor, your country,--mankind,--to take steps toward the organization of that coming community.

--Josiah Royce

We need a cooperative form of organization which recognizes that the necessary thinking and action will occur if we resolve to work together effectively. We need to stop hoarding our resources, our contacts, our ideas: we need to share. We need to recognize that we live in a society in which there are enough ideas and resources to solve our problems if we are prepared to work together instead of competing with each other.

--Robert Theobald

Developing the keyword interest areas

In order to share at a conference, participants have to find others with common interests. We used the list of basic concepts about I&R to help us develop keywords to describe major interest areas. We also took into consideration the subject areas that were being discussed in the various workshops and presentations at the Idea Fair. We combined this information into a final list of interest areas. Some of the I&R concepts were excluded because they were not specific enough or otherwise appropriate for interest areas.

To make it easier for people to participate in the interests exchange, we developed a completely separate questionnaire, which contained a description of the process; blanks for name, agency, address, and telephone number; and the list of keyword interest areas (including an "other" category in case we left something out). Since some of the concepts of I&R included in the models were of moderate political sensitivity among certain groups of people at the Fair, we wanted the responses to the models questions to be anonymous. So we separated the two questionnaires (and even reproduced them on different colors of paper). Some people filled out only one. Altogether, 133 people filled out the interest questionnaire, and 104 people answered the models questions.

Example pages of the master list of participants, the keyword index, and the alphabetical index are included here.

 * COMPUTER-AIDED INTEREST SHARING AND NETWORK BUILDING *
 *

OREGON INFORMATION & REFERRAL WORKSHOP AND IDEA FAIR, May 17-18, 1977

The list below contains some areas of potential interest to practitioners of I & R. If you would like to know about others attending this Idea Fair who share your area(s) of interest, please write your name, organization/agency, address, zip, and telephone number below, and check the area(s) of interest to you. Use either your office or home address and phone number, whichever you prefer.

At the Display of Oregon Information and Referral Systems on Tuesday evening at 7:00 p.m., lists of those interested in each area will be available. It will be up to you to follow through on these referrals.

name: _____

agency/organization: _____

address: _____

city: _____ state: _____ zip: _____

telephone (include area code): _____

interest areas (check as many as you like):

