

RESEARCH OPTIONS AND IMPERATIVES:
IN COMPUTERIZED CONFERENCING

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The workshop utilized the Electronic Information Exchange System (EIES) at the New Jersey Institute of Technology.

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Introduction

This is a report of a workshop conducted for the Division of Mathematical and Computer Sciences of the National Science Foundation intended to examine potential research areas in the use of computers for facilitating human group communications. The workshop was held on such a computer facility, located at the New Jersey Institute of Technology and called EIES, (Electronic Information Exchange System). Over a period of approximately six months some fifty persons from the United States and Canada participated in three discussions of this research area. The individual discussions focused on the following three subtopics:

Design and Implementation
Applications
Policy and Regulation

As a result of these on-line discussions held via remote terminals, seven individuals (the authors of this report) used the same system to write the final report. This coordination group was comprised of two coordinators or moderators for each conference and the principal investigator for the project as a whole. The coordinator group also had three face-to-face meetings (none of which had perfect attendance because of conflicts of schedules). Exactly who is responsible for writing each section of the report is shown in the Report. In many cases this was done by reworking the contribution of a participant to fit the general format. Though some editing of contributions has been done, the differences in style and length of comments which characterize various authors remains. It is probably a characteristic of a report remotely co-authored by seven individuals.

The body of this report offers a rich menu of research options as it is a synthesis of the ideas and views of many contributors (See below). Some of the color surrounding this synthesis is contained in Appendix B where we have abstracted some of the original commentary of the three discussions. From this, one can get more of a feeling for the many differing views that exist. These differences serve to dramatize the newness of the area and the resulting uncertainty about the most promising research methodologies to use. There is little disagreement that there exists a large body of unanswered questions.

Before presenting the main body of the report, we first offer a definition of our topic area followed by a short historical perspective on research efforts to date. There is also a comprehensive bibliography on published work.

A number of summary observations are offered on what appear to be very significant researchable areas that have not received the attention they would seem to deserve.

In addition, because of the diversity of considerations to be made in any new form of human communications, we have evolved a structure for presentation of the materials, which is explained preceding the actual material.

LIST OF CONTRIBUTORS

The following is a list of those who contributed to this report by their participation and comments in the on-line conferences:

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In addition, the draft of the report was sent for comment to approximately twenty additional people who were unable to participate in the conferences, but who have a professional interest in this area of research.

Definition:

We are concerned here with the integral use of computers to structure and facilitate communications processes among groups of people. In the literature this topic has been addressed to various degrees under a host of alternative names. Those more commonly found are:

Teleprocessing (TP)
Message Systems (MS)
Electronic Mail (EM)
Teleconferencing (TC)
Office Automation (OA)
Telecommunications (TC)
Computer Conferencing (CC)
Computer Communications (CC)
Computerized Conferencing (CC)
Computer Based Conferencing (CBC)
Computer Mediated Interaction (CMI)
Electronic Information Exchange (EIE)
Computer Assisted Teleconferencing (CAT)
Computer Mediated Teleconferencing (CMT)

It appears that these alternative names derive largely from the perspective or direction from which the individual or group is approaching the problem. The four perspectives reflected in this list are:

- 1) Communications
- 2) Computers and Information Systems
- 3) Applications
- 4) Human Behavior

Because of this our approach to a definition will be of an illustrative nature. We will define the properties of what we are discussing based upon the following assertions:

By involving the human as an integral part of the data processing and communication functions performed by a computer, the Communication System aspects can be made indistinguishable from the Information System aspects; and the whole can be more than the sum of its parts.

By tailoring such new "communication-information" systems to facilitate specific applications, it is possible to integrate the design and use of the system with its applications and objectives.

By involving the individual and the group as both the creators and retrievers of information, the psychological and sociological factors become inseparable from the design and use of the system.

As a result what we have is a unique area of endeavor for the development and application of computer systems that falls in the intersection of a number of different basic and applied research and development areas. We must be very careful that the names we use do not unnecessarily limit the scope and potential of this field in the minds of those who have not followed its development.

In this report we shall use the term "computerized conferencing" for the sake of convenience without any formal implication that the writers and contributors to this document agree on the choice of a name for this phenomenon. We are discussing systems which have exhibited in various incarnations the following properties:

- 1) They enable individuals to send messages to other individuals or groups via computer terminals.
- 2) They provide for various data processing functions to be performed on those messages such as text editing, re-routing, obtaining confirmations of reception, obtaining approvals of content, delaying the message until an appropriate date, etc..
- 3) They allow the establishment of group discussion or "conference" spaces where permanent transcripts open to a particular group are accumulated, indexed, reorganized, retrieved, updated, etc.
- 4) They introduce many information-processing functions such as voting, integration of data bases and models, inclusion of relational information or data structure, Delphi like processes, forms generation and data collection, Computer Assisted Instruction, Interpretive Structural Modeling, transaction processing and tracking, etc..

However, to date most of the systems that have been implemented and utilized are largely oriented to free text discussion objectives and except for a few, tend to be perceived on the surface as electronic replications of the post office. It is our belief that computerized conferencing is a unique form of communication that has its own potential and characteristics. Furthermore, the systems in existence today should be considered somewhat rudimentary in terms of the possibilities offered by the further integration of computer power into human communication processes.

We are focusing in this report on what research issues seem most important in terms of the characteristics of the computer-based written media, as contrasted with the more "traditional" media. A perspective on the differences between computerized conferencing and other forms of human communication can be derived from the following table which compares various human communication options with the physical properties of the system.

CROSS COMPARISON TABLE: COMMUNICATION MEDIA AND THEIR PHYSICAL PARAMETERS

M	*Single	*	* Telephone	* Electronic * Mail
E	*Structures	*	* Video(TV)	* Mail * Telegrams
D	*	*	*	* TWX, etc.

I	*****			
U	*Varied	* Face-to-Face *	* Computerized	* Delphi
M	*Structures	*	* Conferencing	* Opinion
	*	*	*	* Surveys

	*Mode	* Verbal	* Written	
	*	*	*	

P	*Control	* Group	* Individual	
A	*	*	*	

R	*****			
A	*Speed	* Talking Rate	* Reading Rate	
M	*	*	*	

T	*Coincidence	*	*	
E	*Time	* Necessary	* Not Necessary	

R	*****			
S	*Geographical	* Necessary	* Not Necessary	
	*Coincidence	*	*	

	*System Delays	* None	* Short	* Long
	*	*	*	*

	*Memory	* Separate	* Integral	* Separate
	*	*	*	*

*The above chart is taken from: THE NETWORK NATION: HUMAN COMMUNICATION VIA COMPUTERS, by S.R. Hiltz & M. Turoff, Addison Wesley Publishers, to appear in 1978

We are concerned in this report with the systems represented in the third column. That is, they are written computer based media. Control over participation rests with the individual. Geographical and time coincidence are not necessary, and memory is an integral part of the communication structure. Within this class, we have drawn a distinction between what seem to be two very different axioms or objectives at least implicitly guiding the current research and development objectives. One is the school of thought behind "electronic mail" oriented efforts and the other is the school of thought behind "computerized conferencing" efforts. These might be characterized by the following statements:

Electronic Mail: The concept of communications is essentially a pure one which should be divorceable from its application. There should exist one master plan for a communications system that is well suited for use by most people in a wide variety of environments. Efforts should be directed to evolving this single appropriate system.

Computerized Conferencing: The introduction of the computer into the communications loop allows the tailoring of the communications structure to best fit the problem and the requirements of the applications. There may be as many appropriate communication structures as there are problems with which people deal.

At this stage in the development of these systems it is healthy to encourage both perspectives as useful results can be obtained by approaching the problems from either direction. Once again, for convenience sake, the term "electronic mail" as well as the other terms will be implicitly included when we use the single term computerized conferencing throughout the remainder of the report.

The above table reflects the differences among communication systems that result from their physical properties. We believe the literature and experiments today support that view that these differences lead to major psychological and sociological differences in the behavior of humans who use these systems, and the impact on the objectives for which they are used. Key among these differences for the area of computerized conferencing is the high degree of control and self activating nature of the communication process offered the individual. It is the only system where an individual makes his or her choice as to when, how, where and at what pace to utilize the medium of communication without the system itself, or the group, introducing constraints or delays. As a result, psychological and sociological considerations become key factors in the development and understanding of these systems.

Historical Perspective

Beginning with the first time-sharing systems at M.I.T., mail drop or message systems have generally been included in some form, usually for the convenience of programmers to exchange knowledge of the latest new routines, or at least to communicate with the system operator. However, the first implementation of more generalized computer conferencing for use by non-computer oriented professionals was the work at the Office of Emergency Preparedness beginning about 1970. This was an operational environment and not a research one. However, meaningful results for researchers were obtained as by-products of the effort and the effort itself served to demonstrate the powers and utility of this technology in operational development. Also about this time, usage of Scientific Timesharings' MAILBOX system was becoming widespread. In addition, at least two independent efforts in the area of Computer Assisted Instructional Systems, one at Northwestern and one at the University of Illinois, were directed at introducing a high degree of communications into the CAI environment. The first major research oriented efforts directed at computerized conferencing as a topic in itself were made at the Institute for the Future and Bell Canada. Currently the Institute for the Future is emphasizing both field trials and attempts to develop evaluation methodology for studying this form of communications. Bell Canada's work has been oriented to potential commercial applications, and some components of their efforts are proprietary. In 1973 another major effort was launched at the New Jersey Institute of Technology, which is concerned with highly structured computerized conferencing systems and the investigation of some of the hardware, software, and human factors associated with this technology. One principal effort there is to achieve low cost systems on dedicated mini-computers.

Some other directions of research that have affected this area are the work at the Stanford Research Institute on word processing and joint report writing, and at MIT on citizen participation. The most extensive "Message System" work in recent years has been through the ARPA net efforts.

In addition, there has been some work done with on-line games involving communication among the participants. Currently, parallel efforts are underway at the University of Michigan and the University of Wisconsin. A table included at the end of the Bibliography in the Appendix shows the number of publications, year by year, from the major institutional sources of work in this area. The over 200 papers included are limited to those which deal specifically with the use of computers to facilitate human communication, except for a small sample of application papers that are not technology specific, such as the 'electronic town hall' work popular in the early 70's. It is obvious from the distribution of publications alone that there is a sizable and growing research activity and increasing interest in this area.

The following table presents a summary of publication activity in this area, and illustrates a growing community of active researchers.

year	OEP	IFTF	NJIT	UM/UI NW/BC	ARPA MIT/SRI	Others	Total
1968	1	1					2
1969	1			1		1	3
1970	1	1			1		3
1971	6			2	3	5	16
1972	10	2		7		6	25
1973	8	8	1	9	4	7	37
1974	6	13	3	9	2	8	41
1975	4	8	12	8	8	12	52
1976		10	12	4	7	7	40
1977	3	10	13	8	3	11	48
1978			1				1
<hr/>							
TOTAL	40	53	42	48	28	57	268

The columns are based upon an estimate of what work the author is reporting on regardless of his affiliation when writing the paper.
The abbreviations represent:

OEP Office of Emergency Preparedness
 IFTF Institute for the Future
 NJIT New Jersey Institute of Technology
 UM University of Michigan
 UI University of Illinois
 NW North Western University
 BC Bell Canada
 ARPA Advanced Projects Research Agency, Dept. of Defense
 MIT Massachusetts Institute of Technology
 SRI Stanford Research Institute

The actual reference from which this table is compiled is an appendix to this report.