- _____ social action advocacy
- _____ legal advocacy
- _____ telephone "green pages"--special section of public & human services information
- _____ crisis counseling
- _____ staff "burn out"
- _____ alcohol/drug problems
- _____ public relations and publicity
- _____ networks
- _____ tie-lines
- _____ staff training
- _____ training other community groups (agencies, schools, civic organizations, etc.)
- _____ confidentiality
- _____ data base decision making
- _____ funding
- _____ computerized information banks
- _____ other (please describe briefly): _____

```

#####
##-----##
##--- C O M M U N I T Y   I N F O R M A T I O N   S Y S T E M ---##
##--- SECTION 2:  INTERACTIVE SEARCH AND RETRIEVAL OF INFORMATION ---##
##-----##
##----- DEVELOPED BY PETER & TRUDY JOHNSON-LENZ -----##
##-----##
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##-----##
#####

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OREGON I&R IDEA FAIR AND WORKSHOPS, MAY 17-18, 1977

THE FOLLOWING KEYWORDS ARE AVAILABLE IN THE I&R NETWORK FILE:

soc act advocacy	legal advocacy
burn out	publicity
confidentiality	green pages
crisis counseling	alc/drug probs
networks	tielines
staff training	training groups
data dec making	funding
computerized info banks	resource file & library
data collection	sr. cit. legislation
work w/ pub libraries	special ed
handicapped	produce referral
mental models	

OREGON I&R IDEA FAIR AND WORKSHOPS, MAY 17-18, 1977

LIST OF PARTICIPANTS IN INTERESTS EXCHANGE -- PAGE 8

(43)

Mary Reynolds
Clackamas County Community Action Agency
825 Portland Avenue
Gladstone, OR 97207
655-8640
soc act advocacy, crisis counseling, publicity

(44)

Rosalind Weber
Urban League Senior Adult Service Center
3904 NE Union
Portland, OR 97212
288-8338
soc act advocacy, legal advocacy, green pages, burn out, publicity
networks, staff training, computerized info banks

(45)

Alice Stuckey
Multnomah County Legal Aid
310 SW 4th, Room 1100
Portland, OR 97214
224-4086
soc act advocacy, legal advocacy, publicity, training groups
confidentiality, funding

(46)

Marianne Baldwin
Corvallis Human Resources Center (DHR)
850 SW 35th
Corvallis, OR 97330
757-4226
soc act advocacy, legal advocacy, tielines, staff training
training groups, data dec making, computerized info banks

(47)

Maggie O'Shea
Corvallis Human Resource Center (DHR)
850 SW 37th
Corvallis, OR 97330
757-4222
soc act advocacy, legal advocacy, green pages, publicity, networks

OREGON I&R IDEA FAIR AND WORKSHOPS, MAY 17-18, 1977

ALPHABETICAL INDEX TO PARTICIPANTS -- PAGE 1

NAME	NUMBER
Pat Abeita	65
Laurel Airrington	126
Becky Allen	40
Virginia Alzner	10
Marjorie Anderson	97
Mary Anderson	115
Aurora Angel	12
Julia Apt	15
Marianne Baldwin	46
Lola Ball	92
Dana Barricklow	38
Alicia Benavidez	13
Gary Pullman & Janice Berndt	130
Ann Bishop	68
Frances Bodle	102
Lola Boyett	113
Beth Brown	27
Jesse Bunch	24
Pat Casey	99
Alta Chalfant	95
Judie Chamberlen	28
Catherine Charron	84
Michael Chocholak	2
Evelyn Chose	21
Marilyn Clark	19
Nancy Clow	88
Marjorie Cowles	127
Ella Curran	93
Debbie Dawson	78
Sister Anne Deuprey	17
Patricia Duke	117
David Emmons	89
Margaret Esler	85
Verna Forbes	112
Jan Fortier	26
Anita Foster	14
Mary Furuto	4
Joseph Grant	86
Judith Hadley	1
Deborah Hall	16

OREGON I&R IDEA FAIR AND WORKSHOPS, MAY 17-18, 1977

KEYWORD INDEX OF INTEREST AREAS
 REFERENCED BY THE PARTICIPANTS' LIST NUMBERS
 PAGE 1

soc act advocacy

1	2	4	8	10	12	13	14	15	17	18	19	20
24	28	30	32	33	35	36	37	38	39	40	43	44
45	46	47	48	50	54	55	56	57	58	59	62	63
64	65	66	67	68	70	71	72	73	74	76	79	80
83	84	85	93	94	95	98	99	100	101	102	103	104
105	107	110	111	115	117	123	125	126	128	132		

legal advocacy

1	2	5	7	8	10	11	13	14	15	17	19	21
22	23	26	27	30	34	35	37	39	40	41	42	44
45	46	47	48	49	55	58	59	60	62	63	65	66
67	68	70	71	73	75	78	79	80	85	86	88	90
94	95	99	100	101	102	103	104	110	111	113	117	119
125	127	132										

burn out

1	2	4	6	7	8	9	10	12	13	15	17	28
29	30	31	32	33	34	35	36	37	38	39	40	44
50	51	53	54	55	56	57	58	59	61	66	68	69
71	72	73	74	76	77	78	79	80	81	82	83	84
85	86	87	89	93	95	96	99	100	101	102	103	105
106	107	109	110	112	114	118	126	127				

Publicity

1	2	7	8	10	11	13	14	15	16	17	18	19
21	28	29	31	32	34	37	38	39	40	41	42	43
44	45	47	48	49	50	51	53	55	57	58	60	61
62	63	66	68	69	71	72	74	79	80	81	82	85
87	90	91	92	94	95	96	97	98	100	103	104	108
109	110	117	121	125	127	129	130	131	132			

confidentiality

1	5	7	8	12	13	14	17	18	19	21	22	26
27	28	32	34	35	37	39	42	45	48	53	55	56
57	58	59	63	66	71	72	73	75	76	79	80	81
83	84	85	86	89	91	93	94	97	98	99	100	102
103	106	110	125	126	131							

green pages

2	3	8	10	12	17	18	20	21	22	25	27	28
29	31	34	38	39	40	41	44	47	48	52	53	54
55	56	60	63	65	66	67	68	70	71	72	77	79
84	85	90	91	94	96	97	98	99	101	103	104	106
107	109	110	116	117	120	130	131	132	133			

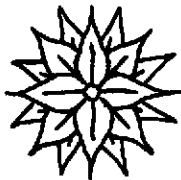
Going further

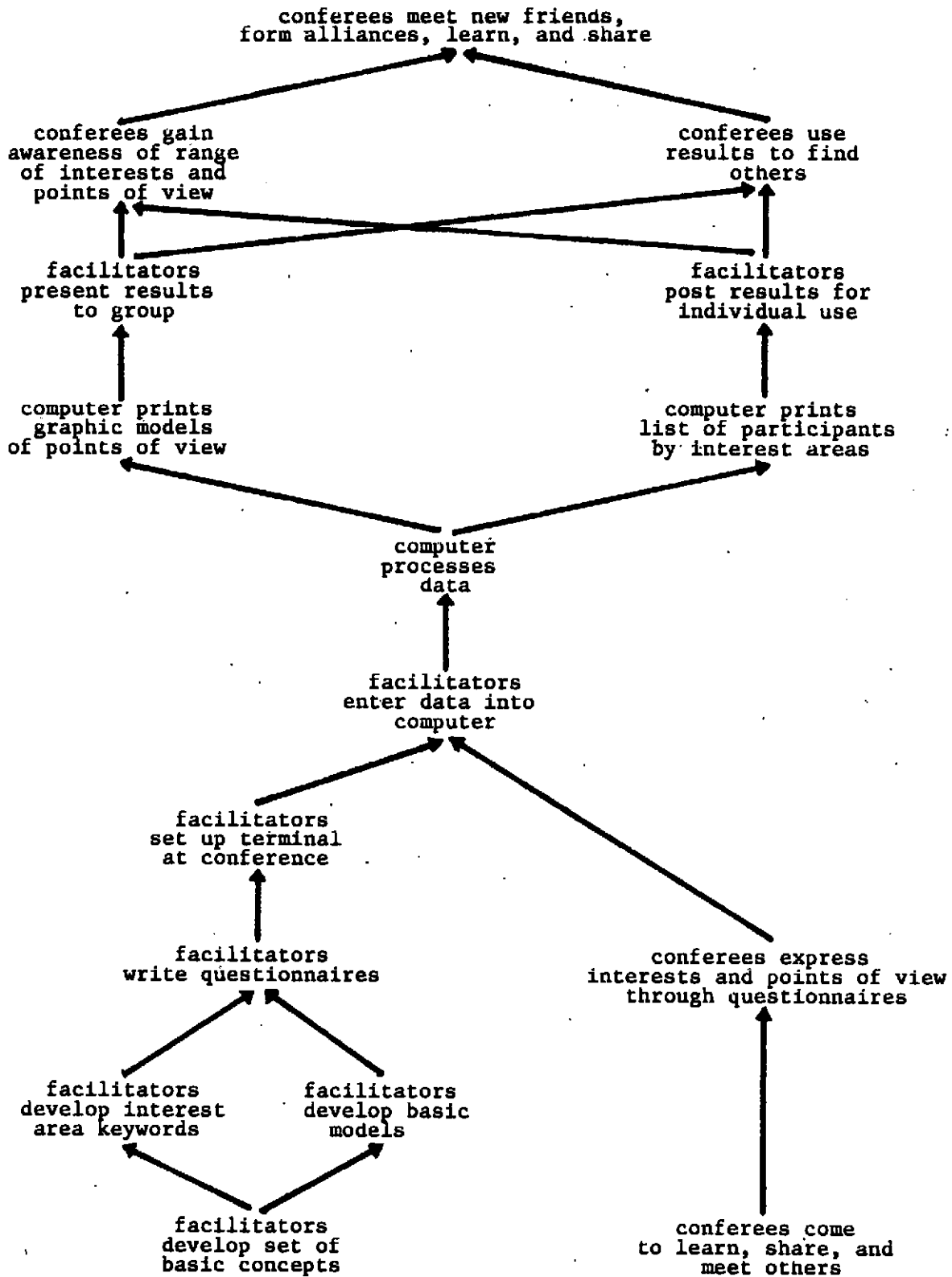
The methods described here are simple and fairly inexpensive. Depending on the conference, meeting, gathering, or whatever, some variations or extensions might be more appropriate. Here are some additional possibilities.

1. Have people fill out questionnaires beforehand so that the final models and interests lists can be distributed to everyone at the beginning of the conference.
2. Have people specify additional information about their interests, such as willing to teach, want to learn, expert, amateur, willing to moderate a group, and so forth, to improve the usefulness of the exchange.
3. Have the computer create special packets for participants containing lists of people interested in the same areas that they are.
4. Combine both questionnaires so that the model data will not be anonymous. Then people can also find out who thinks about or views a topic in the same way they do.
5. Use pre-conference responses in a presentation of interests and models at the start of the conference. Then use the participants' reactions and comments to update or improve the models and interests lists during the conference session.
6. Use electronic group dialogue hardware to:
 - a. build the models interactively with conference participants to improve their accuracy and to help people identify with the models (models mean the most to those who participate in their construction);
 - b. respond to the questionnaires in a group at the start of the conference, providing virtually instantaneous feedback of the results.
7. Develop a third questionnaire that contains a list of all participants. Have people check all people they know. Use the results to:
 - a. show existing networks of people;
 - b. show how interest and point of view information can be used to extend existing networks;
 - c. give each participant a list of all people known by the people they know but not known by them (potential new friends and acquaintances), showing what those people are interested in;
 - d. collect data later in the conference about who now knows whom to show how the network of people is growing.

8. Use the computer to format and print an "instant conference directory" of all participants, indexed by interests and points of view. Have it ready to give to people as the conference closes. Or, if pre-registration information is available, have the directory ready at the beginning of the conference.

9. After the conference, continue the facilitation with a participatory newsletter.





The Portland Community Resource Center

(503) 284-9465, 284-9461

1723 N.E. Tenth Portland, Oregon 97212

Hi there Sandi,

Here's a copy of the over-view section of my report. It is rough draft, with original (and sometimes creative!?) typos in place. [also not numbered so keep in order]. Other sections that are done but in even rougher form are specific to our use of EIES, a glossary, all the little goodies [table of contents, abstract, etc.], recommendations, and a resource list/bibliography which is rather out of hand right now, got to figure out a way to be selective.

Hope you find it interesting/useful. Would appreciate any feedback so I can make final copy including anything I say about CM). If, for some reason, you are interested in part of it for Journal Comm. Communications. I'm open to it. And as I mentioned before if I can help with the journal from here, that too.

I mentioned to Art Kliener that I'd be interested in working on the Whole Earth Catalog, even moving there to bay area for awhile. My home is here, but I'm getting restless--know any short term jobs/contracts/reasons for me to visit there?

Has someone kept you up on the possibility of an appropriate technology network on EIES? Gil Friend is facilitating that and you could talk with him on EIES or at OAT/Sacramento.

By the way the article I wrote in Rain about networks is probably going to be reprinted in "Connections" (newsletter of the international network of social network analysis), so maybe CM will get mentioned there too.

In the flow (or what ever is
being said for sign-offs these days)



Steve Johnson

TECHNOLOGICAL DEVELOPMENTS

INTRODUCTION

Some revolutions, such as the "Electronic Revolution", sneak up on you; like aging they are not always visible. The future as portrayed in 1950's magazines such as "Parade", with electronic everything, is here, although many of the fondest and wildest expectations are missing, such as automated highways and picture-phones. We adjust to an onslaught of electronic wizardry; with supermarket clerks waving electronic wands past our groceries, and electronic toys of every possible description (an estimated \$500 million industry, non-existent several years ago).

At the heart of this revolution is the computer, and the "computer on a chip", tiny microprocessors that can be programmed to perform unlimited number of tasks, making it possible to computerize most everything, from kitchen appliances to industrial machinery.

Our reason for discussing the general state of electronic technology in this report is to show the relationships between one use of computers, EIES (The Electronic Information Exchange System), and related uses, which we propose constitutes a decentralized multi-purpose information and communication utility. We are also interested in supporting the idea that we are moving from an energy-based economy to an information-based economy, and that as either individuals, or members of organizations we can enter the information era now. Even today, with computers and computer terminals in the range of \$300--\$3000, a citizen can access the cultural storehouse of knowledge through on-line information systems, purchase pre-packaged computer software programs for learning and entertainment, and communicate with people, via systems like EIES.

In effect the utopian versions of the computer utility (the end-all-world-brain) is here today, only its development has taken shape by a good amount of free-enterprise, open-market competitive development. One can put together one's own "world brain", buying software from private vendors, linking into computers with dedicated purposes, such as on-line information systems, using special telecommunication networks.

As important as the growth of small computers that are now affordable to the average person, is the development of special telecommunication techniques that allow computers to "talk" to each other.

EIES uses the commercial, Telenet, "packet-switching network" to connect participants through their terminals to a central processing computer. A Packet-switching network is a special telephone line designed to transmit data between computers and computer terminals, opening the door to the creation of decentralized information and communication networks.

COMPUTERS

In the early 1950's nearly all computers were owned by or devoted to tasks of the federal government. By the mid-1950's there were only about 1000 large-scale computers. By the mid-1960's there were about 220,000 computers in the U.S.; of these 40% were medium or large scale computers; the others being mini-computers (costing less than \$50,000). Also

by the mid-1960's there were about 750,000 microprocessors, the so-called "computer on a chip".

It has been estimated that now there are about 750,000 mini-computers and more than 10 million microprocessors.

The microprocessor is a general purpose logical unit that can be programmed to perform an unlimited number of tasks, eliminating the necessity of designing new circuitry for each new application. They can thus be mass-manufactured, at much lower costs. One can find microprocessors being used to control mechanical and electrical equipment of every description. The very definition of a computer is up for grabs. Hand-held programable calculators are what in an earlier period we might have called computers.

Other advances in electronics including new computer storage mediums, such as "floppy disks", have made it possible to develop small multi-purpose computers, the long awaited home computer, the micro-computer as it is popularly called.

There are now quite a number of manufacturers of micro-computers, with costs ranging from \$500 to \$10,000. Electronic parts are also readily available allowing persons with some electronics background to assemble a \$10,000 computer with about \$2000 in parts.

Micro-computers are capable of many operations, many as powerful as computers once used only by government and large corporations. Pre-packaged software programs, add-on circuit boards with special functions, and add-on memory through floppy disks, make micro-computers very flexible.

The capability of micro-computers by themselves is astounding but when considered in the context of telecommunication technology that allows these micro-computers to talk to each other, and to other special purpose larger computers, then one is talking about a revolution in our abilities to communicate and access storehouses of knowledge undreamt of even several years ago.

Recently, for example, a manufacturer started producing a small circuit board (for about \$300) that could be added to some micro-computers that allow one to establish a community electronic bulletin board; whereby others with computers and computer terminals can "call up" a computer and leave or receive messages for others, using regular telephone lines.

Although a micro-computer can be used for linking up with other computers, sometimes only a computer terminal (referred to as a "dumb terminal") may be necessary for one's purposes. A dumb terminal is used only to "talk" to other computers. Such terminals are either hard copy/print terminals or video-display (sometimes called CRT's). A small, portable hard copy terminal such as the one used by CUE during its EIES project, manufactured by Texas Instruments now sells for around \$1500-\$2000. Used hard copy terminals are selling for below \$1000; and some simpler models are available down to \$300. A video display terminal, using a Cathode Ray Tube, and therefore sometimes referred to as a CRT, are more popular among the home computer crowd because so many of the users are interested in home computer games that demand visual displays. A CRT terminal sells for between \$500--\$3000. Building a computer system will depend on one's need for independent computing, and the need for printed copies of what is available in the computer. Most portable hard copy computer terminals printing capabilities leave much to be desired, and a separate "line-printer" as an add-on, with more flexible typing/printing capability, but more expensive, may be desirable.

Some computer terminals (so called dumb ones) now have limited built in programable memory which present an interesting compromise between a computer terminal and micro-computer. For example, at least one EIES participant uses a terminal such as this for composing messages off-line (using the terminal itself), before transmitting them via EIES to other participants, thus saving costs of using long-distance telephone lines (Telenet) for the actual composing of messages on the EIES computer.

Although many individuals and organizations have information and communication needs that can only be met by linking up with other computers, either through direct connection with a large computer, or by just contracting for computing services, it is now evident that investment in micro-computers are an important consideration. If the appropriate hardware is chosen it is possible to have both private computing power while linking into other computers for special purposes, and linking up with other computers and computer terminals for communication purposes.

One should, however enter computerization cautiously as sometimes the investment will only pay-off in the long run, and the transition from manual and/or existing communication&information systems is sometimes complicated, forcing one to maintain both the traditional and new methods simultaneously.

It is beyond the scope of this report to present a buyers guide to computer hardware, however we have included several buying guide references in the bibliography.

TELECOMMUNICATIONS

"tele", from the Greek, meaning "over a distance", and when combined with "communication", "telecommunication", or, to communicate over a distance, as evidenced in some of our basic ways of communicating over a distance: telephone, telegraphy, television.

Today the predominant forms of telecommunication involve either use of the electromagnetic spectrum (radio, television, microwave transmission, etc.), or by use of telephone lines and the hybrids of those lines such as cables (as in Cable TV), and "packet-switching networks".

The convergence of computer technology and telecommunications, an increasing number of services that fall outside of AT&T's "natural monopoly" of communication technology, is presenting us with legal distinctions that border on being unsolvable metaphysical questions.

At the heart of telecommunications is the nature of basic means of one-to-one communications, the telephone. The telephone uses analog signals for transmission of human communication. An analog signal is a voltage sent over telephone lines representative (an analog of) the pressure wave form of the human voice. With advances in computer technology, and other means of electronically transmitting and receiving information, analog information can be translated into a diget form which a computer can process. Once an analog signal is converted to a diget form it is possible for the form to tolerate a tremendous amount of distortion of its wave shape (the signal) and still be capable of simple reconstruction into a neat distortion-free series of pulses. This allows greater economy in the packaging of information in a communications circuit and allows the use of lower quality (and cost) channels. Telephone systems are increasingly using computer circuits to switch messages from one circuit to another. Human communication, then, once treated separately from digital infor-

mation can now be treated (and is) the same. Bits of information entering the telephone network are being treated the same as bits of data feed into a computer for processing.

The fact that the basic means of communication between individuals, the telephone, is increasingly controlled by interlocking computer circuits, and the availability of new telecommunication tools involving the transfer of physical information (e.g. electronic mail), creates a hell-raising quandry for communication lawyers; and a highly competitive market. Large corporations such as AT&T and IBM, in their separate markets (telephones and computers) are involved in battles about definitions as to what constitutes information and what constitutes communication. There is also room now for individuals, and small companies to compete with the primary providers through establishment of decentralized communication systems using computers and computer terminals.

During the last decade the Federal Communications Commission (FCC) has encouraged competition in transmission for other than voice telephone services. New transmission companies and "value-added carriers" (sometimes called "common carriers") have been authorized. The value-added carriers essentially lease telephone channels from the communication carriers, add processing features, and use the leased lines so effectively that they are able to sell the product for a profit over and above the cost of the basic regulated channel. For example, IBM's plan for a communication satellite network for major business users, which bypasses AT&T's telephone lines, which faces opposition from AT&T and competing computer companies who fear another form of monopoly in the works.

The blending of computer technology with traditional and new forms of telecommunications is sometimes referred to as "comunications" in an attempt to illustrate the merging of communication and information systems. Now, and in the future, the different systems may only be distinguishable in terms of "brand names" as so many possibilities emerge systems will be developed by individuals and corporations that use many techniques simultaneously; transmitting human communication and data through telephone lines, satellites, micro-wave transmission, etc.

PACKET-SWITCHING NETWORKS

The demand for long distance communication lines between computers has, since about 1970, created a variety of "value-added" communication networks. It is expected that such services will grow, offering services to fit new telecommunication and data processing needs. For our discussion the primary service, at the heart of the new value-added networks is referred to as "packet switching".

In a packet-switching network, packets (individual lines of characters) are sent between terminals, and/or between terminals and different special purpose computers. Each line (packet) is sent by the best route, which may involve several methods of tele-communication, including micro-wave or satellite transmission. A message sent through the packet-switching network might be transmitted, one line at a time, with each line (potentially) going by a different route.

Packet-switching originated with the Department of Defense's Advanced Research Project Agency (ARPA). The agency built an experimental network to be used by academic and research institutions working on government contracts, and who had a need to communicate with others in order

to transmit data. The ARPA network grew out of the need to create a communication system that could survive nuclear, or other major holocaust. The system does so by automatically switching packets (lines) through whatever means is available, so if one "node" fails, the line is sent to another, creating the only, or most efficient path.

Telenet, operated by General Telephone and Electronics (GTE), is the packet-switching network used by EIES. Within the continental United States, current costs for using Telenet are \$3.75/hour, considerably less than basic long distance telephone rates.

A system like Telenet can serve to interconnect a wide variety of computers and terminals. Computers equipped with the appropriate input/output devices, and simple "hand-shaking" programs (commands that in effect tell the system what language the computer speaks), can form alternative communication networks transmitting both digital information and human communication.

SATELLITES

In 1962 the U.S. Congress passed the Communications Satellite Act which authorized the formation of a private corporation to carry out the country's interest in worldwide satellite systems. The corporation, COMSAT, was formed in 1963. In 1964 COMSAT joined the international entity known as TELSAT, which is now an organization of some 95 countries joined together to operate satellites and earth stations (receiving equipment). In 1965 the world's first communication satellite INTELSAT I (known also as Early Bird), was launched.

Since then other communication satellites have been launched. A subsidiary corporation of COMSAT, Comsat General, controls MARASAT, a three satellite system operating over the Atlantic, Pacific and Indian oceans, linking ships and offshore facilities with land-based communication networks. Comsat also owns COMSTAR, a domestic communication satellite which is leased to AT&T. The corporation (COMSAT) is also a partner in the Satellite Business System, a partnership formed with IBM and Aetna Life and Casualty. The U.S. has other domestic communication satellites, including Western Union's Westar, and RCA's Satcom. Even amateur radio buffs have communication satellites, called Oscars 7 and 8 (Oscar I was launched in 1961), and Phase III.

In most cases U.S. Policy (FCC) on marketing of services based on communication satellites is broken up so as to decrease likelihood of vertical control of communication. Services offered by operators of satellites are similar to common carriers in land-base communications; operators, for example, have not offered direct television programming though they might lease space for another corporation to do such programming.

In 1975, RCA began supplying satellite transmission facilities to Home Box Office, Inc., an Aetna Life subsidiary, to link up cable-tv systems into pay-tv networks. Major television networks have been using communication satellites for transmission of news and special events. 1/5 of the world's population watched the moon landing in 1969. The revolution for television hasn't really taken place yet. Home Box Office Inc.'s special sports event programming and a few "superstations" (who bounce their beam off a satellite to gain a larger audience), make up the bulk of the offerings.

In August 1979 COMSAT announced its plan to implement a domestic satellite-to-home broadcasting service by 1983. The proposal is unique,

since up until now COMSAT has not been involved in direct use of communication satellites. The current plan calls for the offering of a non-commercial, subscription television service with two to six channels of "Original" programming. COMSAT might provide first-run movies, sporting events, educational and cultural material, and data and text transmission services. Anticipated cost of the service is \$150 fee to place the dish (a small version of earth stations), and between \$15--\$40 monthly fee for programming service and antenna maintenance.

A peculiarity of communication satellite transmission is that what ever is sent can be picked up by anyone willing to invest in the proper gear, especially the receiving "dish". Today a person with some electronics background can construct an adequate receiving station for around \$1000.

CABLE (TV) SYSTEMS

At the present time there are approximately 3,350 operating cable systems in the U.S., serving some 7,300 communities. Another 2,650 systems are approved but not built. Operating systems currently reach about 10 million subscribers, perhaps over 30 million people, 15% of the nation's TV households. The largest, COS Cable in San Diego, has almost 140,000 subscribers. Teleprompter is the largest multiple system operator with more than 1 million subscribers. Monthly fees range from six to nine dollars. The cost of laying cable ranges from \$3,500 a mile in rural areas, to \$10,000 in urban areas, and up to \$80,000 where underground cabling is required. Nearly 530 systems originate some programming in their own studios. Pay-cable is on approximately 100 systems, reaching 273,000 subscribers in 18 states.

After nearly a decade of off-and-on-again activity, the City of Portland is finally close to offering up the city's cable-tv market. On December 14, 1979 Cable Task Force, presented to the Portland City Council, its recommendation for a Request for Proposals, that when adapted by the City of Portland City Council (sometime in January), cable system operators will have 90 days to submit a bid for operating the proposed system.

INTERACTIVE TWO WAY CABLE

Network television is a "one-to-many" media, as the telephone is a "many-to-many" media. With television a handful of people control what is seen by millions of viewers; the editors of telephone conversation, on the other hand, is the individual. Cable-tv can be used essentially like broadcast television, with basic programming produced by a few large corporations, even so it can bring more variety.

Cable-tv can also support two-way interaction; allowing individuals to interact with operators and programmers, in some ways interact with the broadcasted show itself, and to some degree , with each other.

QUEBE is an experimental cable-tv system , developed by Warner Communications Corporation, which has been operating in Columbus, Ohio for several years. The kind of programming available on many systems is offered, but what is gaining some attention is the system's two-way interactive capabilities. On interactive shows viewers can push yes/no and multiple choice buttons to respond to opinion polls or to vote on their

viewing preferences or even to buy products after commercials. QUEBE was recently used in conjunction with a press conference held by President Carter, providing us with a view of what democracy might be like in the future, when QUEBE subscribers were asked to vote on issues brought up by the president, providing an instant opinion poll. But this opinion poll was not a random sampling, but, in effect, a vote. If it had been done on a large-scale (nationwide) electronic voting system it would be, in effect, an instant referendum.

Warner Communications Corporation see future developments of QUEBE including: video games, home security systems and electronic funds transfers which would allow people to transfer funds from banks directly to retailers, when purchasing items advertised on the system.

VIDEOTEXT/ TELETEXT

We are used to television presenting video-images but anyone who has worked with video-display (CRT) computer terminals knows that text can also be displayed. A fantasy that has been around for sometime is the push-button electronic personalized newspaper that would also link into something like a Library of Congress. This fantasy is now being realized with several models in existence.

The key again is the computer which makes retrieval and transmission of human communication and digital information possible. There is only a difference of degree between more computer-based systems such as The Source (See, Electronic Mail and Conferencing Systems) or QUEBE (above) and so-called videotext systems.

The Viewdata System developed by INSAC, for the British Post Office, has gained a lot of attention. Other companies and governments have developed similar systems or contracted with INSAC for use of the Viewdata system. Germany, Holland, and Canada have all bought Viewdata systems. The General Telephone and Electronics Corporation (GTE) has contracted with INSAC to come up with an American version. The Knight-Ridder newspaper chain is planning an experimental system for Miami, Florida. KSL-TV, in Salt Lake City has an experimental demonstration system similar to Viewdata. The major broadcasting networks (ABC, CBS, NBC, PBS), have all expressed interest in developing their own versions. Antipode is a videotext system developed by the French government. Project Greenhouse is an experimental teletext project of the U.S. Department of Agriculture and the National Weather Service to bring weather and agricultural information to farmers and rural communities.

The Alternative Media Center in New York City is experimenting with a teletext system under contract from the Public Broadcasting Corporation. It resembles the Viewdata system (in form), and the digital radio broadcast model in that a constant stream of text and pictures are broadcast over a TV station, each piece of information coded with pre-selected keywords. The Alternative Media Center also organized the Berks county (Pennsylvania) interactive TV system used in an electronic voting and citizen participation process.

VIEWDATA

Viewdata is a system developed by the British Post Office and INSAC, a subsidiary of the British National Enterprise Board, and which is pre-

sently being offered on an experimental basis to several thousand subscribers using telephone lines (cables and broadcasting could also be used). The text itself is seen as a 960 character page (40 characters per line, 24 lines). A modified TV is used which costs about \$30-\$50 more than an average TV set, which uses a small remote control keypad that looks like a pocket calculator. After entering an individual subscriber code, the viewer is presented with a table of contents of what is available, listing such things as: weather, news, sports, retail advertising, travel information, restaurant guides. Sub-listings within the general table of contents then take one to the appropriate pages.

Retail outlets are using the system for advertising goods, with the advantage that the system, with some two-way capabilities, allows one to order products directly by using credit cards.

Subscribers can also use the system to link up with a central computer which can perform a variety of tasks, such as what might be done with a sophisticated calculator.

Simple messages can also be sent between subscribers, for example, one can type in messages such as "coming home late", or "happy birthday", and sent time to others who will be informed of the messages whenever they turn on their set.

The system can also support interaction similar to Warner's QUEBE, where viewers can respond to questions asked, therefore creating a model for a home voting and opinion polling machine.

Future development plans call for an alphanumeric keyboard which will allow people to send more detailed messages to each other. Many corporations and organizations are bidding for contracts to be information providers for the system. One corporation is presently entering the contents of a 60,000 page encyclopedia.

HOME VIDEO

Television, by definition, is a telecommunication technology but the television set is being used for other purposes these days. The slow to emerge portable-video-revolution seems to be finally here, having completed its journey through the home video scene.

"Video", the magazine of home video, distinguishes between home video and television as:

"Television is just the machinery used to send and receive video, the medium. Today, video doesn't even have to be transmitted over a distance for us to watch it at home; and when it stops coming to us from a distance, it stops being television. In 1979, we can watch a picture on our home screen by: playing a disc rotating on a turntable; capturing a signal from the air and playing it back whenever the urge strikes; playing back a tape that was recorded commercially and bought by the viewer in a store. When we play a disk, play back a tape, or play a video game we are not watching television. We are experiencing video. It is no longer passive. It is participatory."

Many of the new "toys" may not be significant (for our purpose) but it is important to note that the devices are creating a sense of control over television. Even a simple device like remote control, allowing one

to turn off commercials (or visa versa) is some measure of control. Television with the features of a Viewdata system brings about some control over the great passive television world as it is today.

One of the more far-reaching, and humorous illustrations of participant-controlled TV is QUEBE's "gong" show where subscribers actually vote on amateur acts, deciding which acts should continue.

DIGITAL BROADCASTING

One can transmit data using subcarrier authorization channels, which are unused FM radio frequencies. The information can be transmitted without interrupting the FM signal's main, audio component. The information can be picked up and processed by a special FM receiver connected to a small computer. The computer allows each user to perform information processing operations such as searching every item transmitted for keywords of interest.

One effort to use this is proposed by the Digicast Project of San Francisco. Digicast, as it is called, will be a steady stream of news, financial data, real estate listings, classified ads, weather, etc.

VIDEO DISKS

A videodisk system is made up of two basic parts: the videodisk player which resembles and serves the same purpose as a record player, and the videodisk itself which looks like a 12 inch audio record. It differs in that it contains both audio and visual information.

IBM and MCA have formed a joint venture to develop, manufacture and market videodisk systems. MCA, under the name Magnavox is presently offering the only videodisk player which sells for around \$695. They also offer about 300 disks, with offerings similar to videotapes currently being marketed.

The merger with IBM underscores the importance of the videodisk in terms of information storage. A videodisk contains 54,000 frames and has the capacity to store some 14 billion bits of data (the Encyclopdia Britanica could be stored on one disk).

A Xerox corporation executive has stated that, "technological developments would make it possible to store all the contents of the 18 million books held by the Library of Congress on 100 optical disks by the mid-1980's."

SLOW SCAN VIDEO

Slow Scan video is an inexpensive way to transmit images almost instantaneously around the world. Using a portable tv camera images are fed into the slow scan transceiver (one produced by Extron Industries is called the Robot 530), and with an eight second digital scan, converts the frozen image into coordinate audio-FM tones. This "audio-image" is then transmitted over the telephone network (or satellite or ham radio networks) to a similar receiver at the other end. The receiving video monitor reconstructs the audio information into a visual display.

The resulting program is at 8 second intervals, creating an effect like animation. The digital scan moves from top to bottom of the video screen, and one can see the frame develop, when the total image is developed, it is held until it is dissolved by the following scan.

Direct Media Association (RR#1, Port Washington, B.C. VON 2T0, Canada) is one group working with slow scan video. Direct is experimenting with several related communication technologies such as electronic mail, slow scan video, and computer conferencing. Their orientation in using such telecommunication technology is artistic. They have, for example, used slow scan video to transmit art gallery exhibits (images of the exhibited materials).

MICROFORMS

Although computers are performing admirably in handling large amounts of data they are not always economical for storing and transferring the vast amount of information that may have to be processed. Microfilm and microfiche may be more convenient storage for large amounts of information.