Observations:

There appear to be three general areas of application that deserve more research emphasis than they have received to date. These are:

Public Use
Problem Solving Investigations
Social Science Experimentation

While our observations are broken down by application area, it will become apparent from the following discussion that each of these areas encompasses very basic issues and research areas in computer and information science that are peculiar to them. Because of the high degree of user involvement in computerized conferencing systems, it is almost impossible to divorce any particular system and its characteristics from the users and their applications. Therefore, we do believe that research into the development of the technology must be closely tied to specific applications areas. In the Design and Implementation Section of this report a few exceptions to this are pointed out with respect to such areas as the design of executive software.

Public Use

This area may include such applications as: Work at Home; Use for the Disadvantaged and Disabled; Family and Recreational Use; Affinity and Peer Groups; Education and Citizen Participation in Democratic Processes. The emphasis here is on the design of systems that may provide beneficial services to various societal groups whose members may have had no previous experience with the direct use of this technology, or of computers in general. It is felt that this area places the most severe demands on the design and implementation of the User Interface and the ease with which users can take advantage of the powers offered by the computer.

An equally important consideration is the current lack of awareness by those in policy and regulatory areas of any need to consider issues of public access to this technology, or to the associated digital communications technology now becoming available. While there is general recognition of business and industrial applications and demands, we can find no serious investigation of the potential for public use and the possible implications for regulatory, legislative, and executive decisions at the federal, state or local level. Because no real funding has been allocated for public use aspects the intuitive judgments by researchers who have been engaged in Computerized Conferencing development that this technology has a tremendous public and societal use potential is only informed supposition at this time. In order to insure that the issues raised by potential public use receive attention in policy areas, there must be an experimental and developmental program adequate to produce actual data about the degree of potential use, the economies involved, and the nature of the design of such systems.

While computer technology is beginning to penetrate the public market with respect to microprocessors, it is felt that this development will not bring about the experiments needed or expose the potentials where the service requires a centralized system and a critical mass of users. These latter two characteristics are a necessary condition for computerized conferencing systems as well as other possible public use information services. It is also desirable

in some application areas to consider public use of computerized conferencing in conjunction with other information services designed for public use. Examples might be an information retrieval system on jobs or a CAI system for education.

Problem Solving

This applications area includes investigating the degree to which computerized conferencing can aid groups faced with specific problems or issues they must resolve or deal with, and associated specialized technology requirements. It also must consider the quality of the resulting solution and the level of efficiency needed to reach the solution as compared to alternative approaches. The design issue here is the open question as to the degree of problem solving facilitation which the presence of the computer in the communication process can provide. In principle, the computer can be tailored to include appropriate communication structures, modeling and analytical aids, data bases, graphic representations, and normative communication controls such as voting. Therefore, this application area includes the possibilities of incorporating highly sophisticated computer techniques directly into the communication process. However, we have very little firm understanding of how much of a role many of these approaches have previously played in influencing decision processes. For example, the number of models that have been designed to aid decisions seems to be far greater than the number that appear to have had an influence on a decision. On the other hand, the use of tables, charts, and other relational tools is quite common. As a result, the basic issue of what technique is appropriate in each problem situation is part of the research requirements in this area. Because of the capability of recording the actual communications which is made possible through the use of computerized conferencing, this area appears to represent a unique opportunity to determine the utility of other computer tools for problem solving processes.

To further clarify this area, we wish to distinguish the basic investigation of problem solving from the specific area of business applications. It is our consensus that a great deal of money will be invested by industry over the next decade in office automation, message systems, and Management Information Systems incorporating computerized conferencing capabilities. We see no need for any sizable NSF funding in this general area, with the possible exception of special requirements unique to small business applications and independent professionals. However, development of business applications is not likely to result in the basic investigations needed for general understanding of human problem solving processes and their dependency upon the design of computerized conferencing systems, nor will it necessarily lead to the more flexible and specialized decision support systems. Yet the possibilities for eventual improvements to decision processes involving very large expenditures of resources, both public and private, make this potentially an extremely high payoff area of research.

Social Science Experimentation

Computerized Conferencing would appear to represent a unique tool for those engaged in the study of human communication processes. Unfortunately, this area has not yet made a significant impact on the appropriate subfields of psychology and sociology. One reason for this is the lack of adequate software that allows the creation of, in a short length of time and with a reasonably small amount of effort, the types of computerized conferencing systems that would be needed for conducting experiments. Since the arrangements for any given experiment are likely to be discarded once the

experiment has been run, it would not be practical to invest years of programming effort for isolated experiments. This area places severe demands upon the convenience and flexibility of the software and the programming language to be used. For computer science this presents the challenge of being able to tailor computerized conferencing to new interface and structural requirements with a minimum of software effort. It highlights the lack of an algorithmic language to describe human communication processes and structures. From the standpoint of the technology the capabilities are not yet there to see widespread incorporation of this technology as a standard tool in the social sciences. There has been very little attempt, to date, to use controlled experimentation to try and uncover the relationships between the design of computerized conferencing systems and what we have termed in this report the 'intermediate processes' of human communication such as norms and rituals, group cohesion, group morale, etc. Therefore we currently lack fundamental understandings in bridging the gap between design and application in this area. Until a significant amount of research is done into these intermediate processes and their dependencies upon design, we can only evaluate computerized conferencing systems and their associated applications as black boxes. In other words, we are constrained to looking at the inputs and outputs of the process without comprehending the mechanics of the group process or the key underlying factors for success vs. failure.

Report Structure:

There are many different morphologies that could have been used to structure our results. The one we have chosen is based upon emphasizing the interrelationships of the factors that emerged from the discussion. One may view the six major areas that comprise the structure as elements in a counter-clockwise circular impact model:

1.0 ENVIRONMENT

2.0 INTERMEDIATE HUMAN COMMUNICATION PROCESSES

6.0 TECHNOLOGY DESIGN & IMPLEMENTATION

3.0 GROUP & INDIVIDUAL IMPACTS

5.0 REGULATION, POLICY & LAWS

4.0 SOCIAL & ECONOMIC IMPACTS

1>2

The Environment (1.0) is the super-system in which the communications take place, the application, the users, and all of the factors. As a result of the environment, an atmosphere is created that can be characterized by various Intermediate Processes (2.0). It is quite clear from the discussions that we have very little knowledge about how to optimize the relationships that exist between 1 and 2, and in many cases we do not know the specific impact of a factor in 1 on a factor in 2.

2>3

As a result of these intermediate processes we then have group and individual impacts (3.0). There is some knowledge of relationships between factors in 2 and their impact on factors in 3 that comes to us via studies of other communication media. However, there are sufficient cases of uniqueness occurring in computerized conferencing such that there are also sizable gaps here. This is particularly true where attempts would be made to implement applications that could only be accomplished otherwise by face-to-face or co-located groups. The psychological processes appear to be different enough that one can not extrapolate face-to-face results into the computerized conferencing environment. Also, a number of potential application areas represent new concepts for the use of communications and there is no basis from which to extrapolate.

3>4

The process of going from group and individual impacts to multi-group or social and economic impacts is one that demands forms of technology assessment. At this point there is general agreement that category 4 impacts are going to be significant ten to twenty years from now. Beyond itemizing and making gross estimates, the only way to gain a better understanding of category 4.0 will be through major field trials. However, (cont.)

it is meaningful to do technology assessment by experimentation utilizing the technology. Although in general technology assessment is largely viewed as being limited to paper and pencil studies, we do not consider that sufficient for adequate assessment of the possibilities and difficulties associated with computer conferencing, and thus actual field trials are, in our opinion, essential.

4>5

An awareness of social and economic impacts or potential ones leads quite naturally to consideration of Regulation, Laws, and Policy (5.0). Here there are opportunities for good analysis, since there appear to be many serious issues raised by the technology of computerized conferencing that have not yet surfaced in the regulating and policy making areas. At this stage, more of an education and awareness effort may be required as opposed to research, per se, except in the area of some new looks at economic impact potential. Adequate evidence to convince policy makers will be dependent on field trials when it comes to specific application potentials aside from pure business usage.

5>6

Over the long term, the regulatory and legal situation may very well dominate the potentials in terms of what is available from the technology. It is the unfortunate circumstance of regulatory uncertainty that is probably today preventing sizable investments in commercial research and development into computerized conferencing except for pure business use. This is one of the reasons we must look to governmental funding for research and development associated with this area in terms of support for various experimental applications. The variety of potential designs and the flexibility needed for experimental utilization of these systems combine to generate a significant number of basic computer science problems that must be investigated.

6>1

We now come full circle as the state of technology makes possible new options and the trial of new applications. Without the technology there can be no experimentation to evaluate the effectiveness of the application and determine its consequences. There is a strong feeling by those engaged in this research area that experimentation is the meaningful key to assessment.

Following is the complete outline of what is covered in the body of the report. What is contained in this material are hypotheses, issues, and unanswered questions. There is very little that is conclusive in a generalizable sense at this time. Research to date has largely demonstrated the potential and brought about the evolution of a community of researchers. However, that community is still small relative to the opportunities presented. We therefore invite the reader to consider this report as an opportunity menu for research. We have not attempted to address the more difficult issues of what research methodology, approach, or experimentation is best to answer any one issue except for a few more obvious examples used more as illustrations than recommendations. In fact, it is doubtful that the group involved in the preparation of this report, let alone the contributing group as a whole, could have ever reached agreement on appropriate methodology. Many of the issues raised can be approached by different techniques and with the perspectives of

different disciplines. Because of the central position of the human in this type of computer system, we must consider the perspectives of both the computer sciences and the social sciences in many aspects of the subject. There is no lack of techniques to approach these issues, but there is a need for imagination in using these techniques in new and different environments, which do not always correspond well with the original situations for which these techniques were initially evolved. This applies to the design of software to operate these systems and to the evaluation of the human use of these systems.

1.0 Environment

1.1 Situation Context

1.1.1 Application

- 1.1.1.1 Size and distribution of group
- 1.1.1.2 Length of the interaction process
- 1.1.1.3 Cooperation or competitiveness
- 1.1.1.4 Homogeneity or Heterogeneity

1.1.2 Cultural Factors

- 1.1.2.1 Cultural factors in acceptance
- 1.1.2.2 Cultural factors in Use

1.1.3 User Skills, Talents & Training

- 1.1.3.1 Matching skills to training and measuring effectiveness

1.1.4 Individual & Group Motivation & Expectations

- 1.1.4.1 Individual and group factors
- 1.1.4.2 Influence of Interface design

1.1.5 Institutional Practices

- 1.1.5.1 Institutionally Constrained Computer Conferencing
 - 1.1.5.1.1 Technical/Clerical Roles & Functions
 - 1.1.5.1.2 Institutional Innovation
 - 1.1.5.1.3 Institutional "Pace"
 - 1.1.5.1.4 Economic Impacts
 - 1.1.5.1.5 Message Forms & Symbols
- 1.1.5.2 Institutionally Unconstrained Computer Conferencing
 - 1.1.5.2.1 Intellectual Team Work
 - 1.1.5.2.2 Intra-Organizational Communications
 - 1.1.5.2.3 Inter-Organizational Computer Conferencing

1.1.6 Other Factors

1.2 System Capabilities

1.2.1 Conferencing Structure

- 1.2.1.1 The Chairperson or Moderator Role
- 1.2.1.2 Organizational Aids
- 1.2.1.3 Special Purpose Structures

1.2.2 Complexity & Power

- 1.2.2.1 Simulation and modeling
- 1.2.2.2 Data Base Application and Development
- 1.2.2.3 Social research
- 1.2.2.4 Conference facilitation

1.2.3 Interfaces & Terminals

1.2.4 Service Factors

1.3 Economics

1.3.1 User and organizational economic factors

1.3.2 Charging

1.3.3 Equity

1.3.4 Communications economics

2.0 Intermediate Processes

2.1 Social Conventions (Norms & Rituals)

- 2.1.1 Normative Rigidity
- 2.1.2 Salutations
- 2.1.3 Leave Taking
- 2.1.4 System Unavailability
- 2.1.5 Introductions
- 2.1.6 Temporary Unavailability
- 2.1.7 Anonymity and Pennames
- 2.1.8 Citations
- 2.1.9 Copying to Third Parties

2.2 Social Networks

- 2.2.1 Friendship or Collegueship Formation over CC
- 2.2.2 Maintaining Existing Relationships

2.3 Socialization

- 2.3.1 Socialization Agents
- 2.3.2 Length of Socialization Period
- 2.3.3 Sanctions
- 2.3.4 Effects of User-Consultants
- 2.3.5 On Line Explanations
- 2.3.6 Group Leadership and Socialization
- 2.3.7 Effects of "Turn-Around" on Socialization

2.4 Humor & Relaxation

- 2.4.1 Humor as an Assessment Tool
- 2.4.2 Humor as a Socializing Mechanism
- 2.4.3 Rhetoric- The Use of Satire, Irony, Sarcasm, etc.
- 2.4.4 Catharsis
- 2.4.5 Use as Reductio Ad Absurdum in Testing Hypotheses
- 2.4.6 Induction- Mental Excursion to the Absurd

2.5 Leadership & Control

- 2.5.1 In Small Group Problem Solving Discussions
- 2.5.2 In Long Term Operational Use

2.6 Cognitive Transmission

- 2.6.1 Complexity of Material & Form
- 2.6.2 Cueing
- 2.6.3 Learning
- 2.6.4 Feedback
- 2.6.5 Disability Compensation
- 2.6.6 Validation
- 2.6.7 Enhancement

2.7 Effects of Computerized Conferencing upon Group Cohesion and Morale

2.8 Subjective Satisfaction and Attitudes

2.9 Communications Content & Behavior

- 2.9.1 Communications Content
- 2.9.2 Amount of Communication
- 2.9.3 Behavioral Patterns of Communication

3.0 Group & Individual Impacts

3.1 Information Overload

- 3.1.1 Effects on the User
- 3.1.2 Software Features for Decreasing Overload
- 3.1.3 Human Roles to Mediate Between the system and the User
- 3.1.4 User Skills or Practices which Decrease Subjective Overload
- 3.1.5 Hardware Features for Decreasing Overload

3.2 Acceptance & Attitudes

3.3 Emergent Groups & Communication Patterns

3.4 Problem Solving & Quality of Solutions

- 3.4.1 Differences in Interaction Process
- 3.4.2 Quality of Decision
- 3.4.3 Resources Required
- 3.4.4 Problem Type

3.5 Desires & Expectations

- 3.5.1 Simple Inquiry or Message Exchange
- 3.5.2 Report Generation
- 3.5.3 Discovery and Analyses
- 3.5.4 Planning & Decision Oriented Systems
- 3.5.5 Management, Monitoring, Operation and Command and Control

3.6 Measures of Benefits

4.0 Social & Economic Implications

4.1 Potential Impacts

- 4.1.1 Work at Home
- 4.1.2 Family Applications
- 4.1.3 Disadvantaged Applications
 - 4.1.3.1 Physically Handicapped
 - 4.1.3.2 Homebound Aged
 - 4.1.3.3 Prisoners
 - 4.1.3.4 Mentally retarded or Disturbed
- 4.1.4 Organizational Applications
- 4.1.5 Democratic Processes
 - 4.1.5.1 Electronic Town Hall
 - 4.1.5.2 Peer Grouping of Community Leaders
 - 4.1.5.3 Citizen Advisory Groups
 - 4.1.5.4 Lobbying
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1.0 Environment (McKendree)

The policy decisions of an organization, in which computerized conferencing might serve in a supporting role, have to do with the choice of purposes, the molding of organizational character, the definition of what needs to be done, the mobilization of resources, the attainment of goals in the face of competition or adverse circumstance.

In an age of increasing complexity where jobs are becoming more and more specialized- so that many times individuals may be completely unaware of what co-workers are doing, it is very important that the specialist discern his organization's purpose, make recommendations for its clarification or development, and shape his own contributions.

The special needs of individuals and the technical requirements of specialized groups and disciplines inevitably develop points of view that come into conflict with one another and with the central purposes of the organization they serve.

Computer conferencing offers a potential for including in any environment discussion and/or exchange of information in which the participants may be freed to make creative contributions to the organization's progress and growth.

Research toward this end is concerned with the situation context for the organization, the capabilities available from the conferencing system, and the costs and benefits to be expected.

1.1 Situation Context (McKendree)

The purposes of organized effort are usually neither clear, nor unchanging. Except in abstract language, they cannot be communicated once and for all to the variety of persons whose effort and commitment are required. But the duration and scope of a single Conference is necessarily limited. Some of the limitations are set by the authority and/or expertise of the conferees. Others are a function of the urgency of the immediate task, the cultural values held toward computers and the written word as a primary medium of communication, certain institutional constraints, etc.

Research is needed to establish the preconditions in the situational context which will suit organizational purposes and capitalize on the new medium of communication.

1.1.1. Application (Hiltz)

The type of application will inevitably affect both the outcome of the use of a computer-based system and the ideal characteristics of the system capabilities and interface. One dimension of the application is the type of organization and the specific kind of function--for instance, government, business, education, or recreational use within the family. The ways in which impacts of computerized conferencing are expected to vary relative to the institutional sectors within which it is used are covered in chapter four of this report.

Some dimensions of the nature of the application cut across classifications by institutional sector and type of mission. The dimensions of

type of application which appear to be potentially significant and to warrant investigation are

1.1.1.1. Size and distribution of the group

How many persons are participating in a computer-mediated group task, and in how many different geographic locations?

1.1.1.2 Length of the Interaction Process

Is one looking at a circumscribed, short-term goal which might be achieved in a few hours to a few days, or to an ongoing, operational application that stretches over many months or years?

1.1.1.3. Cooperativeness or Competitiveness

Is the application one in which all of the participants share a common set of interests, or a competitive-hostile one in which there are two or more "sides"?

1.1.1.4 Homogeneity or Heterogeneity

Is the group homogeneous or heterogeneous in terms of such characteristics as disciplines represented, status, socio-economic composition, etc.?

1.1.2. Cultural Factors (Hiltz)

Three major cultural or subcultural differences may arise in CC: user culture vs. programmer culture, user culture A vs. user culture B, user culture vs. outside (non-user) culture.

1.1.2.1. Cultural Factors in Acceptance

What cultural or subcultural factors are associated with acceptance of CC and the manner in which it is used? EXAMPLES: Is user satisfaction correlated with programming experience? Are there breakdowns of communication traceable to the lack of cultural bridges in CC? Are user groups different from the rest of their professional or social peer group because they use the system? How can cultural factors be identified and how can the group then cope with them? For example, one might conduct cross-cultural field trials.

How would computerized conferencing fare in a culture which emphasizes groups rather than individuals, such as Swedish work teams, Israeli kibbutzim, mainland China management committees?

1.1.2.2. Cultural Factors in Use

We have identified "subcultural" differences due to profession or organization; to social class; and to ethnicity or region of a country. "Cultural" differences refer to differences in attitudes, values and communication practices at the societal or cultural level.

Are there cultural or subcultural differences in the amount of use made of

various types of features or capabilities?

For example--are there differences in the extent to which anonymity is seen as useful or "fun", vs. annoying or impolite? Do certain cultures, or subcultures, object to being asked to vote or conform to highly structured interaction processes as compared to rambling attempts to achieve consensus? Do some cultures or subcultures differ in their preference for interface style?

1.1.3. User Skills, Talents and Training (Hiltz)

When a user approaches a computerized conferencing system for the first time, how can s/he be guided to understand

- a. the overall purpose or capabilities of the system,
- b. its utility for their jobs or goals,
- c. the mechanics of how to operate the system.

One can separate out the FORM (medium) of the training and the CONTENT. The available forms are

- a. personal lecture and demonstration (group or individual)
- b. Audio-visual aids used in lecture-demonstration (video tape, cassettes, slides)
- c. Set of written instructions
- d. on-line tutorial (which may be a fixed, abstract set of materials to guide a single user through a sopecific routine; or a "laboratory"-type exercise which teaches by giving a group a communications task to complete and guides them through the options).
- e. Audio-link provided for personal on-line learning (teacher and learner are simultaneously linked by terminals and telephones).

Among variations in content are the questions of all at once or modular instruction; and style and level of presentation.

1.1.3.1. Matching Skills to training and measuring Effectiveness (Hiltz)

What kinds of screening or classification devices can be devised for determining what form and amount of instruction is optimal for a particular user?

Sub-issues include the tasks of learning to measure effectiveness of training (How many potential users "drop out" with various approaches? What level of competence is reached in what period of time? What are the total costs of each method, including the time of trainers and persons who prepare the materials, as well as costs of on-line learning time?

Example of research in this area:

A wide variety of users of different educational levels and with various motives for using such a system could be divided into two or three groups, each given training on the same materials, through two or three different media forms.

There would be two main types of research products

A. A set of predictors or selection factors which show the most closely correlated sets of variables for predicting success of training (perhaps they might be age, level of education, and previous exposure to computers, for instance).

B. A set of "model" training materials that might be adapted by others, and a case history of their total costs, for development

and administration, to assist others in making a choice of training media.

1.1.4 Individual and Group Motivation and Expectations (Hiltz)

The success or failure of a computer conference may be determined in part by the degree to which initial attitudes of the user are matched to the functions of the system, and vice-versa. An understanding of the process by which users are first exposed to the conference--independent of the training required to learn to use it--is necessary to improve the use of the medium.