For example, the typical bibliographic data base, such as those offered through DIALOG are most efficient for locating information because the computer is used to look through abstracts of documents, not reading through actual documents, which might be several or hundreds of pages long. With some bibliographic data bases the actual document is available by ordering it from a central clearinghouse; often microfiche editions of the documents are available. The microfiche editions are likely to be as much as 80% cheaper than the printed edition.

A 4x6 piece of film (a microfiche) can store 88 written pages, or as many as 1.5 million bits of information.

Holographic storage systems presently being developed will be able to store far greater volumes; a 4x6 inch "holofiche" may be able to store as much as 200 million bits of data.

In using microforms it is important to consider the available indexing and retrieval mechanisms. Finding a particular piece of information manually pouring through a stack of microfiche cards, or on microfilm, can be time consuming and frustrating.

There have been a number of innovations designed to assist in locating documents. For example, the Micracode system developed by Eastman Kodak, uses the concept of converting alphabetic indexing into a numeric code. A pattern representing the code is put on the film. The user can ask logical questions such as, "What information is available pertaining to terms A and B; looking up the codes for A and B, one enters the code into a special console and the microfilm is scanned for the desired combination.

Aperture cards are also used. A microfiche is mounted on a punched card which can be coded so that it is machine-readable, just as punched cards are used in traditional record-keeping systems. One can then treat the microfiche as one would a punched card (as long as you don't bend the film).

Computer-output-microfilm (COM) is a further step in the use of microform information systems. A COM recorder converts data from computer magnetic tapes to letters, numbers, and data for recording directly onto microfilm, thus eliminating the need for initial printing or plotting on paper.

ELECTRONIC MAIL

The idea of an organized mail system is said to have originated around 400 B.C. in the Persian Empire. The term "mail" today broadly refers to the physical transporting of documents from one place to another in special containers known as envelopes. However, electronic communications has made some features of mail delivery obsolete. An article in Fortune (6-18-79) presents the current U.S. Postal Service way of handling mails "a ridiculous arrangement that employs internal combustion engines and human backs to lug around information, an essentially weightless commodity".

The telegraphy and telegram were early means of transmitting information electronically. Teleprinter systems (such as those used by news services, UPI, AP), Telex and TWX (special teleprinter services offered by Western Union and AT&T), and newer forms of electronic communications such as point-to-point facsimile (imagine 2 copiers sending copies over a distance), and communicating word processors (imagine computerized typesetting equipment "talking" to each other over a distance).

Robert J. Potter, in an article on electronic mail (Science, March 1977) describes three functional characteristics of electronic mail (1) originator (2) transmission (3) printing. He goes on to say:

"Electronic mail can be originated by conventional means (typewriter, handwriting, printing), or the information can be entered on a keyboard device capable of either transmitting the information directly or recording the information on some medium, such as paper tape, magnetic card or magnetic tape) for subsequent transmission. The transmission can be accomplished through a number of channels, such as the direct distance dial telephone network, microwave systems, satellites, and packet-switched networks. The mail can be printed in any of several ways: impact printers, or faster printers using xerographic, electrographic, thermal, or ink-jet technologies."

The growth of the alternative methods of electronic mail delivery depends mostly on social/political decisions; all of the systems are in some degree used; and they all have special qualities making them more or less desirable for different purposes. For example, "facsimile" communication might be most effective where actual copies of documents are more important than the transference of large amounts of information; the use of communicating word processors on the other hand are most often employed by newspapers where a large amount of information must be shared.

POSTAL SERVICE

The U.S. Postal Service is, of course, at the center of discussions about electronic mail, with new forms being developed by private companies, making the Postal Service's role unclear. They have for years advanced the use of electronic communication devices and computers for sorting and even sending mail, but recently have begun research and development of electronic systems, involving point-to-point transmission (where carriers would still hand deliver mail in a local area). Hughes Aircraft Company has reported a Postal Service contract with COMSAT to test the

feasibility of transmitting facsimile mail solicited by banks and large corporations. The system would scan the original documents and convert their contents into electronic signals. The impulses would then be relayed via land lines to an earth station for satellite transmission to their foreign destinations. Once received facsimile equipment would convert the electronic impulses into black and white duplicates of the original letters.

RCA has also announced a contract awarded to them by the Postal Service to develop an electronic messaging science laboratory.

STORE AND FORWARD MESSAGE SYSTEMS

In The Crying of Lot 49 Thomas Pynchon invisions an underground postal service that has existed for hundreds of years outside the mainstream, carrying on its own mad dialogue. Today, in effect, there are many such alternative mail services, used by corporations, government and educational institutions, based mostly on computer programmed to receive, store and retrieve messages sent over regular phone lines, packet-switching networks, or internally within a particular office. Systems such Scientific Timesharing's Mailbox, AIM, developed for Tektronix Inc., Bolt, Beranek and Newman's Hermes system, and ones operated by IBM and Bell Telephone.

TELEFACSMILE

Documents can be entered into an optical scanning terminal. The electronic image of the document is transmitted over either conventional telephone lines or wide bandwidth communication channels, to receiving terminals capable of reproducing the scanned image of the original document.

A primary advantage of facsimile, as already noted, is that a document is exactly reproduced, including graphic representations and some photos. The ability of computers to transfer highly graphic information is still limited, however advances in coming years will merge the facets of actual transmission of documents with more dense graphic information and data oriented computer systems.

COMMUNICATING WORD PROCESSORS

Typesetting equipment has advanced rapidly in recent years due to new interfacing with microprocessors & computers and the use of photo-composition equipment rather than key-striking & imprint equipment (imagine a typewriter).

In a computer-assisted typesetting system a person might be able to (depending on specific system) justify right and left margins, or automatically hyphenate words, visually compose documents on a video display screen (changing type sizes and styles to accommodate available space), or store text and retrieve it for future editing. With the same system it might be possible to send versions and final copies of a distance.

In a computerized typesetting system pieces of type/sections of a document can be moved about, edited and corrected, merged with other pieces stored in memory. For example, a person composing a letter can retrieve a previous letter (or some other stored information such as a budget), and include it in the present letter without recopying it. The document can also be sent to other computers for special processing of some kind (to have it, for example, formatted into a pre-arranged form); or the copy can be exchanged between typesetters. Typesetting on a large scale is sometimes done through remote terminals linked into a central processing computer.

Communicating word processors then would describe a system where equipment designed to write, edit and compose documents is linked to other terminals over a distance, and which can be used to transmit versions and final copies of text. Newspapers, such as the Wall Street Journal use such a system, dispatching original copy from writers at terminals through a central processing computer, and over a distance to branch offices using telecommunication lines.

TV-TELEFACSMILE

Matsushita Electric Company of Japan had developed a television set it is testing in the U.S. which can provide printed copies of either actual TV images as they appear on the receiver, or hard copies of documents sent by the program originator. For example, a Julia Childs type cooking show might make a recipe available to viewers, which could be gotten instantaneously by pressing certain buttons on the television receiver.

ELECTRONIC MAIL AND CONFERENCING

As noted before distinctions between communication & information systems is sometimes arbitrary. For example, EIES, a computer-conferencing system can be, and often is used as a straight forward electronic messaging system; The Source provides electronic messaging while also providing (limited) access to the New York Times Bibliographic Data Base.

Two-way interactive cable systems such as Warner's QUEBE system, and versions of Viewdata, can support some of the features of electronic mail and conferencing.

The naming of computer-assisted communication systems is difficult because systems develop, with names applied like brand names, and because there are over-lapping parts which can be recombined in many ways, adapting to particular needs. Some of the alternative names that Turoff and Hiltz mention in The Network Nation, are: teleprocessing, electronic mail, electronic message systems, teleconferencing, computerized conferencing, computer-based conferencing, computer-mediated interaction, electronic information exchange, computer-assisted teleconferencing, and computer-mediated teleconferencing.

We have included in this section several systems whose main goal is communication between individuals and groups, and will call them computer conferencing systems even though there are dramatic differences between the systems.

In a computer-conferencing system a computer is used to structure, store and process written communication among a group of persons. When something is entered through one terminal, it may be obtained on the recipients terminal, immediately or at any time in the future until it is purged from the computers memory. To participate in computerized conferencing, the members of a group type their written comments of contributions into a computer terminal attached to a telephone, which transmits the material to the host computer (or directly from terminal to terminal in some cases).

Instead of a face to face meeting in which only one person can talk at a time and everyone must be present at the same time and place, the insertion of the computer into the communication network means that all individuals may enter and receive the materials at a pace, time and place of their own choosing. The computer stores each entry and delivers it to those to whom it is addressed the next time they join the discussion and are not busy making an entry. Thus, the participants could conceivably all be making entries simultaneously, they could be spread out in locations all over the world; and the sending and receiving of material could occur minutes, hours, days, or even weeks apart.

A computer conferencing system (called by the designer, a computer-mediated communication system) for dispersed groups of people was designed and implemented in 1970, at the Office of Emergency Preparedness, of the Executive Office of the President (United States). The people who designed this system, EMISARI, including Murry Turoff, designer of EIES, had backgrounds in the research and design of organizational communication structures; versed in methods for facilitating groups of individuals to work together, make decisions, share information, understand each others points of view.

The Delphi, for example, is a method designed to structure group communications in such a way as to capitalize on the strengths and minimize the weaknesses of collective problem-solving. In a delphi, structured communication process, judgements/ideas/opinions on a particular topic are collected using carefully designed sequential questionnaires, interspersed with summarized information and feedback on opinions derived from earlier responses.

The EMISARI system was an outcome of translating techniques such as the Delphi into a computerized form; and as a response to the need of the Office of Emergency Preparedness to be in touch with its branch offices.

"The ten regional office of OEP needed to be able to generate and share timely and useful data on the policies, problems, and progress related to the wage-price freeze(1970). The regional offices had to respond to requests and inquiries from the public in a way that was consistent with the initial guidelines and emerging modifications and interpretations. The central OEP management had to make sure that policy interpretation was consistent from region to region, and that the Cost of Living Council was kept well informed of the progress and problems that occurred."

EMISARI was designed to meet the needs of the Office of Emergency Preparedness, and was programmed, for example, to set up alternative communication forms, such as collections of numeric estimates, tables of numbers, and situation report forms, and have those assigned as a permanent responsibility to some member of the communication group who would

supply the information on a regular basis.

EIES, in some ways is a direct outgrowth of EMISARI, but was designed to potentially meet the communication needs of many types of organizations, with a focus on the scientific research community. (EIES is described in great detail later).

Since the early 1970's several other computer-mediated communication systems (or computer-conferencing systems) have evolved.

The Personal Computer Network (PCNET) is a national electronic network created by Dave Caulkins. In the PCNET system there is no central processing computer (as there is in EIES). The system allows individuals to dial up other computer terminals and leave messages. Regular phone lines are used, and design of the system has included sorting of garbled messages (due to the quality of phone line transmission).

The Community Memory Project in San Francisco, was one of the first computer projects devoted to general public access to computers for communication applications. Between 1973 and 1975 CM put inter-connected terminals in public places in San Francisco (including a public library and the Whole Earth Catalog store). People used the terminals as electronic bulletin boards, leaving and picking up news, messages, reading lists, poetry, classified ads.

A new version of the system has been developed and will be implemented in several test sites in San Francisco neighborhoods. In the new system each set of about 14 terminals will form a node connected to a central-processing unit. Each node will be governed by an organization of individuals and groups in the community served. The system is one of the few being developed with terminals being placed in the public sector (terminals will be in community centers, libraries, etc.). Future plans call for regional networks of computers which could be linked to each other when appropriate.

The Source is one of the most ambitious information & communication systems being offered to the home-computer market; it most resembles the traditional idea of an information utility. The Source is a joint venture of Digital Broadcasting Corporation and Dailcon Time Sharing Corporation. It is a combination of electronic mail, data base, and and provider of small computer software programs (self instruction, financial management, etc.). To join The Source one can buy terminals directly from the corporation for between \$595 and \$2000, or lease them at about \$20 a month. If a customer has a terminal then there is a one time registration fee of \$100, and a per hour use charge of \$15 an hour between 6am and 7pm, and \$2.95 an hour evenings, weekends and holidays.

Some of the services and information available on The Source include: classified ads and bulletin board, electronic mail, NY Times news summary, simple shoppers service, games, entertainment and self-instruction programs.

There are quite a number of other systems being used or under development. Panalog is a discussion oriented computerized conferencing system being developed at General Telephone and Electronics (GTE), and presently used by some members of the American Society of Information Scientists (ASIS). CONFER is a system used at the University of Michigan for experiments in citizen involvement in public issues. Xerox and AT&T have both been developing large scale systems, pending FCC regulation decisions before marketing them. The Institute for the Future's

FORUM computerized conferencing system was developed in the early 1970's to allow structured-like Delphi activities for group communication, and has been re-designed under the name of PLANET. There is a system in England called CONCLAVE; and one in Canada designed by Bert Liffman of Memo From Turner (an organization) for the Canadian government called The General Conferencing System.

Control Data Corporation, which has been making dramatic bids for marketing computer technology to the general public and special audiences, has its own form of conferencing called Technotec. In Technotec a person offers a description of a technology they have to offer, or wish to find (a technological solution to a problem), and the information is entered into a computer and made available to others who call up a computer and ask questions using keywords. It is expensive, operating like a classified ad in a newspaper, one pays for entering a request or a bulletin; one resource element which is either "1 techno-unit" or 24 minutes search time, which costs around \$35. \$3000 a year allows one 88 of these elements.

COMMUNITY BULLETIN BOARD SYSTEMS

Microcomputers are being used to establish simple message systems allowing people with computers and computer terminals to enter and receive messages "posted", stored and indexed on a microcomputer that has been programmed to answer the phone and talk with the person at his/her terminal calling in. It is reported that in 1979 there were at least 30 of these community bulletin boards, most all of them done on a volunteer basis, including one in Beaverton, Oregon.

It is interesting to note that these microcomputer-based community bulletin boards can be interconnected with other local bulletin boards, into an exchange totally owned by its users.

ELECTRONIC FUNDS TRANSFER