1.1.4.1. Individual Factors

What aspects of personality, work habits, communications skills (such as ability to type and facility with written English) or previous experience with computers and terminals are associated with initial enthusiasm or resistance toward using computerized conferencing?

Are the prospective users a "real group" with some sort of history of social relationships among members, and a real need to communicate? How much difficulty does the group have communicating through traditional means?

1.1.4.2 Influence of Interface Design

What preconceptions on the part of designers cause systems not to be well accepted by new users? Do designers' beliefs that users can type reasonably well, or that they are comfortable with special symbols or computer terms result in a mismatch with user realities or preferences? Do designers implicitly imbed a structure into use of a system that differs from some users' approaches to problem solving, thus making use of the system inherently frustrating in some cases?

How does this interact with other factors, such as the degree of prior experience with computers and computer terminals; level of education; purpose and expected duration of the use of the conferencing system?

Example of research effort in this area

Comparable sets of users, using the same initial methods of training, for similar purposes, could be surveyed about their expectations before using the system; and about their initial attitudes at periods such as five hours and fifteen on-line hours after beginning use.

1.1.5 Institutional Practices (Snyder)

The compartmentalized, hierarchical institutional forms of Western society originally evolved around the functional need to insure orderly flows of information between leaders/decision makers and their subordinate decision-implementors and data gatherers. Such human structuring has been essential throughout most of history since information flow entailed the physical movement of people or media. The hierarchical structure assured that, through chains of command and response, the leaders orders would be implemented, and that they would be kept current regarding all events under their authority.

Initially, the advent of electronic communication forms did little to

alter this state of affairs. The telegraph was employed simply as a high speed alternative to mail, subject to the same careful formalities of message initiation, approval, and distribution as its slower analog. The use of the telephone, once it had passed through more than 50 years as a carefully controlled status symbol, was the first communications technology (outside of the coffee break, the bowling league, and the office party) that freely circumvented the traditional lines of formal organizational communication. (Although up through the 1950's, many large private and public sector institutions maintained procedures on who might telephone whom without management approval.)

However, the telephone today has been almost totally freed from artificial management constraints. This is partly because of its enormous efficiencies, and partly due to the liberalization of modern management theory and practice. But it is unlikely that either of the foregoing would have provided sufficient rationale for unfettering the telephone were it not for the fact that the telephone is an almost purely transitory medium; it produces no physical record of the messages transmitted! Thus, official information flows, which continue to be restricted almost exclusively to the medium of the printed word, are not seriously compromised by the telephone.

Computer conferencing, with its unique combination of total documentation and inherent flexibility, can circumvent the traditional restrictions (channels and chains) upon official written internal communications and information flows, and thereby constitutes a powerful potential for altering the basic nature and structure of large scale bureaucratic institutions as we have come to know and understand them.

Of course, CC could be employed by institutions in an entirely traditional context; that is, as a simple electronic replacement for current systems of written communication, subject to the continuation of existing controls, e.g. channels of communication and co-ordination, realms of authority, and chains of command, approval and response. Under such an arrangement, impacts would be predominantly economic, although there would be other significant effects which would merit assessment. Because of the inherent threat to basic institutional forms, careful thought should be given to the merits of evaluating the use of CC in a traditionally constrained context, as a means of promoting user acceptance. (see Ogburn, Bright on overcoming resistance to social innovation.)
ssssss:/sredominantly/

The alternative institutional mode of employing CC would entail freeing the technology to be used to the full extent of its capabilities. Specific institutional applications of this type are discussed at length in Section 4.1.4. of this Report, and tangential issues arising from such applications are covered in Sections 4.2 and 5. In this Section, the principal concern will be the interaction of traditional institutional norms and the generalized application of CC within an organizational context.

1.1.5.1 Institutionally Constrained Computer Conferencing (Snyder)

In this context, CC simply supplants current technologies in the creation and transmission of situationally specific written communications. This definitional statement is intended to exclude from consideration automated reporting systems, electronic publishing and distribution systems, and general electronic research and reference systems, for which purposes separate and specific computer-driven technologies are evolving. Interface and/or overlap between a general purpose institutional CCS and systems of the aforementioned

type do pose relevant issues for evaluation, however.

1.1.5.1.1 Impacts Upon Traditional Technical/Clerical Roles and Functions Within the Institution

Experience to date suggests that powerful cultural and functional norms and other psychological mechanisms militate against professional employees' easy adaptation to direct use of keyboard terminals. Under a generalized adoption of CC, will originators compose their messages, position papers, etc. directly, or will they continue to compose their material in the traditional manner (e.g. handwritten drafts, dictaphone, etc.), to be subsequently transcribed onto the system by clerical personnel? What are the key factors governing this choice? How may they be manipulated?

In a full-scale implementation, with electronic filing and retrieval (especially if linked directly to electronic research, reporting archival, and publishing systems), CC would serve to supplant the principal clerical functions, either substantially altering such jobs, or eliminating many of them altogether. The requirement for direct originator composition, on-line, would appear to be the main barrier to realizing this paradigm shift. The critical variables for examination here would be those factors which determine the willingness of professional employees to directly utilize terminal equipment, in conflict with traditional professional images.

1.1.5.1.2 Impacts Upon Institutional Innovation (Snyder)

There seems to be little reason to anticipate that the simple supplanting of traditional message flow technology by CC would have any significant impact upon levels of institutional ideation. Such impacts if they are to be achieved, are more likely to occur under more innovative applications of CC, particularly under small groups or work team applications (see 1.1.5.2.1). However, there are some applications under traditional institutional structures which could be fruitful areas for research in increased ideation. One such area would be employee suggestion systems. Such systems, although they have produced substantial operational savings in a number of instances, have traditionally been the subject of employee decision and management inattention. A key factor in the success of suggestion systems, other than earnest management support, appears to be the process by which suggestions are approved for submittal and evaluated. Typically, productive suggestion systems flow rapidly, require no approval prior to submittal, and must be definitively assessed within a short period of time. A CC would be ideally suited to such a process, and although the cost of providing organization-wide CC could scarcely be justified simply in support of an employee suggestion system, a system installed for general message purposes could easily serve as a medium for proposing and evaluating suggestions. Further, such a system would have the advantage of permitting a dialogue between the suggestor and the evaluators, a feature which should enhance the addictiveness of the process. Since the costs and benefits of most suggestion programs are well documented, changes in program productivity should be easy to demonstrate.

Beyond formal suggestion systems, most organizations have evolved in recent years some form of "hotline" process, whose purpose is to identify operational dysfunctions as early as possible, and cut across normal organizational channels and red tape to facilitate quick problem resolution. CC should serve as an ideal medium for such a process, since it suits the desired mode of operation, and it offers the added advantage of immediate participant interaction, to facilitate the identification of anomalous patterns of

phenomena, and the development of solutions even as a part of the problem identification process. Unlike employee suggestion systems, however, the costs and benefits of problem resolution systems are generally not well documented, and thus the impact of CC may be more difficult to assess without prior establishment of a well-documented control period, prior to its' introduction.

1.1.5.1.3 Impacts Upon the "Pace" of Institutional Life (Snyder)

While scarcely achieving a "real-time" information flow within the organization, the replacement of a traditional institutional message system with CC should substantially accelerate the pace of data flow and information mobilization within the organization. This would be particularly true if CC were linked with a word processing capability for composition purposes, and possessed an electronic access to various "institutional memories." Key questions for research here are:

By replacing traditional institutional message systems with CC, is more useful information mobilized in support of organizational decisions? Is the quality and/or timeliness of decisions enhanced? Are more variables considered? Conversely, does the availability of more and more timely information overwhelm decision-makers and traditional decision processes? Are new decision processes imperative, and if so, what might they be? Does the institution reject or ignore the increased capabilities that are available to it, or does it naturally evolve toward utilization of the added information resource? Is there an absolute limit to the human ability to take in, retain, and appropriately react to information, as suggested by George Miller's now famous approximation of 7 ± 2 clumps of information?

1.1.5.1.4 Economic Impacts (Snyder).

The 1972 Oliver Task Force on Federal Employment observed, almost in passing, that approximately one-half of the Federal workforce was engaged in some form of information handling, creating, analyzing, transcribing, transmitting, storing, retrieving, and disposing of information. Most people tend to think of organizations as being made up primarily of a vast number of doers (policemen, mailmen, assemblyline workers, insurance agents, revenue officers, etc.), backed up by a small number of managers, analysts, bookkeepers and executives. But this perception fails to appreciate the enormous number of people involved in processing the data which flows through large institutions--secretaries, file clerks, messengers, key punch operators, librarians and archivists, etc., are all handling information in one form or another.

Beyond its direct impact upon the efficiency of the information process, CC will have a multiplicity of secondary and tertiary impacts throughout an institution. (E.g., correspondence via CC may be expected to reduce paper costs for initial drafts and final originals, but may increase photocopy costs, especially if correspondence files are also electronic. Since CC would not handle all types of institutional information flows, hard copy files would still be necessary, and the problem of mixed media filing would have to be addressed, etc.). In summary, a full-scale application of CC could be accurately assessed only in the context established by a thorough evaluation of the system-wide impacts.

Once specific applications with proven productivity enhancing effects have been identified, broad adoption of such applications under monitored conditions might be promoted, at least in the Federal sector, by the National Bureau of Standards ITIP program (Innovative Technology for Increased Productivity).

1.1.5.1.5 Impact Upon Message Forms and Symbols (Snyder)

Even when applied in a traditionally restricted mode, CC will have a natural impact upon message forms, including grammar, syntax, and spelling as well as format and structure. Philological monitoring should be conducted in association with all major trial applications, to identify such changes, both in terms of the processes of innovation, adoption and dispersion, but also in terms of how such changes might come to influence general patterns of communication in society.

1.1.5.2 Institutionally Unconstrained Computer Conferencing (Snyder)

Comprehensive innovative trial applications of CC within an institution would be the sole means of assessing the so-called "synergistic" impacts upon the institutional organism. However, it is clear that such large-scale trials would have to be preceded by a number of tests of specific innovative applications, so that well-founded comprehensive applications may be designed. The most significant targets for specific research and assessment would be:

1.1.5.2.1 "Intellectual Team Work"

Within institutional theory and practice, there is an evolving emphasis on increased interaction among various segments of the institution which have traditionally been separated by organizational hierarchies and channels. Within this area of emphasis is the concern for more participative management work teams, and labor/management problem solving communities. Further, although to a lesser extent, there is a move toward greater interaction between the institution and the human elements of its environment. CC might be applied to a number of trials of this sort of institutional innovation.

In particular, trials in work team applications should include varieties of institutional environments, to identify key commonalities and variables in institutional problem solving processes to permit the development of generalized guidelines for the most effective application of CC to these types of institutional circumstances. In order to more clearly isolate the impacts of CC, a significant portion of trial work team applications should entail restrictions on team members from communicating outside of the CC, or at least limiting non-CC communication to specific, monitored circumstances, so as to limit circumvention of the CC and the adulteration or obscuring of its impact. By restricting work team members to communicating only via CC, test applications should evolve more quickly toward unique new message forms and communications techniques than they would do under circumstances where the CC is merely one of a mix of otherwise non-innovative communications media.