We seem to be becoming a "cashless society", where financial transactions take place electronically. We've adjusted easily to special consoles installed by banks for after-hour bank transactions. The number, and near-necessity of credit cards in general is another indication. We've learned to accept the new noise cash registers make these days; ones, for example in grocery and department stores which serve several functions including automatic inventory and order/entry tabulations.

Possibly the economy is going through a dramatic shift as more transactions between buyers and sellers and financial institutions are carried out electronically.

Even now a number of banks allow corporations to access their bank accounts directly by computer terminal. Viewdata and Warner's QUEBE system have experimental direct financial transaction services. On viewdata companies buy commercial space as they would on regular broadcast television, however persons may use the system to directly order products from their home terminals. It is possible to include within this transaction direct access to one's bank account, so that a purchase

might be made, funds transferred directly to the seller, with the buyer being presented with his/her new bank balance.

Turoff and Hiltz, in *The Network Nation*, foresee the possible use of computer-assisted communication in electronic funds transfers, and how it might facilitate more complicated transactions between people. It could, in effect they suggest, change our economic structure towards a more direct bid-and-barter system:

"In fact, it would now be technologically possible, for about a half-million dollars, to set up a single computer that merely allowed individuals to seek and transact exchanges of goods and services in which no actual money changed hands, and transactions were handled in some sort of credit unit other than dollars. The computer would run a settlement function, so that your plumber got credit for the job he did for you from the grocer for whom you performed legal services. It is also possible to introduce interest on credits and deposits and also borrowing of credits. Is such a system a bank in the regulated sense, or is it a communication system in the FCC-regulated sense, or is it an information system? Or an employment agency? Or perhaps, illegal gambling."

There are many thorny political problems we encounter when seeing the possibilities of an increasing amount of bid-and-bartering in the U.S. (estimates also run high for international bartering; being estimated that as much as 40% of world trade being bartering in nature). Skill exchanges, invisible colleges, learning networks, resource and personal support networks have emerged in the last decade along with barter festivals, swap&exchange centers, and sophisticated swapping services for large corporations. The Internal Revenue Service, among others is concerned over the growth of such exchanges, sometimes representing methods for people to avoid paying taxes.

WORDS AND MORE WORDS

First there was Gutenberg who invented moveable type, the method of typesetting which was used virtually unchanged until the 19th century. The linotype machine, invented in the later 19th century, allowed a typesetter to sit at a keyboard and select characters by striking appropriate keys, casting a one-line piece of type to a predetermined length.

Paper tape controlled systems were introduced that allowed a different interaction with actual typesetting. In this system an operator might use a device that punches a tape that can be read into a linecasting machine, with characters and other instructions, thus allowing the typesetting to take place at a more efficient speed, being not inhibited by the slower input of a human operator. There are other systems along these lines in operation today, however there have been advances in direct-composition equipment (typewriters, cold-type, "strike-on"), photo-composition techniques and the introduction of microprocessors and computers.

An ordinary typewriter produces, at least by definition, "typeset" copy. Some typewriters can do some higher-function typesetting routines, e.g. proportional spacing (letters take up space proportional to their

size, an "i" is smaller than a "w"), and different typesyles.

IBM and others have introduced "super-typewriters", with high-quality type, more typesyles and sizes (within each style), and some margin-justification capabilities.

High quality typewriters have also been developed with, what is sometimes referred to as, "word-processing" capability; typewriters with memory. For example, the IBM-MT system consists of one or more recorders that produce unjustified copy and coded input magnetic tape. If the input is correct, the magnetic tape can be processed, and a selectric composer (typewriter) sets justified composition. If there are corrections, these can be made on another magnetic tape, and the tape reader merges the correction tape with the original tape to produce the final composition.

These typewriters with memory can be programed to type and retype particular documents at a rapid speed; or a document can be stored, have corrections made and retyped later automatically from the stored copy.

The largest advance in typesetting involves what has just been referred to: the use of micro-processor and computer control and the evolution of photo-typesetting and photo-composition typesetting.

There are several methods of typesetting using photographic principles (an image, light source, and photo/light sensitive material). Generations of the equipment have advanced through several stages since the 1950's, until today the most advanced systems involve a merger of computer/micro-processor technology and high resolution Cathode Ray Tubes (CRT terminals/video-display terminals).

The application of photo-composition devices was advanced most in the newspaper industry where efficient and speedy composition of materials was more important than high graphic quality.

Video-display terminals allow an operator to view the contents of an input tape (copy produced by a complimentary equipment), and then to add, delete, change copy, in the end, producing a corrected tape. Operators may now, not only edit pre-keyboarded (typed) copy, but also do make-up/layout directly on the screen. Some video-display terminals allow tabular material to be show on a screen exactly as it will be typeset.

Some newspapers use such systems in conjunction with a computer, programed for storage and retrieval, allowing writers to enter articles directly into the system from terminals, where it is stored on magnetic disks, can be corrected, read by others, and sent, with instructions to typesetting equipment.

This same typesetting process can be used as an information management system. As well as the articles (copy) being written, and in the case of newspapers, "yesterday's news", information stored on other computers (for example, a bibliographic data base), can be incorporated into copy being produced.

To imagine all this it is necessary to think of text, data, graphic information, and human communication, as all potentially "machine-readable".

Information (characters, words, numbers, etc.) can be fed into a computer in a variety of ways. One of the earlist forms was the notorious punched card. The operator of a key-punch device depesses keys that activates a punching device that creates cards which can be read by a computer. Punched paper tape, instead of cards, can also be used.

In both cases the actual text can be merged with other special commands which directs the computer to perform particular functions (for example on a paper tape that might be fed into some typesetting equipment, holes are punched taht tell the computer what typesyle and size to type in.

Optical Character Reading (OCR) has also been feasible for a number of years. Typed pages are collected and passed through a scanner. Often the typing is done with a special type-face, but new methods allow the transfer from most ordinary type. The scanner (or reader) rearranges the alphabetic characters and transfers them to magnetic tape. Such a scanning can also be done to transfer microfilmed text to a computer.

With the merging of these different technologies it is possible to move information around in a variety of ways. Copies of text, stored on computer storage-medium can be added to and corrected, with new copies being made when appropriate. This same text can also at some point enter a communication system, where, for example, several authors could write an article together, and have it eventually, sent from one system to another to be typeset.

The view this gives us of writing and publishing is odd in some ways. For example, a directory published in this fashion, could have daily additions made to it. It would never be the same book twice (to echo a Greek philosopher). With other persons, equipped with a computer or computer terminal, we might send parts of (a very updated) directory, along with a letter (an electronic message) received requesting some information. It could be sent in several forms, microformed, or directly to the terminal, or to another "node" where it was typeset. The same directory might be a joint project, set up on a system like EIES, as a special "directory conference", where geographically-dispersed individuals and groups made additions and corrections within some kind of guidelines (a particular format for the information).

ELECTRONIC VOTING SYSTEMS

Direct participation in the democratic process, as represented by the traditional town hall meetings of New England, seem impossible with the number of people and complexity of issues & decisions in the U.S. today; however electronic technology may make it possible to convene town meetings in an urban setting, or even on a national level.

Fantasies about the process, electronic or not, have abounded, culminating in the Bi-Centennial year (1976), with a number of experiments including: Washington 2000, Goals for Georgia, Goals for Dallas, Bend in the River (Oregon); conferences and communication processes that allowed citizens to vote directly on issues concerning the future directions of their region.

We have already mentioned interactive cable systems such as QUEBE and Viewdata which can support some direct voting and opinion polling; and that EIES has been programmed to provide for efficient voting on issues by participants.

Computer-based electronic voting systems have been set up in a variety of contexts, including Televote in Palo Alto, designed for communities/neighborhoods, and small scale systems, such as one developed by Harry Chandler Stevens for town-hall-like meetings; here participants all have access to small consoles that allow them to respond to issues raised, with the results being instantly tabulated and displayed for the group.

State Legislative Assemblies, including Oregon's, use electronic voting systems. Here, terminal operators enter information about current action on legislative measures which are instantly available on terminals

throughout the capital, state agencies and private organizations. A state printer can convert the data base into camera ready copy for publication. The system automatically tallies member's votes and feeds directly to the Measure Status Subsystem for inclusion in the "Daily Calender", a publication which contains the history of introduced measures; tables which summarize legislative action, and schedules for hearings. Other plans, under the more general name of the Oregon Legislative Information System (OLIS) calls for linking this voting system into other data bases and communication networks to create a system to serve legislative communication, information and research needs.

A public tie-in with such a legislative voting system could also be possible through telecommunication links, allowing, for example, the placing of computer terminals in public places (libraries), geographically spread through-out a state, allowing citizens to be informed about current legislative action.

If this same system were two-way, a system that allowed citizens to register their response to issues, we might have a more effective direct-participation system.

COMMUNITY DATA BASES

There are a number of computer applications we have not addressed in this report (to say the least!), for example: numeric data bases, record keeping systems; simulation systems, such as those used by architects and engineers in plotting design variables, and all those ogreish systems that computer nightmares are made of, such a credit bureau records, client-transaction, criminal information tracking systems.

Although there are ways that the computer systems we've described can be misused, and individual privacy threatened, most of the concern about computers as "big brother", is about record keeping systems where information about individuals is kept for more efficient marketing, or under the auspice of providing more effective government services.

The invasion of an individuals privacy could take place without computers; the information collected is usually done by humans. The processing and manipulation of information facilitated by computers is where the threat lies. The same methods we speak about elsewhere, that allow machine-readable information to be transferred from one system to another, that has great potential for decentralization of power based on knowledge, and individual empowerment, can also be used to transfer and merge large data bases about individuals, which in isolation may be harmless but when combined and manipulated, creates some of the morbid 1984 fantasies.

What we are referring to as a "community data base" has some of the controversy surrounding it, but the tradeoffs are important to consider.

As an individual human, a community needs a monitoring process; filters and organizing mechanisms that allow the individual or the community to take life-sustaining and creative steps forward. There is an interesting conflict in the recent tax revolt related to this monitoring process. The demand is, on the one hand, for less government expenditure, and on the other hand, for more efficient use of tax money. Government units are under pressure to demonstrate efficiency, need, and cost-benefit trade-offs. This kind of monitoring and analysis demands more information, more record-keeping, more evaluation of services, more time spent justifying programs. All of this is time and money consuming.

In any major urban area today, there is some form of de-facto community data base, in some cases it may be centralized, in most cases it is spread through several/many government departments and other community organizations. There have been many theoretical models developed of the community/urban data base, a one-stop-shopping place for all vital community statistics. It is unlikely that there is such an animal; it is more likely that methods can be found which will protect individual and organizational privacy; systems which will allow for different data bases to be "networked" when appropriate--minimal computer protocol techniques (allowing computers to shake hands and talk to each other), and basic agreements about collecting and organizing information.

The kind of information routinely gathered today by the variety of players in an urban community might include such things as: tax revenue information, real property transactions, crime statistics, community surveys and needs assessments, information on the physical plant of the city, census information, human service client records, school facility usage, environmental quality statistics.

The information gathered, maintained and manipulated by agencies and organizations may be for internal use only (client records) or it may be specially generated for public use (such as census information). The degree of interaction between this internal and public information is of great importance. It poses both a threat to privacy, and a potential for coordinated, more efficient delivery of vital services and plans for future community development. Too often, agencies and organizations, interested only in their own internal goals and objectives, and/or about client privacy (rightly so), spend time and money re-inventing the wheel, compiling statistics that someone else already has, or by not sharing information with others who could benefit from it.

There has been substantial research done towards creating more efficient coordination of data collection, manipulation and sharing; much of this coming from the federal level through research supported by the Department of Commerce, National Science Foundation and the Law Enforcement Assistance Administration (LEAA).

Some specific techniques have been developed to coordinate the gathering of census and census-like information. One such process is called geo-processing. Geoprocessing is used when information is needed on aggregate numbers of people, housing units, etc., in a specified geographic area, rather than on an individual basis. The heart of a geo-processing system is the geographic base, the computer "map" of an area. The base can be created by digitizing, or assigning location coordinates to existing maps. The Bureau of Census offers another type of base: The Dual Independent Map Encoding (DIME) which lists streets and addresses along with X-Y coordinates. When data is fed into the computer, it is compared to the geographic base file and a location code is assigned, a process called geocoding. With the geocoded information it is possible to sort and resort the statistics for specific needs, for example if information is needed by neighborhood sub-divisions rather than by census tract, it can be accomplished.

There have also been attempts to create more effective community data bases through establishing clearinghouses/ centers. For example, the University of Washington Urban Data Center which provides computer geo-processing , research, generation of maps, and other data processing services; or the Lane County Regional Information System, which operates a computer shared by over 30 public agencies. The computer stores records for member agencies. The agencies have their own computer ter-

minals, with software to meet their specific needs while being in a system that allows for sharing of some information.

ACCESS, a project funded by the National Science Foundation in Santa Barbara, and similar to other "urban observatory" models, was an interesting approach to creating an urban information center, somewhere between a library and museum; where both citizens and government employees could obtain data about the urban environment, from occasional special exhibits and workshops to access to planner's tools such as maps and statistical information.

In the early 1970's a traveling exhibit put together by the Philadelphia-based group, GEE (Group for Environmental Education), called, "making the City Observable", brought together a wide variety of communication and information tools that could be used to comprehend the urban environment, ranging from complicated maps illustrating the many separate (and inter-connected) systems of a city, to computers programmed to manipulate data that would allow one to see the consequences of possible future actions.

One of the more futuristic ideas in the exhibit was a kind of electronic display that when plugged into a data base containing vital statistics of a community would, in effect, register the present "mood" of the city; for example, when the crime rate went up, lights would be triggered representing the communities leaning toward violence and despair.