Within the context of trial work team applications of CCS, there are two broad areas of concern.

1. Does the easy, low-cost involvement of many disparate institutional components (field personnel, line, staff, R&D, etc.) in problem solving or decision-informing processes enhance the quality and/or productivity of these processes; and

2. By providing a total record of a decision-making process, would CC enhance the degree of integrity and/or innovation of such processes by curtailing the influence of institutional and personal politics? Or

conversely, does the existence of such a record curtail candor and the free exchange of information? Does the potential for anonymous participation in a CC significantly alter the dynamics of the process; that is, the degree of integrity, the speed, innovation, and overall quality of the output? In many institutions, staff people address a problem and produce options for decision makers to select (the "problem-solving" or "problem-informing" stage). CC could be particularly useful for such staff work, and provides no threat whatsoever to the decision makers.

In the case of the second question, a key variable factor would be the accessibility of the process record. That is to say, if the general public, interest groups, and the mass media were to have access to the record, the fact of its existence would have a more powerful effect than if the record were merely to rest in the institution's archives. Still, in this day of Freedom Of Information, and unpredictable court rulings, the existence of any record, even under lock and key, might have a powerful effect upon the decision-making process itself.

Finally, work team applications of all sorts provide appropriate contexts in which to assess the "work-at-home" concept, which is discussed in detail in section 4.1.1. Because of the variety of work subjects and products which can be associated with the work team context, as many work-at-home arrangements as are practicable should be assayed in association with work team tests, to generate a broad base of experimental experience.

1.1.5.2.2 General Intra-Organizational Communications (Snyder)

In an absolutely unconstrained general intra-organizational application, all operational staff and managerial, technical, administrative and executive personnel would not only have easy access to CC, but they would be free to use it in any way they wish. Basically, this would mean that individuals could query the organization, or inform it of new perceptions and knowledge as they deem it appropriate. In the real world, however, it would seem unlikely that such an arrangement would be viable. Rather, it seems more probable that new rules concerning the management of communications flows under CC would have to be developed. Some of these would become apparent through experiences with specific trial applications, such as those described in 1.1.5.2.1 above. But, in many ways, generalized applications would confront circumstances so unique that experience gained in work team and other small group applications would be inapplicable and it will ultimately be necessary to undertake some trial experiences on a large scale to assess some key factors.

Finally, these sorts of applications would raise issues concerning the freedom of access to information: the freedom of individuals in one portion of the organization to become intimately knowledgeable concerning another portion. In other words, in the absence of traditional organizational constraints upon information flow, are there other constraints, of either a systemic or psycho-social nature, which come into play to restrict information flows? If so, what are they? How may they be overcome? In effect, an unfettered CCS would have the potential of facilitating the function of many, even all, individual employees as a collective institutional conscience and consciousness. What happens to authority in such an environment? Is there a natural tendency towards group management and decision-making? Or do existing forms remain, but with altered selection criteria emerging for the filling of decision-making jobs?

1.1.5.2.3 General Inter-Organizational Computer Conferencing (Snyder)

Computer Conferencing is, at least, a collaborative medium. In our traditional socio-economic structure, independent institutions and their respective employees do very little collaborating, except for that which occurs under the specific provisions of a contract. In fact, the management of projects under contracts involving a client and one or more contract vendors (e.g., a construction consortium) would appear to constitute an ideal application of CC for research purposes. But because of its inherent documentational feature, CC may lend itself to two areas of institutional interaction which are of growing public concern.

One of these areas deals with the reported public distrust of major institutions, and the growing pressure, on one hand, for greater social responsibility on the part of institutions, and on the other hand, for greater public access to institutional decision processes as a means of insuring such responsibility. On the government side, in addition to the two Freedom of Information Acts, there has already been the Open Government Act and Senator Kennedy's proposed Open Communications Act. On the private sector side, there has been repeated congressional testimony recommending greater openness as the optimal means of assuring corporate responsibility. In this context, there might be some experimental applications of CC for the sole purpose of establishing a public record for documenting a particular decision process. (E.g., a multiple institution assessment of the safety of nuclear power generation, or multiple-judge pre-sentencing review panels, etc.).

As regards the second area, the issues described above are compounded by the question of illicit collaboration among business interests in contravention of the anti-trust laws. The classic example of this would be the current debate over the deregulation of scheduled airlines. While the government, the public, and the airlines all want deregulation, the airlines and those who finance their air craft are fearful of wide open competition, which could seriously alter the financial stability of the industry and damage the carriers' ability to meet their financial obligations. Accordingly, the airlines have asked that if air routes are deregulated, industry representatives be permitted to "negotiate" an orderly transition to a free market competition in a manner that would be in the best interests of both the public and the industry. To date, these requests have been denied by the Federal government, as violating the Anti-Trust Act.

CC might provide an alternative mode of "negotiation" which would be acceptable. Under such an arrangement, carriers would be permitted to discuss fares, routes, and schedules among themselves, and reach agreements on such matters, (and other areas, such as food services and other amenities) so long as all such discussions took place only via CC. The system monitor, in this case, would represent the appropriate Federal arbiter. Or, there could be a panel of arbiters--one from the public, one from the government, and one from the industry. The specific arrangement is not as important as the potentially critical innovation of permitting open and aboveboard, intra-industry communication. A trial application of such an arrangement would be a significant and compelling research initiative.

Other innovative applications of CC to inter-organizational communications would involve opening up selected institutional decision processes to participation by outside parties. An example is provided us by the Northern States Power Company, which solicits the participation of a wide variety of outside interests in some of its critical decision processes, such as power plant siting and transmission line routes. The involvement of rank and file workers in plant operating policy might also be enhanced by the opportunity which CC offers for participation without confrontation. The expansion of the

employee suggestion system concept to involve the participation of community members in a dialogue with local industry management (a process which is now evolving into a national movement in Great Britain called Community Industry Cooperation (CIC), would also be facilitated by CC. Trial installations of this sort might be encouraged, particularly in "one-industry" towns (e.g., St. Johnsbury, Vermont or Columbus, Indiana).

1.1.6 Other Factors (Turoff)

There are some other factors which could have a significant impact upon the utility or desirability of computerized conferencing systems in any given situation. Among these are climate, mobility, alternatives in transportation and communications. Some of these become very pronounced in application areas such as international applications, underdeveloped countries, rural areas, etc.. There have been to date no experiments where any of these factors are prominent, so once again it is only by intuition that we can point to the potential desirability in these situations. Of the above, it would probably be easiest to experiment with applications in rural areas of this country to try and get a firmer feel for the potential and to gather some data.

1.2 System Capabilities (McKendree)

Computerized Conferencing is a process by which groups of individuals may communicate about complex problems through the use of computer terminals. The topic under discussion may last a few days or weeks or may be continuing. Conferencing structures which assist in focusing the discussion should be tailored in a day or less to the needs of the group.

Potential advantages of such computer systems include their ability to process and store information related to the discussion; to permit text, statistics, and/or cases, as needed, to be printed in familiar outputs; to permit voting on proposals raised in the discussion; and to couple the conferees to various modeling, simulation, and/or games routines.

Research is needed to determine, among other things, the feasibility of CC supported groups identifying issues, developing alternatives, or managing projects, more effectively or efficiently than with simple messaging services.

1.2.1. Conferencing Structure (Hiltz)

To what extent should the computer guide the user during a computer conference? At one extreme is the questionnaire mode or voting structure where one cannot proceed until a certain question has been answered. At the other extreme is the open-ended conference in which a user can send messages to anyone or make entries on any subject at any time. Between these two extremes are many possible structures that should be studied.

1.2.1.1 Structuring Human Roles (Hiltz)

How can a human leader serve to organize proceedings and generate closure on discussions? What special skills are necessary for effective conferencing structure through leadership only (no software structuring)?

Most current systems have provided capabilities to allow persons to function as chairpersons or moderators but we do not know yet how to design capabilities for gate keepers, general facilitators, judges, negotiators, etc.

There are a host of roles people play in human communications where we do not know what corresponding computer tools may be of use.

The degree of control exercised by a chairperson could be studied as a parameter influencing the outcome. The effectiveness of Delphi-like processes could be compared to that of open-ended discussions and of discussions heavily guided by human leaders for specific tasks, durations, group sizes.

1.2.1.2. Organizational aids (Hiltz)

Can key words and association or sequencing of items with earlier ones help a computerized conference to produce more effective results? Will contributors actually use these aids to develop their own thinking, or help others in assimilating their material, or must a conference moderator be depended upon to use these features?

1.2.1.3. Special Purpose Structures (Hiltz)

Most systems today are largely free discussion systems. There is a need to experiment on more highly structured systems reflective of Delphi and gaming exercises, where variable and adaptive relationships or conditions may be placed upon the protocols governing who can communicate with whom, and under what conditions. Roberts-Rules of Order is one excellent example of such a communication structure, but one which is oriented toward face to face conferences in which only one participant should contribute at a time. Is there an analogous protocol better suited to the parallel participation permitted in CC?

1.2.2 Complexity and Power (McKendree)

Computer conferencing offers a group the opportunity to collaborate by bringing information to bear on the solution of assigned problems. For example, problem definition work (e.g. simulation, modeling, data base application, or - useful in its own right - discussion among experts), and data collection (e.g. social research, crisis management, project management). Data processing can assist the group with summary analyses and publication and distribution.

The desirability and feasibility of Computerized Conferencing support for such collaboration has been demonstrated at an elementary level. Much greater understanding of the processes involved is required if effective and practicable applications are to evolve.

1.2.2.1 Simulation/Modeling (McKendree)

Computerized conferencing has potential benefits to three phases of modeling: design of the model, running it manually or with computer assistance, and evaluation of model outputs. Communication among analysts and other users of the model can be facilitated by providing access to data bases, organization of the model's inputs and outputs, or simply inserting the cooperative decision process between phases of the model's operation.

Three categories of conferencing might evolve: cooperative, antagonistic, or competitive. Sub-conferences, private communications, and shifting viewpoints could occur, particularly with regard to the protection of anonymity, or of other conferencing mechanisms.

This research effort would incorporate computer-collected statistics in combination with documented independent observations, and also opinions of conferees. User feedback, including measures of effectiveness, would be accommodated by the design.

Products of the research effort would include:

1. Feasibility of conferencing integral to modeling: design, operations, and evaluation. 2. Quantitative analysis of computerized conferencing performance. 3. User feedback collected and documented as to measures of effectiveness.

1.2.2.2 Data Base Application and Development (McKendree)

There is an emerging field of evaluative numerical data bases that are being converted to on-line access capabilities. CC could be helpful for these systems in two respects: 1. The CC editor/referee/journal procedures would appear to be tailor made for the evaluation process: i.e. the process could be extended to a larger user community not confined to the physical plant of the data center. 2. With on-line interactive access via computerized conferencing, user feedback could be controlled and analyzed more systematically and become more truly interactive with the design, a part of the evaluation process (on-going), and a continuous input mechanism.