It is clear that for effective community decision-making, involving private citizens, government, the private corporate sector, the non-profit education organizations, and the "third sector" (volunteer and grass-roots groups), agreed upon methodology and statistics are critical. Dialogue between the different sectors breaks down, even with the best intentions, when basic facts are not known or agreed upon. If we view all the players in a community as involved in problems-solving, then a central issue becomes what is a problem, or what is "the" problem. Too often problem-solving goes on in isolation, allowing for the sometimes tragic, and sometimes, farcical case of a problem being solved by one group working within one system, only to pop up in someone else's system as a new statistic, possibly another unexpected problem.

ON LINE BIBLIOGRAPHIC DATA BASES

A data base can refer to any organized collection of information. Using this as a definition, a library is a data base, in so far as it is an organized collection of information.

Although the mission of the library has traditionally been to provide public access to books and serials the changing information environment has forced libraries to think of themselves as information providers and not just as proprietors of good books. The complexity of individual information needs has accelerated, and a library is now likely to be involved in collecting, cataloging and making available new forms of information such as: films, video tapes, microforms, fugative documents (publications from non-traditional publishers), and on-line bibliographic data bases.

With our loose definition of a data base as any organized collection of information we have to add specific qualifiers in order to distinguish types of data bases. The first qualifier we add is "machine-readable", which

means information that is available through interaction with data processing equipment (computers) directly through a terminal connected to the computer or through special telecommunication links.

There are many machine-readable data bases produced by and/or used by corporations, government, and educational institutions, for internal or public use, on down to the data base the owner of a micro-computer might create (e.g. household bookkeeping, file of personal friends, reading lists, whatever).

Now if we add yet another qualifier, "bibliographic" then we are referring to document-related data, as distinguished from statistical data bases. So we have, a machine-readable-bibliographic-data base (which might also be referred to as an on-line-bibliographic data base.)

It is easiest to understand what an on-line bibliographic data base is by imagining their manual predecessors: bibliographies. A bibliography typically consists of: author, title, publisher (or source), date of publication, and perhaps length and price. On-line systems also resemble library reference books, such as book digests, annotated bibliographies, and periodical abstract indexes; where as well as basic citation information there is also a description (an abstract) of the literature referred to. Examples would include, Psychological Abstracts and Reader's Guide to Periodical Literature.

As there are research groups and publishers of these reference books there are researchers and "publishers" of on-line bibliographic data bases, and in fact they are sometimes the same; for example "Psychological Abstracts" is available both as a hard copy reference book and as a machine readable data base.

Although in many cases one can actually buy or lease machine-readable data bases, available on some computer medium such as a magnetic tape, the expense is prohibitive for many users. What has grown up to meet the need for public access to the many different data bases are wholesalers such as Lockheed's DIALOG, which acts as a middleman, providing one-stop shopping through a computer set-up that allows one to access many data bases at a distance through telecommunication linkages.

On-line Bibliographic data bases have been around and available to the public since about 1972, when Lockheed's DIALOG opened its door by offering access to one data base, ERIC, (Educational Resources Information Center). Today more than 70 are available.

An on-line information system (which would include bibliographic as well as some other related type data bases) is one in which information is entered into a computer, and the computer is operated with a set of programs that enables a user to withdraw specific parts of the information according to their needs. How one gets information from data bases is going to differ depending on what system one uses, but we will use DIALOG as an illustration.

The DIALOG processing computer is in Palo Alto, California, so the first thing to do is to call up the computer, using a value-added communication network (referred to earlier, see Packet-switching networks), called Tymenet. The tymenet computer will answer the phone, and ask you who you are (actually asking who your computer is, the type), and then request that you type in the name of the system you wish to call. After we enter the abbreviation for DIALOG, the computer calls the computer in Palo Alto. DIALOG then asks us about who we are (our code), provides some "news" (changes in policy, new data bases, etc.), and then will stand waiting for us to respond to its "prompt", which in the case of DIALOG is a question mark, and is like the computer saying, "yes, what can I do for you". On DIALOG there are some 70+ data bases

each with its own numeric symbol. Depending on the nature of ones need a number is typed in and the system responds by opening that file (in effect, opening up a particular reference book). there are a variety of possibilities but we will just follow one choice. Typing in the word "select" and combining that with a key word or several related keywords is the equivalent of looking up a word in the index of a book. Let's say; for example, we type in the word "energy", the computer will run through what ever data base we have selected (it will actually at this point only look through an index to the data base; if we enter another command it might look through the entire record). Almost instantaneously the computer will respond by saying, "yes, I found 5000 references to "energy" in my memory' (actually, the computer being very busy and always brief will say "5000 energy"). We might gasp and realize we can't deal with 5000 references and decide to narrow the choice. We can ask the computer to search for another keyword/phrase, something like: "select community (w) development", with the (w) meaning "with", the computer knowing that means to find references where community and development are found in that order in a data base record. The computer might then say, "yes, I found 2000 records with "community(w)development". In both cases the computer has put aside these records into "sets". If at this point we say combine land2 we will get a "set" of the records that contain both the words "energy" and "community(w)development".

There are many other special ways of interacting with the DIALOG computer, but the basic quality of "searching" (looking for documents) is illustrated by this example. After the interaction we can request the computer to type out the records it has put aside into various formats, receiving them directly on our computer terminal, or, when the number of records is extensive, we can request "prints" of the records to be sent in the mail.

The information on each record will be basically bibliographic citation and abstract, in most cases the actual documents referred to are not available directly, although information about ordering the document will be listed (publisher, source, author, etc.).

The important link between a description of a document and the actual location of a document is being developed through library networks such as OLIS and RILM, where card catalog of actual library holdings of different libraries are computerized, are on-line. (see next section).

The growth of the database industry since the early 1970's has been significant. For example, in 1975 there were only about 100 on-line information bases (publically available); by early 1978 that had grown to about 360. In 1973 a University of Illinois study revealed that there were about 300,000 individual "searches" conducted; with 700,000 in 1974, and more than 2 million in 1977. Some authorities predict that in 1980 the number will have grown to more than 4 million (not including an additional 2.8 million in Europe).

As well as DIALOG, other data base wholesalers have entered the scene, including the System Development Corporation and Bibliographic Retrieval Information.

Due to competition, and decreased telecommunication and computer costs using on-line information systems has decreased in cost, for example, between 1975 and 1978 the cost for an average search dropped from \$50 to \$25. Costs now are not what one could call "cheap" but they are within the means of many. Charges for using DIALOG are based on the actual costs of being "on-line" --the time one is actually connected to the computer, and it differs depending on which data base one is using, from \$25 an hour to \$90 an hour. Costs of off-line prints of the data base records

range from 5¢ to 20¢ a piece. In considering these costs one should compare it with costs that would come about from the doing the same research manually, and the fact that often the actual time on the computer may be less than 5 minutes.

EXAMPLES OF DATA BASES

The following is a description of different on-line information systems available from data base wholesalers and individual data base providers.

In 1977 75% of the total data base records were either scientific & technical or medical & biological. Many of the on-line medical data base records are managed by the National Library of Medicine, through, for example its MEDLINE data base. Examples of scientific & Technical data bases include: Compendex, with 550,000 engineering records; Geo-archieve, with 200,000 records in geology and related fields; Scisearch, one of the largest, with 1.5 million records in many scientific fields.

There are a number of data bases developed specifically for the business community, including: Management Contents and ABI/INFORM, with over 100,000 references; the F&S index which describes manufacturing establishments, and an accompanying data base on non-manufacturing establishments.

ERIC (Educational Resources Information Center) is one of the oldest data bases, widely used and highly refined. In most case documents referred to on the ERIC base can be ordered directly through a complimentary clearinghouse.

There are an increasing number of energy (and environment) data bases. Some developed by private corporations such as Enviroline, Pollution Abstracts and Energyline. Other government sponsored ones have emerged such as the Department of Energy's Solar Energy Research Institute's SERI, which is a compilation of facts about solar energy models.

There are a number of good federal government-sponsored data bases, some available to the general public, others for internal use. NTIS (National Technical Information Service) contains descriptions of over 500,000 reports published under contract to the federal government; GPO, which is a description of publications of the Government Printing Office, and Agricola, which is a computerized card catalog of the holdings of the National Agricultural Library.

In addition, private corporations produce data bases that track different kinds of government information, including news about U.S. defense contracts, an electronic version of the Department of Commerce's dialy record of announcements of government contracts, and the Federal Index which tracks U.S. Congressional activity.

FAPRS, the Federal Assistance Programs Retrieval System was developed by the Department of Agriculture's Rural Development Service to facilitate use of the printed catalog published annually by the Executive Office of the President, the 1500 page (with supplements), Federal Domestic Assistance Catalog. FAPRS is a computerized index only, allowing one to narrow down the choices and complexity of the printed catalog by being able to choose key words, and being directed to the appropriate section in the catalog. FAPRS is available to the public in several ways, including U.S. Congressional Representative's offices and state Executive offices. Recently the Bell system (AT&T) has begun to offer FAPRS as part of a package deal including a teleprinter available on an on-lease basis.

There are many government data bases that are not available to the public. For example, the on-line information system, SCORPIO, developed by the Library of Congress for its Congressional Research Service. In addition to internal CRS reports and other significant documents generated by CRS for Congress, it also includes issues briefs, the National Referral Center Master File (a description of 12,000 information-providing organizations and agencies around the country), digests of congressional legislation, General Accounting Office files, United Nations documents and selected abstracting and indexing of journal articles. In July 1979, the House of Representatives took some action as a first step toward making some of SCORPIO available to the public, by making LEGIS, a sub-part, available. LEGIS contains the status of bills and resolutions presently before Congress.

There are other unique on-line information systems, some of which defy traditional "bibliographic" definitions. SSIE (Smithsonian Science Information Exchange) describes on-going scientific research. The Encyclopedia of Associations, published in a hard copy by Gale Book Company, is available on DIALOG, listing over 50,000 organizations in the United States. The Foundation Index is a description of projects currently funded by major private philanthropic foundations.

Then there's Conference Papers, an index to some 500,000 conference proceedings, and Dissertation Abstracts, and the American Statistics Index. The Magazine Index and Newspaper Index, providing abstracting & indexing of most major newspapers and large circulation popular magazines. The Newspaper Index is also offered (but expensively) as a daily service, allowing one to keep up on news appearing in major newspapers around the country.

The New York Times Information Bank, one of the most popular data bases for public libraries, contains over 1 million records, descriptions of articles appearing in the New York Times, and in about 60 other major newspapers. Microfiche copies of the articles cited are also available.

BENEFITS AND USE

There are many benefits to using on-line information systems. In some cases it is the only method of obtaining information; in other cases one might be able to obtain the information using traditional library research methods. Here are some general considerations:

- From a computer terminal located in one's business or home it is possible to access at least 100 data bases. It is possible to mix and merge these data bases, using the same "search strategy" (being the key words and computer commands that tell the computer what to look for).
- In most cases on-line searching will only take a fraction of the time of a manual search.
- In many cases, when labor is a primary cost factor, it will be less expensive than manually searching for information.
- On-line information systems often represent a more comprehensive view of what is available (although most people report doing additional "off-line" research).
- A single search can cover both current and past literature. Using library reference books, on the other hand might involve

one looking in many volumes.

- Physical manipulation of material is avoided. The searching allows one to "look before leaping".
- The number of ways of finding the information is increased by more effective indexing. One can, for example, search an entire description of a document (of say 100-150 words) to find keywords and phrases, whereas looking something up in a printed index (in a reference book), one is using a pre-determined index.
- That one can obtain prints allows one to not take notes while doing research.
- Computer searching, also creates a new way of thinking; viewing information & research needs in terms of keywords and combinations of keywords.
- There are other features of on-line searching, some built into the system, others that are up to the creativity of the searcher/researcher. One feature is referred to as Selective Dissemination of Information (SDI). A user of an on-line system can save a "search strategy" (the chosen keywords and commands telling the computer what to do with the keywords). With this saved by the computer one can log onto any data base and retrieve any (and only) new information in some particular subject area. This in effect becomes a personalized newspaper, or like having a patient research assistant.

PROVIDERS AND SEARCHERS

We have already referred to "searchers", the term most often used to describe persons who do research using on-line information systems. A new breed of librarians and Information Specialists have come about who act independently or within special research organizations, to provide research services.

There are many information centers who, for a fee, conduct on-line research services. For example, Editec Inc, a Chicago-based company that calls itself an "electronic library"; the Information Clearinghouse of New York, presently serving some 3000 clients annually. Or there's Information for Business (New York City), Information Access (Dewitt, New York), Information Unlimited (Berkeley, California), Inquiry (Buffalo, New York), Documentation Associates (Los Angeles). The fees for such services range from a low of \$15-\$30 an hour to \$50 an hour.

LIBRARIES

It is natural that libraries would be interested and involved in the development of on-line information systems; a number of the commercially available data bases amount to being electronic card catalogs.

In 1974 the Cooperative Information Network in northern California, through backing from the National Commission on Libraries and Information Science and a grant from the National Science Foundation, initiated a program for allowing access to Lockheed's DIALOG to library patrons.

It is estimated that at least 400 libraries, mostly academic and special libraries (corporation and private research), offer on-line searching to their patrons. The Los Angeles public library offers the service for free, while others such as the University of Pittsburg, Oregon State University, the Dallas Public Library and Minneapolis Public Library offer the service for a fee. The Minneapolis library set up a separate fee-based information service called INFORM, which offers a variety of services including on-line research.

The Dallas Public library offers on-line searching using the NY Times Data Base, and others available through DIALOG, they also, using a micro-computer, have developed their own data base, that describes services and information provided by local organizations and government agencies.

RELATIONSHIPS