In operation, this research effort would aim at achieving simplified organizational communication of the data resource. It would identify features of computerized conferencing most easily adapted to data base proposal administration and control. It would enable users, untrained in the limitations and potentials of the data resource, to be assisted by information specialists, and by other subject matter specialists toward solution of common problems.

Products of the research effort would include: 1. feasibility of CC integral with numeric data base research. 2. quantitative analysis of CC performance. 3. user feedback collected and documented as to measures of effectiveness.

1.2.2.3 Social Research (McKendree)

Computerized Conferencing has been defined as "The integral use of computers to structure and facilitate communication among a group of people". Group structures lasting for many months or several years can be reflected in CC software. How feasible is it to accommodate such group structures in CC? How feasible is it (or desirable?) to retain conventional structures, e.g. hierarchical, given that CC is operating in a different format?

From studies at Stanford Research Institute and elsewhere, we observe that organizations seem to weave complex collaborative networks while making individual communications shorter and more precise. Basic organizational structure seems to be the dominant tool for focusing communication and power. Computerized conferencing can reflect such organizational complexity via multiple conferences on separate but related subjects. Products of such research would include 1. the feasibility of relating multiple conferences (eg. relational data base research) 2. the feasibility of specifying/managing a large-scale group effort by breaking tasks into small conferences of sub-group members. 3. the most promising classes of problems to be addressed by the complex organizational approach.

A related outcome may be a partial answer to the question "Do these systems provide the opportunity to create better organizational structures?". This question is addressed to the wisdom of the idea that "all computerized information systems should be designed to replicate what is being done in a non-automated manner and do it the same way".

An alternative to linking many task-oriented conferences is one conference covering a relatively wide range of subjects. Procedures and/or software support could be incorporated in order to prevent the discussion from ranging out of control. Many examples of such group communication structures do exist: for example, management reporting, opinion polling, Delphi policy research, research data collection, etc. Common to all of these systems is a pre-planned administrative structure which is largely unchanged for the duration of the system's operation.

Prototype systems sufficiently large to accommodate a truly representative group at work must be made available for research. Time spent at the terminal may well exceed 25% of the working day. Terminals may even do double duty as word processing machines for the office.

1.2.2.4 Conference Facilitation (McKendree)

Facilitating conferences requires software support. The current state of the art is inadequate to support the variety and extent of facilitation activities implied by the full panoply of CC possibilities. Initialization of system parameters and maintenance for structural changes during on-going conferences is theoretically quite readily included in conferencing system designs. Review of members entries and other data elements as an abstracting service should be performed on an exception basis. Setting up new conference structures should be possible by those without programming knowledge.

Conference facilitation involves, in fact, a dual role (perhaps two people).

First: sustain the people (conferees) in their day-to-day operations while the technologies at their disposal are added/modified/debugged.

Second: specify the application of CC in terms of problem solving process (operations analysis of proposed Group Processes) and, also, in terms of system implementation process (program/features analysis for software development Management). The first orientation (current operations) is concerned with motivating conferees (diagnose problems, suggest solutions, train new users), ideally in terms of the specific conference underway. The second orientation (project operations) is concerned with breaking up a total implementation job into manageable tasks (conference tasks, other Group tasks) and seeing that they are assigned to the right people and then executed correctly. It involves interfacing with functional (as opposed to project) management who have all the actual resources.

What are the common problems among the many possible implementation configurations which conference facilitators face? What software structures are required? For example, essential to most problem-oriented conferences would be the features of anonymity in sending messages, and voting mechanisms. Is anonymity antithetical to conference facilitation- e.g. in such areas as basic training and information overload? Is conference facilitation, particularly with automatic computer assistance, quantitatively different when users spend a large percentage of the working day in conferences (or at their terminals), e.g. 25% or two hours or more? What basic software procedures are essential?

Also, as users develop specialized features for their individual use, what monitoring facilities are required (for example, as the conference evolves into multiple conferences; as system users are away from the conference for extended periods of time and return to a large backlog of items; at the time the conference coordinator determines the roster should be pruned or expanded; when system down-time and re-start occurs)?

The above considerations might be said to be foreground services to the conference facilitator. What background services are effective? For example, what technical approaches are most appropriate for traffic analysis, system maintenance, social research statistics, and/or network maintenance? What permanent/historical records should be kept in transaction form; in summary form?

1.2.3 Interfaces and Terminals (McKendree)

Computer hardware technology is rich in terms of technical options available, most of them off-the-shelf, to meet the majority of data processing requirements. Conferencing via computer places a particularly heavy emphasis on free-flowing or natural expression, however, which is very unevenly available from today's terminals. Users who are skilled touch-typists are least inhibited by standard typewriter keyboard layouts; others are at somewhat more of a disadvantage. Communication of abstract concepts, particularly those involving spatial relationships, would benefit substantially from graphics capabilities at the terminal - not generally found with typewriter keyboard inputs.

Seen from the different perspective of the physically handicapped (blind, deaf, mobility limited), neither standard keyboards nor graphics designs are helpful for communicating with other human beings. If the goal is to facilitate communication, then conferencing systems must accommodate a variety of terminal designs for different user needs.

1.2.4 Service Factors (McKendree)

Users of a computerized conferencing system must have confidence in the system's services. The system must provide easy access and interact with the user permissively and predictably. Minimal initial training must suffice. The system itself must be self-teaching with the support of clear and succinct reference manuals, but the special aids for neophytes must not become burdensome as the user gains proficiency. Frequent down periods are intolerable, as are losses of data on files once they have been correctly keyed in and accepted by the system.

Departures from these standards of service can be tolerated if the primary goal is development of computer hardware, software, or operational procedures. If research is concerned with group and/or individual impacts, however, or with evaluation of final results of the computerized conference effort, then system interruptions must not be allowed to intrude.

In this framework, the CC technical capabilities may be traded off against reliability in hardware, including communications lines, terminals, and host computers; operating system software; application program modules; and even management action, particularly as it affects service of the system. The nature of these tradeoffs should be examined and documented as part of research evaluations of potential conferencing concepts.

1.3 Economics (Turoff)

It is far too often the practice that computer and information systems are evaluated on an economic standpoint only in terms of the costs and economic benefits associated with the hardware, software, and the operation of the system. In computerized conferencing systems, it is impossible to separate economic considerations of the system from those of the user and the organization. Also, several economic issues appear to be peculiar to CC.

1.3.1 User and Organizational Economic Factors (Turoff)

In the evaluation of CC, the actual costs and benefits to the user and the organization must be considered. This may range from simple considerations of user time and its value to more complex issues of alternative use of transportation or other communication options. It is not clear that we know how to do this well on any generalized basis. In particular, we have no economic analog or standards on how to deal with opportunity costs and benefits, i.e., with the things that a CCS may enable us to do that could not be done previously. The only generally practiced economic form of analysis in information systems is the comparison of costs and benefits of doing something without a computer, to that of doing it with a computer. In addition, we do not have a good understanding of how to treat marginal costs and benefits. This is the case where the same system and terminals may be used for a variety of information system purposes and it is desired to introduce computerized conferencing as an adjunct to those services.

1.3.2 Charging (Turoff)

Charging policies can have a tremendous impact on use of information systems. In addition to standard charging options that have been commonly used and some of the more experimental ones (like bidding on use at any time or variable rates based upon immediate level of usage), computerized conferencing offers a unique situation for experimenting with transaction charging at a level that the user can perceive, e.g. costs per item sent and received. As yet there is no data on experimentation with charging policies of this sort and their potential impact on users. Variations of this approach include modifications to current charges for sending, based upon later retrieval and use by others. In other words, both the sender and receivers or utilizers of an item of communication have an interest in that same item, and we have not yet determined what would be the appropriate charging policy in such situations. Perhaps the analogy of the postal system (wherein the sender usually bears the burden of the cost) would not apply in such systems. It may very well be that appropriate charging policies are application dependent, but without specific investigations and experimentation in this area, we have no way of knowing this for sure.

1.3.3 Equity (Turoff)

A long term economic issue that deserves close attention is that of equity and ownership of the information. The information in a computerized conferencing system is information authored by specific individuals. This information may have economic value, but we have no understanding of how to determine the value of such information. Is a market mechanism the best way? This may not be appropriate for many applications. Even where the market mechanism is to operate, there are variations as to how one could implement a marketplace in information via a computerized conferencing system. This area is very open to imaginative experimentation and analyses.

1.3.4 Communications Economics (Turoff)

The introduction of digital technology into communications is leading to some notable economic imbalances in the costs of communications. Computerized conferencing systems are dependent on telephones and digital packet networks. In fact, central computer costs currently are becoming lower than associated communication costs. Today, it is often cheaper to employ computerized conferencing for communications between widely separated metropolitan areas, than between two counties in the same state. In the first case, one is utilizing a packet network, where one pays for the amount of information transferred; and in the other, one is using a complete phone line, where the length of time is charged- regardless of the probable usage of only 5% of the capacity of the line over the time period. This may result in noticeable imbalances in terms of the applications that could be made of these systems, particularly for local geographical areas. While the technology exists and is being installed to share and digitalize voice communication, it is not clear that the economic analyses of equitable distribution of costs for voice and digital transmission accurately reflect the usage that we suspect may occur in the future, or that is in some sense socially desirable. This same problem is common to a host of other information services that may be offered in the future on a local geographical basis.

An examination of this area, and an attempt to lay out the situation so as to be useful for forming regulatory policies, would appear to be in order. Also, until this situation is made clearer in terms of technical possibilities that allow different rate structures, there will not be local understanding of these issues, or the resulting pressures for more equitable distributions of costs. These concerns are addressed further in Section 5.

2.0 Intermediate Processes (Communications Behavior) (Hiltz)

How are communications processes affected by computerized conferencing, in terms of their psychological and social dimensions, and in comparison with other communications media? What are the unique kinds of processes that take place, and how are these likely to affect the total outcome of a single group communication process (a single "meeting" or project?)

The focus here is upon discovering the characteristics of this medium as they affect the information transfer, social interaction, and other processes related to communication, at the individual and group level.

2.1 Social Conventions: Norms and Rituals (Hiltz)

Computer conferencing, like other communications media, is likely to develop established sets of expectations of proper forms of communications behavior.

What kinds of norms will emerge in this new type of social system? We expect to see multiple sets, perhaps varying by type of activity, education, social background of users, and geographical areas, or by other characteristics, such as degree of comfort with the computer conferencing medium. Conventions that become established as a result of computer conferencing experience are likely to exist side by side with norms borrowed from other media. We have here a "strategic research site" for investigating the ways in which norms develop and change in a new kind of social context.

Most of the emergent norms and forms of behavior will also be strongly conditioned by the software of the system. For example, the system may automatically supply some choice of form of salutation, or it may not. The system may, or may not, allow copying or anonymous communications. Thus, the emergence of norms must be seen as strongly conditioned by the design features of the specific system being used by a group.

2.1.1 Normative Rigidity (Hiltz)

As they become established, will the norms acquire a ritualistic tone because of the constraints imposed by the computer conferencing medium? Can system mechanisms or leadership practices prevent this if necessary?