As the home computer market grows it is likely the very nature of on-line information systems will change; with many new companies offering different data bases, and related services.

The wide-spread use of micro-computers may also create some problems. For example, it is possible using a micro-computer (programed in the right way) to interact directly with the host computer (such as DIALOG) with the actual search/research being done beforehand within the micro-computer. This means that when the two are hooked together, the actual computer-connect-costs are dramatically reduced. Also a person with a computer can transfer records directly to memory in their computer, and in effect create their own machine-readable data bases, by "plagiarizing" from existing data bases.

It is also important to note the possible relationships between on-line information systems and computer-assisted communication systems. As Robin Crickman has pointed out, people are more willing to believe and use information they get from people they know. One can imagine a system like EIES, with floating free-lance searchers, networkers, resource persons, and data base producers and operators; where access to the different data bases is mediated by human interaction. The indifference of huge data bases, and a feeling of being overwhelmed, might be easier managed when communication and information services are merged.

LIBRARY NETWORKS

If we look at the library as an institution that deals with information as a problem-solving resource we must change our traditional perception of a library as purveyors of books, and instead see the library as an important component in the "information industry". Instead of being concerned with one physical form that information takes (during its life on earth), the book, the library is instead interested in a common denominator, called information, present in same way in everything (from DNA to the Great American Novel). Information is sometimes defined as "that which makes a difference". Cataloguing (indexing) information is the science (or art) of separating things from one another by naming them. Separate one thing

(a piece or bit of information) from another, hang lots of labels on it, and put it somewhere where it can be found when it is needed. If a library focuses on information rather than "books", the process is still the same. Your basic card catalog points to information in the same way as an on-line information system "points" to information. A librarian cataloguing a book is doing the same thing as an abstracter, each one summarizes the information content of a thing (a book, magazine, etc.) but the librarian only lists basic information (author, title), and throws a few keywords as labels on the thing. An entry in an on-line information system, made by an abstracter, on the other hand, provides a summary of the information contents as well as basic information, and the labels used to identify the "thing" are many--in some complex data bases there might be well over a hundred labels. Imagine a card catalog with 100 cards for each book! Another important distinction between an on-line information system and a card catalogue in a typical public library is that a card catalog refers only to information contained in that library.

A library is a complement and balance to other major information providing institutions in the society, including the education system (especially lifelong/adult learning), the mass media, government and public service information providers, and a growing information profession (including corporations offering computerized learning [Control Data corporation]; The Source and DIALOG offering on-line information).

Information is provided by all these organizations, corporations, government agencies (etc.) and it obviously isn't just information that comes pre-packaged between two covers. Libraries too are involved in keeping track of information in new forms: films, video-tapes, on-line information, addresses, fugitive documents.

Libraries have become involved in providing "community information". And what is that? Well, it is everyday information, stuff that bulletin boards were invented for, and directories and resource files about local organizations, clubs, agencies, services, resources. It is referring people in a crisis to help. It is fugitive information, flyers, newsletters, environmental impact statements. It is gossip and rumors, names of people.

All this sounds natural enough, what better place to find out about the local community than a library. But in fact, often libraries have not been created in order to inform the community about the community; libraries in a pioneer setting (Portland 100 years ago) were established by the same people as the art museums, and they were attempting to bring culture to the community. Libraries have always played an important part in the community social life but libraries have not often focused intensively on the information environment of the local community.

The elements of community information providing (described above) have all been experimented with by many libraries around the country. For example, the Detroit Public Library has been operating a service (TIP) which operates much like a Human Services Information & Referral agency. The Fort Vancouver Regional Library (Washington) operated a card catalog that described individuals in the community willing to teach or share information & skills. Libraries in Kalamazoo (Michigan), Raleigh, North Carolina, Dallas, Texas, and others have published directories to organizations in their community that provide information & public services. Libraries provide research services to individuals and/or the business community, such as INFORM, at the Minneapolis Public Library. The Portland (Maine) library operates the Center for Lifelong Learning.

Table 1 Annual Gross Revenues of Major Information Industries

INFORMATION INDUSTRIES	Approximate Gross Revenue (in billions of dollars)				
	1970	1974	1975	1976	1977
Telephone	18.2	28.3	31.3	35.6	40.8
Telegraph	0.4	0.5	0.5	0.5	0.6
Specialized common carriers	0.0 ^a	0.0	0.0	0.1 ^a	0.2 ^a
Satellite carriers	0.1	0.1	0.1	0.2	0.2
Mobile radio systems	2.0	2.9	3.2	3.5	a
Postal service	6.3	9.0	10.0	11.2	13.0
Private information delivery services	0.7+	1.3+	1.6+	1.7+	2.4
Pulp, paper & board	13.0+	17.1+	a	a	a
Photographic equipment & supplies	3.9+	6.0+	a	a	a
Radio, TV, & communication equipment	12.8+	16.8+	a	a	a
Electronic components & accessories	12.8+	20.3+	a	a	a
Computer systems manufacturers	b	16.6	18.8	21.1	23.8
Computer software & service suppliers	1.6	3.2	3.8	4.5	5.3
Broadcast television	2.8	3.8	4.1	5.2	5.9
Cable television	0.3	0.6	0.7	1.0	a
Broadcast radio	1.1	1.6	1.7	2.0	a
Motion pictures	3.8	5.5	5.4	a	a
Organized sports, arenas	1.0+	c	c	c	c
Theaters	1.5	2.5	2.7	a	a
Newspapers & wire services	7.0	9.6	10.5	11.7 ^a	13.4 ^a
Periodicals (including newsletters)	3.2	4.1	4.4	5.0 ^a	5.6 ^a
Business consulting services	0.9	1.7	1.8	a	a
Advertising	7.9	9.7	10.0	a	a
Brokerage industries	40.6	64.0	69.1	a	a
Book publishing & printing	3.4	4.5	4.8	5.2 ^a	5.6 ^a
Libraries	2.1	d	d	d	d
Schooling	70.1	97.7	110.8	121.4	130.6 ^a
Research & development	25.9	32.7	35.1	38.5	42.7 ^a
Federal information institutions					
Census Bureau	0.1	0.1	0.1	0.1	0.1
National Intelligence community	4.0+	7.0 ^a	10.0+	8.0+	e
NTIS ^f	0.0	0.0	0.0	0.0	0.0
Social Security Administration	1.0	1.9	2.2	2.6	2.7
County agents, government	0.3	0.4	0.4	0.5	0.5
Banking & credit	61.1	136.2	132.7	a	a
Insurance	92.6	133.1	148.8	a	a
Legal services	8.5	13.7	14.8	a	a

♦ estimated

+ additional

There is competition in this, perhaps not blood-letting but nonetheless it is obvious some of the services provided by libraries are also, or can be, offered by other private and public institutions.

Libraries are looking for ways of maintaining and gathering support as an essential service. It has been estimated that only 20% of the adult population uses a public library once a month. A library, not making the need for their services is in danger of being "cut from the budget".

Ideally the library is the most democratic "storehouse of knowledge". A place where "all" information is provided objectively, where an individual can control their own learning evolution. The library is an archetypal institution, with a primary function in society that compliments and balances all other forms of information providing.

Libraries have to demonstrate their essential place in a society, find their niche in a changing information-environment, they also have to respond to demands for efficiency. Costs for producing and maintaining collections of books have risen dramatically. New forms of information are sometimes expensive (video-tapes, films). Cost of books have gone up, for example,

the average science book rose in cost from \$10.94 in 1964 to \$24.35 in 1977, while the average scientific journal rose around 41%. And, of course there's an information explosion. In 1960 there were about 3379 technical books published, while in 1974 there were 14,442.

It is important in such a situation to learn how to share resources.

Most state libraries have as one goal providing library services to individuals not served by county library systems, and to, in effect equalize library resources throughout the state. This is usually achieved through inter-library loans. An individual can correspond directly with a state library and request a book (etc.); and/or through developing inter-library cooperation.

Agreements have been reached between different libraries, either within a geographic area or between kinds of libraries (academic, research, corporate), where "union lists" are evolved which describe all the holdings within a specific network of libraries, and processes evolved for loaning the physical documents (or being able to refer someone to where a document can be found).

There are a number of state-wide, regional or special library networks providing such services. The most notable are, The Washington (state) Library Network; the Research Libraries Information Network (formally BALLOTS), and OCLC (formally, the Ohio College Library Center, Inc., now just OLIC).

Each of these networks differs in structure and services, but the basic focus is on creating centralized card catalogs of holdings of the network, and distribution, in some form, of the cumulative catalog.

There is a difficult conceptual leap to take beyond the point of these regional and special networks to something like a national one. The platform paper presented by the Special Library Association, at the November, 1979 White House Conference on Libraries, summarizes the situation:

"The National Commission on Libraries and Information Science defines the nationwide network as an integrated system encompassing state networks, multi-state networks and specialized networks in the public and private sectors. Its report advocates pluralistic cooperative programs and the optimum exploitation of the rich information and knowledge resources in the United States. What is envisioned here is the horizontal as well as vertical integration of all information resources. While an ideal nationwide network may be projected by the Commission report, a "de facto" network is being forged today; network component planning and development is now in effect with millions of dollars having been made available for this purpose by private foundations."

The Library of Congress, through its Network Development Office is the primary focus for a national model, and coordination of existing networks. Working with the Council on Library Resources, the National Commission on Libraries and Information Science, the American Association of Information Scientists, and others, attempts are being made to lay the groundwork for more efficient resource sharing through developing authority control systems (comparable methods of cataloguing materials); computer network protocols (how to get different computer systems to shake hands), and development of recommendations for legal and governing structures.

The need for resource sharing among libraries also surfaces when libraries begin using on-line information systems. On-line information systems are a tremendous resource, an equalizer, that can turn even the smallest library into a place that can locate descriptions of over 20 million documents. But being able only to point the general direction creates problems. Here's a citation to the document, now where's the thing itself. The merging of catalogs that describe the holdings of a network of libraries with on-line information systems, with their wizz-kid indexing will be a critical step.

The most comprehensive new library models are being created in the private corporate world and special research libraries, where some of the social/political restraints of public libraries are not present.

For example, IBM's information retrieval system, called ITIRC, supplements a network of more than 60 individual IBM company libraries, operating an enormous on-line information base of its own, containing abstracts of over 150,000 IBM technical reports and other documents, plus more than 1 million abstracts gleaned from external sources. Between 14,000 and 15,000 new abstracts are added per month. The Center employs 20 people, who conduct between 16,000 and 20,000 searches per year. They have an SDI (Selective Dissemination of Information) service provided to 5000 IBM specialists, providing them with personalized "news-letters. Member libraries are provided with microfiche copies of millions of pages of documents (some 1000 a month).

The Bell Labs library network consists of 25 libraries serving more than 10,000 technical and managerial employees in 9 states. To help these librarians work together the BELLREL system maintains an on-line information base of the entire book and journal collection. MERCURY, an electronic mail system is used to route information to interested employees. The library also publishes more than a dozen current awareness bulletins, prepared in whole, or in part by a computer.

COMPUTERS AND EDUCATION

Computer-assisted instruction hasn't exactly lived up to its "revolution in the schools" banner; there still are, at last count, more teachers than there are computers. Computers have been used in a variety of educational activities.

Computers can be programed to follow each student's history of learning successes and failures, and use this past performance record as the basis for selecting new problems and concepts the student should be exposed to. Curriculum (text, lessons) stored in this same computer is presented to the student in degrees of difficulty. Each student then is able to control their own pace of learning.

"Self-paced" learning such as this can be achieved without a computer. It is one important model of education, the tutorial, one to one, and where questions and answers are likely to play a larger part.

Computer-assisted instruction systems can be designed to provide adaptive text (also a feature of EIES, and other systems). If the contents of a textbook, on a particular subject, is stored in a computer it will have a different form than its printed counter-part. It will have a form somewhat like Rubber-Mans, being stretched into all kinds of forms by the learner's interaction with it. With the printed textbook we would have things like,

chapters, headings, sub-headings, table of contents, index, glossary, other useful organizational features. With the computerized textbook the organizing features are more under the control of the learner; by being able to, for example, at any time, request more information on a subject, and in effect create their own text and index.

For example, a student is "reading" a computerized textbooks on economics. While reading it, they come across a brief mention of the "Federal Reserve System", not knowing what it means they can inquiry the computer, which if programed properly, might respond with a definition, bibliography, a list of places elsewhere in the text it is mentioned, a contact for more information (addresses of branches, federal headquarters, etc.). If we stretch the system to include a communication system like EIES, those addresses might be account numbers of live people who can respond to questions.

The computerized textbook, with adapative text capability, is like a highway system or a watershed. There may be a primary artery (text) many directions to travel in and out of the central text (artery).

There are computer-assisted instructional systems being marketed by private corporations. Control Data Corporation designed PLATO, one of the better known, leanring systems, which it is now marketing, along with variations on it, to a number of special audiences, including through the establishment of Learning Centers, and developing learning systems for employee-education programs in corporations.

Similar learning systems are being developed in medicine for diganostic purposes. The CASNET/Glaucoma system at Rutgers which provides an organized structure for the diagnosis and therapy for glaucoma; the MYCIN system at Stanford, which assists in the treatment of infectious diseases; and the INTERNIST system at the University of Pittsburgh, which provides clinical consultation in problems of internal medicine.

The primary focus of these "learning (diagnostic) systems" is on providing professionals with research assistance; but we can also imagine a kind of public doctor, who we could interact with to try and figure out what was going on with our body. In a very general way, local medical associations have been doing that for sometime with recorded information on different medical subjects which can be listened to by calling a telephone number.

Computer-assisted instructional systems can be merged or interact with other communication & information systems we have described. There is the possiblity of something we might call the community information system that would provide a way for citizens to learn about their community which could be, in effect, a community textbook (a computerized textbook). The textbook could include instructions on how to travel into other store-houses of knowledge. Into, for example, a community data base, for the more serious researcher. Go in another direction away from the main community textbook and you might enter communication networks of individuals and organizations. Perhaps people offering classes in one of the subjects that has come up on the community textbook, or into a government unit network where specific questions can be addressed to the proper government department or specialist.

Massachusetts Institute of Technology (MIT) and the city of Cambridge have received a grant from HEW (U.S. Department of Health Education and Welfare. Defunct kind of) to design and put into operation an experimental computer-based information and learning service for public use at the Cambridge Public Library. The system will allow citizens to access

information about some basic community needs: delivery of municipal and private human services, telephone refer information, aids for helping citizens join into community decisions, and informal learning programs on a variety of general interest subjects.

INDEXING, ABSTRACTING AND RETRIEVAL

Some information theorists define information as "that which makes a difference" (you might want to try saying that a couple of times). It is difficult to imagine a world of flowing events without differentiation; without, for example, days, names, distinctions, categories, comparisons, principles, patterns.