2.1.2. Salutations or Modes of Initiating Dialogue (Hiltz)

Some users initiate messages with the recipients' first name, as in letter format; most are without any form of salutation; and some are more awkward. What kinds of users, in what contexts, choose which style?

As an example, salutations may be used as indicators of familiarity with the system and the nature of the social relationships between the sender and receiver of the message. We can, in this way, uncover some of the assumptions and dimensions of the system of which most users are unaware. It will be unnecessary to access message texts, which must remain confidential; rather the social relationships can be learned by questioning the parties on a check-list basis. The objective measure of their system knowledge can be learned from

time on-line, perceived familiarity with the system, and ease of using it.

2.1.3 Leave Taking

Electronically or otherwise, this is a complex social ritual, and one in which it may be more difficult to borrow norms from other media. The user's problem is to terminate the interaction gracefully, without resigning or abandoning the relationship.

e.g. Is leave-taking more difficult in particular contexts, as when preceded by an intense, extended, or real-time interaction, or for the new user? Differences in expectations might exist according to whether one is in a dyadic conversation vs. large group; or synchronous vs. asynchronous situations.

2.1.4 System Unavailability

What norms operate when leave-taking is the result of the system going down, in either a planned or unplanned way?

2.1.5 Introductions

What is the etiquette of getting to know someone or introducing others electronically? Is it proper to introduce oneself to a stranger, to ask a third party to describe someone you're getting to know, to supplement electronic exchanges with telephone, mail, pictures, and face to face meetings?

2.1.6 Temporary Unavailability (Hiltz)

When unable to respond immediately to a communication, do users tend to develop habits of notifying others of such things as not being able to respond to a message at that moment (they want to bury themselves in their scratchpads and not chat; they're getting off line for a while), or do they simply not respond to a message? What are the consequences of such actions for social relationships?

2.1.7 Anonymity and Pennames (Hiltz)

Do users develop guidelines about when anonymity is acceptable as useful, or acceptable as playful, vs. when it is impolite or detrimental?

2.1.8 Citations to Material Entered (Hiltz)

What are the proper footnote forms for electronic citations? To what extent do groups form the habit of citing a conference and person as the source for an idea or contribution?

2.1.9 Copying to Third Parties (Hiltz)

Are private messages the "property" of both the sender and the recipient, or should one obtain permission before copying a message to a third party? What about blind versus open copying conventions? System possibilities include automatic notification of the sender that a message was copied, and imposing limitations on the ability to copy a message received. In this matter, as is the case with other forms of computer conferencing behavior, many norms can in effect be "legislated" by the system designers (for example, programming to inform the original sender of a message when that message is copied by a

receiver to a third party or parties). Very possibly, these choices should be available to the person (monitor) setting up the structure of a specific conference; if so, what guidelines should be used, based upon the effects one wishes to achieve?

2.2. Social Networks (Hiltz)

What are the processes by which persons form impressions of one another over a computerized conferencing system, make acquaintances, and form working or social relationships? To what extent is there a tendency for social networks to form among individuals, and to evolve into group or subgroup activities on the system?

2.2.1. Friendship or Colleagueship Formation over C.C. (Hiltz)

Does the absence of non-verbal cues (or some other system characteristic) make it difficult to meet people, or form close social ties through this medium? One method of investigating this area would be controlled experiments of impression formation and interpersonal attraction among persons who meet one another and interact for the first time in face to face vs. CC conditions. vs. CC conditions.

2.2.2. Maintaining Existing Relationships (Hiltz)

Does the absence of non-verbal cues and relatively slow turn-around time (as compared to telephone or visit) produce strains and misunderstandings in existing relationships, when CC is used as either the sole or main means of communication? =10 Does it provide some features that facilitate maintenance of existing relationships between visits? between visits?

2.3 Socialization (Hiltz)

How are the norms and etiquette of proper electronic behavior transmitted to new members? How do they learn the technical requirements and more advanced features of using the system? The absence of nonverbal communication cues makes these processes significantly more difficult than in conventional communication settings, as well as producing some unique constraints upon the learning situations. Miscommunications, misunderstandings, and errors must be corrected when they occur, as quickly as possible, and especially within multidisciplinary groups, so that the group's task may be accomplished rather than dysfunctionally impeded.

2.3.1 Socialization Agents (Hiltz)

How frequently is the socialization function assumed by more experienced users, rather than new user groups creating and communicating their own rules of conduct?

2.3.2 Length of Socialization Period (Hiltz)

How much time does it take for the typical new user to be socialized? (learn the etiquette and norms). Does this vary according to the socializing agents, or according to mode of training (in person vs. written documentation only)?

2.3.3. Sanctions

Under what conditions are deviations from established CC etiquette ignored or sanctioned? What sanctions are possible, likely, and effective? How do participants react when others criticize their behavior, or threaten to expel them from a conference?

2.3.4. Effects of User Consultants (On-Line Helpers): (Hiltz)

What are the consequences of the existence of a group of system consultants trained to orient new members both technically and socially? What is the optimal combination of personality, technical, and social background characteristics of such consultants to maximize their efficiency? What is the appropriate frame of reference or orientation for this group? What kinds of social relationships with new users are most effective in the learning process? Both task orientation and facilitation are issues that must be dealt with in this context.

2.3.5. On-Line Explanations (Hiltz)

What length, form, and content should these on- line explanations take in order to maximize the speed of learning and not over-tax or overload the user with too much information about system features, norms, etc?

e.g.- how much self-discipline is required for different kinds of new users to effectively learn what is expected of them? Can system mechanisms be designed to reduce information overload so as to facilitate these processes?

2.3.6. Group Leadership and Socialization (Hiltz)

What is the optimal leadership style within group conferences to maximize the rate and effectiveness of socialization? What degree of socialization is a condition of the realization of the groups' task?

2.3.7. Effects of "Turn-Around" Time During Socialization: (Hiltz)

What affect does the speed of the interactions allowed by the system have upon misunderstandings, confusion, and frustration as these affect learning? What are the effects of asynchronous interactions, which mean a delay between the sending of a message and its receipt, given that cues and perceptions available from other media such as face-to-face are absent? To what extent do users avail themselves of alternatives, such as visits or telephoning, to resolve CC difficulties?

2.4 Humor and Relaxation

There are a host of auxiliary services and structures that can be incorporated in a communication environment to foster the use of humor and other tension relaxation methods (games e.g. bridge, producing funny remarks by having the computer modify a humans comment etc.) How important is it to use software structures and leadership policy to foster the use of humor, in terms of user satisfaction and degree of group cohesion? What unique forms and functions does humor assume on this medium?

Controlled experiments and/or observation of participants behavior and/or interviews might be employed to explore the following types of possible functions of humor in systems of this type

2.4.1 Humor as an Assessment Tool

A. As a means of assessing the intelligence, Sophistication of a new acquaintance in a socially acceptable way.

B. As a means of assessing group membership, i.e., does the new acquaintance understand the in-humor of the group.

2.4.2 Humor as a Socializing Mechanism

A. Use as an Ice Breaker

B. As a Means of Creating Multi-Stranded Relationships

2.4.3 Rhetoric--The Use of Satire, Irony, Sarcasm, etc.

To underscore, vivify, call attention to the point one is making.

2.4.4 Catharsis

A. The suggestions that Graffiti-type outlets are necessary for programmers

B. Observations that most hostile msgs. usually include a stab at humor at the end to help reduce the tension

C. Comic relief, perhaps, to relieve tension in extended sessions or when the atmosphere becomes unusually tense.

2.4.5 Use as a Reductio Ad Absurdum in Testing Hypotheses Generated in a Conference.

2.4.6. Induction--Mental Excursion to the Absurd, Use of Humorous Analogies, etc. in the Search for Cohesion in Seemingly Unrelated Ideas, in Attempting to Solve Knotty Problems

2.5 Leadership and Control (Hiltz)

The basic problem here is to determine the degree to which and the ways in which Computer Conferencing influences the emergence of various kinds of leaders among participants, and changes the nature of effective leadership practices.

2.5.1. In Small group problem solving discussions (Hiltz)

What effect does the Computerized Conferencing medium have upon leadership (dominance) processes? Does participation tend to be more concentrated upon one

or two persons in a face-to-face condition than in a Computerized Conference?

To what extent might there be differences in the subjective perception of leadership among the meetings' members? To what extent do different types of behavior or personality seem to be related to the emergence of a leader in the two meeting conditions?

This problem area could be explored with controlled experiments. For example, many different groups could be given one problem to solve in a face-to-face meeting and a very similar problem to solve over a Computerized Conferencing medium.

Example:

R.F. Bales and others have provided large amounts of available data on kinds and rates of participation in small problem-solving face to face groups. Replication of the Bales design in the context of a Computer Conference would yield directly comparable data. From comparisons, it would be possible to assess the impact of the medium on participation rates.

The Bales' data also allows for a comparative analysis of various kinds of leadership and participative behavior. Thus, the proposed study would permit the examination of roles as they are exhibited in the Computer Conference medium.

2.5.2 In Long Term Operational Use (Hiltz)

Does the staff manager or project leader need to change his or her leadership style to manage a group effectively through this form of communication? Does the leader feel more, or less informed about the activities of the group than with traditional forms of communication and supervision; and more, or less "in control" of the activities of the group members?

A "before and after" field trial or experiment would be one way to study the effects of introducing CC. A fairly long term trial (probably six months or more) would be necessary in order to begin to measure such long-term effects and changes. One approach might be to choose two very similar staff groups in an organization; to assign them both an identical task estimated to take about three months; take "before" measures on both groups; then randomly assign one group to use a conferencing system to conduct its project, and the other to use conventional means. After three months, a second task could be assigned, with the communication modes reversed.

2.6 Cognitive Transmission (Hiltz)

How does CC affect the accuracy, efficiency, and timeliness of the interactive transmission of ideas and information to individuals and groups.

2.6.1 Complexity of Material and Form (Hiltz)

Does the written CC format facilitate more precise expression of ideas? Does asynchronous conferencing facilitate the development of more carefully considered ideas? Is a written format an aid in structuring more complex ideas? Would graphic capability help?

2.6.2 Cueing (Hiltz)

Can lost non-verbal cues be replaced by compensating mechanisms? Should they be replaced or do they constitute distracting elements in cognitive transmission? Does the suppression of old cueing devices and the development of compensating or entirely new devices lead to better understanding of the processes of language, learning, and communications?

2.6.3 Learning (Hiltz)

Is there better, or poorer retention of ideas that are received in writing via CC than for those that are heard in face-to-face conferencing? Is a sense of emphasis or importance lost to any extent in purely written communications? To what extent does the availability of a full transcript facilitate better understanding of what transpires in an exchange of ideas?

2.6.4 Feedback (Hiltz)

Is there a better, or poorer understanding in CC of whether ideas have been properly grasped by other group members? Are verbal, or non-verbal cues and communications more appropriate for determining and communicating this?