"The basic premise of Information theory is that information is what every reduces uncertainty. This means that for there to be information there must first be uncertainty. A measure of information is based on the amount of uncertainty that the message cleared up. If no uncertainty exists there can be no information. If the message is predictable with certainty, if the probability of that particular sequence of signals is one-hundred percent (we already know what it contains), then it provides no information. The need for communication arises because something unguessable must be imparted concerning our understanding or actions. The essential aspect of information is the unpredictable, the surprising, as opposed to the mere repetition of gesture, incantations, or prayers."

INDEXING

Most all forms of indexing information can take place manually; computerization can improve the effectiveness of manual methods, but the basic principles remain the same. The step, however, between a manual system and a computerized one can be a leap. It is possible, but only possible, and not practical, to do manually, what a computer can do automatically. One of the primary feelings we express about a job is the degree of boredom in the tasks; a computer on the other hand does not respond to boredom, and in a perverse kind of way, seems to indulge in it. For example, the computer used by DIALOG (see, On-Line Information Systems), is programmed to, in effect, read the entire contents of a data base in its search for a particular word or phrase. If a typical data base record is 100 words, and the number of records in a data base, say 500,000, then the computer may read the equivalent of 700 lengthy novels, and with hardly a complaint about being bored looking at the wrong things.

The ways to index information are limited only by imagination, and the nature of the information and the uses it is going to be put to. The following is a breakdown of some methods of indexing information.

(1) Single Access Indexing....The type most often found in the back of a book, where single words or concepts (sometimes titles and authors) are arranged alphabetically. In a printed form, the index is pre-determined (a book). A manual retrieval system using index cards may allow one to change the basic categories, and add new entries under existing categories. A thesaurus of terms can be established to pinpoint inter-relationships bet

catagories. A thesarus of terms can be established to pin-point inter-relationships between catagories (even if only as simple as, "see", "see also").

(2) Key Word in Context (KWIC)....A form of automated indexing in which a computer is programed with "kill-words" (relatively unimportant words that don't change essential meaning, such as "and", "if", "the"). The computer can read, for example, titles in a bibliography, dropping out the kill-words, and placing each significant word in the title at the beginning of a new line.

(3) Key Word Out of Context....Where not only the title is displayed beginning with each significant word, but each of the key words is also listed separately (without the rest of the title).

(4) Coordinate Indexing....On-line information systems (such as those offered by DIALOG) may use KWIC and KWOC (sounds like radio stations) but the computer may also be programed to relate key words to one another with operating commands such as "(w)", translated roughly as "with". The computer might search through its records for "community" (with "development", meaning to find all records where those words appear in that order. Other commands will instruct the computer to find words with different relations (e.g., a word so many spaces from another in a record).

(5) Natural language....An entire document can be put into a machine-readable form, and a computer program designed to analyse how words are used in a sentence. The proximity of one relevent word to another is counted. The program might also analyse particular idioms so that real, rather than apparent, meanings are considered. It is possible to have, in effect, an automated indexing system, that would place an item where it could be found in hundreds of ways. Because of the expense of entering an entire document into a computer it may not always be practical. The most effective use of such a fully-automated indexing system would be where documents were composed in some machine readable form in the first place.

ABSTRACTING

A form of indexing is achieved when, instead of entering an entire document into a computer, a document is abstracted (described). This description then can be dealt with like it is the document if it has adequately summarized the contents.

A typical abstract will consist of bibliographic information (title, author, source, etc.), and a 50-100 word description (the actual abstract). Because of the imponderable volume of information we, as a culture deal with doay, the process of abstracting is critical. An abstractor has to be able to write a description of something (a book, an event, film) that will provide enough "labels" so that others following can find there way back to that spot.

An abstracter isn't necessarily knowledgeable in everything under the sun, and in cases it isn't necessary to know anything about a subject if particular guidelines are established, e.g. write down title, author, headings, and sub-headings, first and last sentences, etc. Computers have also been programed to scan a document for just such formatted information.

A 25 page technical paper which an abstractor is competent to abstract (and index), will usually take 10 to 20 minutes, depending on depth of analysis. A reading might include: title only, abstract and forward, table of contents, headings, summaries, and conclusion, or reading the full text. An alternative set-up can be established whereby several people do abstracting, and a document might be passed along being marked for a final editor.

RETRIEVAL

Our primary focus has been on electronically-based information and communication systems, but it should be kept in mind that in most cases some form of manual information system will exist prior to computerization, and in many cases there are on-going manual systems. Peter and Trudy Johnson-lentz, EIES User Consultants, use a simple (even old fashioned) looseleaf notebook to keep track of messages they are sending and receiving on EIES.

Some manual information systems to consider are:

(1) Edge-Notched cards...Cards, of various sizes and shapes are coded by notches along the edge of the card. Each notch can represent a different category. When entering a card in a specific category, a hole puncher is used to cut out the space on the card between the pre-punched hole and the edge of a card, therefore when a needle is passed through the holes, any card that has been so cutout falls from the pack of cards. The system is limited by the number of categories that can be used by the pre-punched holes, and that beyond a point, passing the needle through the deck of cards becomes clumsy.

(2) Scan-Column Card Systems....This system uses one card per category, with each item being catalogued having an accession number (a number assigned when it is entered into the system). When an item is entered into the system its number is placed on the appropriate category card, with the actual document being filed elsewhere. The system is limited by the fact that one must have a good sense of a limited number of categories.

(3) Optical Coincidence (Peek-a-boo)....Here also, one card per descriptive category is assigned, and an accession number ties the actual item to the optical coincidence retrieval device. An accession number is drilled into a unique x-y coordinate position. To enter an item into the system category cards that describe the item are selected and punched at a specific, unique spot on the card. Searching for the proper items then is achieved by superimposing the cards on a special reader (like a light table). The system is especially useful in finding items that fall in several categories.

NETWORKS

The concept of "network" has already been used in several ways: computer-networking, involving the ability of computers to "talk" to each other by sharing information; communication networks that are facilitated

by computer-assisted communication systems like EIES; and the evolution of resource sharing processes among libraries referred to as library networks.

NETWORKERS

You won't find "networker" in the Dictionary of Occupational Titles (a basic reference book for the U.S. Labor market, describing job roles). It is, nevertheless, a job role, and it describes several tasks undertaken by many. A networker is someone who makes connections (linkages) between people, or between people and resources. This alone as a definition would include strange bedfellows, since so much of our society is based on just such connection making, between buyer and seller. A networkers activities might also resemble a librarians tasks, answering questions or performing research. A networker might also be involved in activities that resembles mailing list brokering, computerized dating/matchmaking services, community organizing, negotiating between individuals and organizations in attempting to make coalitions, bridging gaps between specialists and isolated problem-solving sectors in a community. The Networker might also be involved alot in many shapes of organization, organizing the resources of a community by publishing a directory, or organize people by hosting a conference.

These descriptions are all possible. A networker, like a librarian, is often an objective service provider, making connections between people and information regardless of its content. This may also mean our typical networker is likely to be a generalist; intertested in relationships between problems, and connecting points between different kinds of information.

The Networker serves a vital role in a society that has grown complex, and where specialists of all kinds exist, who may be separated from each other by mountains of information.

Probably the most vital distinguishing feature of some Networkers is their moral or political point of view. Networkers have been around in some form or another for a long time. People who served as linkers between ideas, individuals, cultures. They have sometimes been called busy-bodies, interested in news, gossip, rumors.

Networkers (and Networking, believe it or not) have become more conscious of their activity as a job role in the last decade. Many cultural events have been at work creating the emergent army of networkers but one important influence can be traced to the formation of a counter-culture in the late 1960's and early 1970's, which has since being disassembled into many special interest/issue networks and communities of people. The awareness of Networks/Networking surfaces in the counter-culture, and other minorities, underground cultures or movements, because a smaller group with in a larger one is aware that the story of the world is shaped by the majority. The counter-culture in the 1960's was acutely aware of mass media's monopoly on reality and formed countless alternative publications; and aware that education shaped an individual to conform to the measure of average reality, and formed free-schools; and aware that in order to make social change it was necessary to organize into groups, coalitions, federations, networks, cooperatives; and aware that in general there was new and interesting information: some old discussions we, as a country, had seemed to have forgotten; or news from some scientific or artistic frontier.

NETWORKS

As well as the ways already mentioned, one can also describe the networks of electrical systems, airplane routes, patterns of commodity exchange, social relationships, other relations between partially or completely interconnected elements.

Network is used in describing relationships in central nervous systems. For example, studies at the National Institute of Mental Health involve the examination of how groups of points, or nodes (forming networks), in the central nervous system, store and inter-relate experience. These experiences become organized into concepts. The theory holds that as individuals develop or species evolve, the complexity and number of concepts (size of nodal network) increases. There are mappers of networkers in the mind, like early explorers laying the ground work for the cartography of the future.

Peter and Trudy Johnson-Lenz in Lake Oswego, have developed a computer assisted method of illustrating people's points of view in graph form which illustrates clusters or networks of concepts. These clusters can be compared with other people's, and a kind of series of mental maps can be drawn-up and compared.

The scarcity of information facilitates network building among individuals and organizations of individuals. For example, when there are not many people talking about a particular issue, networks may emerge as people attempt to find a few others that "talk like them". When an "underground" activity (a minority, special interest network) becomes part of the public marketplace, the network that might have been made up of people that even knew each other, becomes many networks, and the very success of communicating with others produces a social fracture.

Mary Darnvosky, in an article entitled, "Is Networking Not Working in the Anti-Nuclear Movement?" (Journal of Community Communication) makes the point that often a network is actually just a "pre-organization structure" that eventually a network is formalized into what resembles one of many models of organizations, e.g., federation, coalition, alliance, etc.

Formation of, or just recognition of networks can, in this context, be a simple way of reaching for further collaboration between individuals and organizations, without encountering problems of responsibilities and rights of either individuals or organizations that arise in more formal organizational structures.

Networks have formed around an issue (movements) or around special interests (invisible colleges), or because of the need to share resources in order to survive (skill exchanges, personal support/self-help groups).

There are many examples of networks where there is a self-conscious attempt to focus on the process of individual and collective network building and the principles of information sharing, and people to people and/or people to resources connections.

"Networking in San Francisco" by Luba Zarsky and Village Design (Journal of Community Communications) is a summary of some research done by Village Design of communication patterns of community-based organizations in San Francisco, with descriptions of several formalized networks such as Briarpatch, Peoples Food System and the Community Coalition.

Linkage is a network convened by Robert Theobald, (as he did in 1971 with what was sometimes simply called "The Theobald Net") designed to be a formalized "invisible college". Linkage is now developing working relationship between members, in part using EIES.

The Open Network of Denver Colorado, charges members \$10/year to provide them with access to the "Network News", where members may post announcements up to 100 words long, a library, and a computer for storing, and retrieving network information.

Participation Systems Inc. is developing a series of networks through providing specific services to members. Calling all of the networks, "politechs", the one now operating is Legitech, an information exchange among state legislative assembly research staff members, who use EIES to share information through a software program developed to handle inquiries and responses that circulate between members.

Self-Determination is, as they describe it, a "Personal/political network". They are presently involved in publishing "Nex-us", a state-wide directory listing individual and organizational skills, interests and resources. They publish a quarterly journal and develop ad-hoc networks and coalitions around critical public issues.

SOCIAL NETWORK ANALYSIS

Social network analysis is an emerging branch of sociology which deals with the patterns of relations between individuals and collections of individuals. With mathematical precision (and in fact theories of patterns and clusters developed by mathematicians), these sociologists study the ways we relate, how we form links (linkages) that constitute the ways we are informed, and our values. An important aspect to locating linkages is finding what linkages do not exist, e.g. between classes of people, between specialties, branches of government, etc.

Network analysts catalog the existing and possible ways we can relate to one another, studying, for example: kinships, cliques, influence networks, forms of organizations, inter-locking directorships and other social power structures, speech and language patterns that distinguish networks of people.

Peter and Trudy Johnson-Lenz, in an unpublished manuscript, entitled, "Speculations on Facilitating Network Structures: Balancing Social Coherence and Individual Liberty", have done an admirable job of discussing the use of the term, network, as applied to social change organizations, social network analysis, and the use of computers & telecommunications.

At one point they describe network facilitation on the individual level as a response to "the need to provide people with access to information about alternative ways of living as well as access to people with whom they can link up to learn, share, solve problems, and support each other. The point is not necessarily to increase the sheer number of connections between people, but rather to make available a much wider range of potential associations to ensure a higher likelihood of developing the few actual associations which are vital and which meet perceived needs."

CONCLUSION

In Chile, between 1971 and 1973, the British organization theorist, Stafford Beer, set up an effort to prepare a single computer program to model and simulate, and then eventually control every level of the Chilean economy. This was not only a system that would throw facts about in a simulation, such as an engineer might use to plot the results of alternative design strategies, but a system that would more literally direct and control the basic transactions making up the economy.

The idea that computers might just take over (with our permission of course) is not far-fetched; although short of dictatorships, "the" system is more likely to look rather shabby and disorganized. The electronic "world brain" is being created from the parts in many places and forms, and the deversity is probably its strongest point.

John Clippinger, a consultant on information policy for a Federal Telecommunication agency, has said, "a computer information utility is inevitable, but how it grows in our laissez faire economy is extremely important. It could be distributed between many companies or a few. It could be labor intensive or automated. It could reinforce some of our cultural values or undermine them. Government as it stands now is not equipped to cope with political and social implications of this magnitude. In France they have a Ministry of Culture, which asks, what will this mean for our civilization. But we don't have that here."