2.6.5 Disability Compensation (Hiltz)

How can CC be employed to aid those whose understanding, reception and transmission of ideas is now impaired by physical or learning disabilities?

2.6.6 Validation (Hiltz)

How can computer assisted voting, questionnaires, Delphi, etc. be employed to convey or expose differences of interpretation by members of a group?

2.6.7 Enhancement (Hiltz)

How can the individual or group use the computer to add leverage to human capabilities in organizing, retrieving, arraying, synthesizing, analyzing, and displaying ideas for greater understanding?

2.7 Effects of CC Upon Group Cohesion and Morale (Hiltz)

Do members of a group which communicates primarily through CC for an extended period of time tend to come to like each other more, or less; to feel more in touch with what the other group members are doing, or more isolated?

How does long term use of such a system affect the job satisfaction of the members of the group? To what extent does this vary with job type?

What are the subjective judgments of the group members about how well they are able to coordinate their efforts and about the quality of the work that the group produces using the CC system?

2.8 Subjective Satisfaction and Attitudes (Hiltz)

Comparing various communication modes to CC, how does the subjective satisfaction of users differ? Do users prefer certain media for certain kinds of tasks (e.g.- information exchange vs. conflict). Does the degree of subjective satisfaction with computerized conferencing vary with total cumulative time on the system, average time on per day, or whether or not a person can work at home or must work in an office?

2.9 Communications Content and Behavior (Hiltz)

Given a computer conferencing system (hardware+software), many problems of communication may be encountered in the transfer to other modes of communication. This includes the loss of nonverbal cues and intonation, as well as possible misunderstandings of the communication process.

On the other hand, what unique kinds of cues or communication possibilities in CC are not available in other forms of communication? In exploring this area, we must separate out the effects of "learning" from those of the medium. (After all, adults have had decades to learn how to use the face to face conversation or the telephone effectively). Therefore, studies of this issue should be focused on experienced users only, who have mastered the mechanics of using a system and have had considerable practice time.

2.9.1 Communications Content (Hiltz)

How does the actual content of the communications differ between CC and face to face, or audio modes? For example, what happens to content that is usually conveyed by nonverbal means, or by drawings, in face to face communication? Is there more, or less "social" or "emotional" content, as compared to task oriented, emotionally neutral statements? Is there a greater, or lesser tendency to disagree?

2.9.2 Amount of Communication (Hiltz)

Can groups of various sizes (say, five, ten, twenty) exchange more, or less total information in the same number of total participant hours?

Do written conference statements via CC tend to be longer, or shorter than spoken statements at a face to face meeting?

2.9.3 Pattern of Communication (Hiltz)

When there are choices provided by a system for forms of communication (such as private messages, group messages, conference comments, signed or anonymous entries), what form tends to be used, for what kind of comment?

To what extent does communication take place within user groups, or across user groups? How is this affected by the system design? For example, PLANET does not permit group messages or conference comments across user (conference) groups. ARPA has a printed directory that is generally out of date, and no on-line capabilities for searching design features, or interacting with other factors to determine the pattern of communication that takes place on the system, in terms of who communicates with whom, and in what form. On the other hand, EIES has a searchable directory of members and groups, and permits any user to send a message to anyone on the system.

3.0 Group and Individual Impacts (Hiltz)

What are the typical impacts of the extensive, or permanent, use of computerized conferencing as a primary mode of communication, upon the individuals who use such systems, groups which communicate in this way, and organizations in which such groups work or exist? In other words, over time, what cumulative effects do the processes described under the topics covered in 2.0 have, upon the problems or roles of individuals, the social structure of groups, and the quality and quantity of work accomplished in an organization?

3.1 Information Overload (Hiltz)

As the flow of items to and from a given user becomes heavy, what are typical reactions to the form and contents of the information? What mechanisms are needed to enable users to cope with a high level of communication activities on such systems? Does CC lead to communication with a larger number of persons, and to the sending and receiving of a greater volume of information than would otherwise be the case?

3.1.1 Effects on the User (Hiltz)

What are typical subjective (emotional or attitudinal) reactions of users at various levels and types of activity? What are the "objective" behavioral manifestations of information overload in terms of decreasing productivity, or inefficiency? (For example, inability to remember and answer all items directed to the person; avoidance of the system).

Examples:

1. How many synchronous conversations or activities can a user engage in without feeling unable to cope?
2. How many different (asynchronous) conferences can a user reasonably be expected to be able to participate in, without falling behind, or feeling fatigued?
3. Is there some number of hours of activity a day on the system, beyond which overload reactions become high? If so, is it a function of the users' other responsibilities?
4. Is on-line editing activity in a notebook type facility more, or less stressful than conferences?

3.1.2 Software Features for Decreasing Overload (Hiltz)

What system functions (software features) can decrease information overload reactions?

Examples:

How useful do users find such features as reminders, strings of commands preset by the individual user, review of titles of messages or conference items only, association or Keys to signify subject?

How does this interact with the complexity of the particular system, response time, and access difficulties?

3.1.3 Human Roles to Mediate Between the System and the User (Hiltz)

What human roles can facilitate adaptation to heavy use? ex.- Can secretaries be trained to retrieve and filter material? Can they be trained to enter material from dictated or rough draft forms? (This has been done by many users; perhaps it needs documentation, rather than research.). How can roles such as conference moderator and group coordinator on the DIES system, or their equivalents on other systems, be used to maximize efficiency of communication time on line for the members of groups and conferences?

3.1.4 User Skills or Practices which Decrease Subjective Overload (Hiltz)

What user practices can reduce information overload reactions?
Examples:

1. Users might develop practices which decrease on-line waiting time, such as the habit of entering a string of commands to print out all waiting messages and conference comments, and then walking away until they are all printed out, and ready for reading; or accessing the system before or after regular office hours, when nothing else will interrupt.

2. Users may develop effective ways of handling and filing materials that could be shared with others.

3.1.5 Hardware Features for Decreasing Overload (Hiltz)

How does system and user hardware effect overload? For example, terminals printing at hundreds of characters per second facilitate skimming, and off line high speed printers to run off large amounts of material can save considerable amounts of time.

3.2 Acceptance and Attitude (Hiltz)

How does computerized conferencing eventually fit into the total communication pattern of an individual, group, or organization? When individuals have a choice, what kinds of tasks, meetings, or social situations do they choose to conduct via a computerized conference, and what kinds to they choose to conduct in person, by telephone, or by other media of communication?

3.3 Emergent Groups and Communication Patterns (Hiltz)

To what extent does CC result in the formation or emergence of affinity groups which did not exist prior to their "meeting" over a conferencing system? For example, what characterizes the "electronic migration" of persons from one user group to another? When subgroups split out of a larger user group, what are the common interests or attitudes which set them apart from the rest of the group?

Is this a function of the size of groups; the total number and types of groups on a system; the amount of geographic dispersion among members, or what?

3.4 Problem Solving and Quality of Solutions (Hiltz)

What are the effects upon the process, and the immediate and long term outcomes, of group decision making or problem-solving sessions that are conducted either synchronously or asynchronously over a CC system, as compared to face to face meetings?

3.4.1. Differences in the Interaction Process (Hiltz)

How do group interaction and problem solving processes differ between a Computerized Conference and a face to face conference organized to solve a problem or reach a decision?

Example: Is there more negative comment or disagreement in a Computerized Conference as compared to a face to face conference? Is this affected by the use or absence of anonymity in a Computerized Conference? To what extent are more ideas raised and explored in one medium as compared to the other? To what extent is there a difference in the content of the communications; for instance, in the amount of social or emotional content, as compared to the amount of strictly task oriented content?

3.4.2. Quality of Decision (Hiltz)

Suppose one compared groups solving the same problems under a controlled experimental condition. Are more options or aspects of the problem discussed in one medium compared to the other?

Are the final decisions reached by face to face groups better or worse than those reached by Computerized Conferencing groups; and what are the appropriate criteria for determining this?

Is the degree of riskiness of a decision reached greater or less in one condition as compared to the other?

Is there a greater failure in one condition as compared to the other?

3.4.3 Resources Required

How much time and money does it take to reach a decision in CC vs. face to face conditions; given various sizes of groups, combinations of travel time, and participant's hourly rates?

3.4.4 Problem Type

Is Computerized Conferencing as a communications process more suitable for some kinds of problem solving or decision making than for other types of problems or social conditions? If so, what characterizes the more suitable types?

3.5 Desires & Expectations (Turoff)

A computerized conferencing system represents a human organization imposed by the computer system within the context of a specific application. For the success of any group of people engaged in meeting some objective, must there be a match between the expectations of the individuals and/or group using the system, and the capabilities of the system to fulfill those expectations? Understanding the users' expectations and matching the system to those may be crucial to the success of the system. There are a number of category schemes for defining levels of expectations that have been used previously in considering the design of on-line systems. The following represents a modification of one of those. The hope is that expectations can be categorized at a more general level than specific applications, and that characteristics of

systems can be related to this level of classifications. As yet, there is no evidence that would strongly contradict or support this view, which is held by some designers of on line systems, and more investigation is needed.

3.5.1 Simple Inquiry or Message Exchange (Turoff)

This is the level of application pertaining to the desire to keep in contact with a number of individuals, and remain informed of what is taking place. This seems to be satisfied by straightforward message type systems, which may or may not have various flourishes offered by the computer such as: delayed messages; routings for approval; in boxes and out boxes; group messages; conditional messages; etc.

3.5.2 Report Generation (Turoff)

This supports the need for a group of individuals to compile a joint report on a topic. At this level, it is a matter of pooling the existing knowledge of a group; for example, the exercise that created this report. This seems to require some sort of common writing space, as typified by a conference or joint notebook, and the role of a coordinator to oversee the process. As a function of the complexity, size, and amount of quantitative material, this may also require various data processing support functions in terms of indexing, retrieval, and reorganization of existing material. Depending on various human factors involved with the group and its objective, such as the amount of disagreement, this may also require other communication aids such as voting, post scripting, etc.

3.5.3 Discovery and Analyses (Turoff)

This concerns the need for a group to develop new knowledge by joint investigation and exploration. At this level, the need may arise for a great deal of structuring and other facilities characteristic, for example, of Delphi or Nominal Group like processes. This would be particularly true where the groups, in terms of backgrounds and/or disciplines, are heterogeneous in nature. Very little work has taken place in this particular area, with respect to computerized conferencing systems. Depending on the tasks, this area also presents the need for the incorporation of data processing tools such as data bases, models, simulations, and other analysis tools.

3.5.4 Planning and Decision Oriented Systems (Turoff)

This is a level where groups must develop and examine alternatives and reach decisions and/or recommendations for action. The lack of psychological pressure in existing forms of computerized conferencing systems has made it difficult for groups to reach collective decisions using this medium and has exhibited more utility for the exploration of options in a more reflective and relaxed type of atmosphere. However, no one has really tried to design a system which was intended for the planning and decision making purpose, and it is an open question as to what design characteristics might be imposed to stimulate the atmosphere of the "locked meeting room until the decision is reached", or other group decision modes. This area might also capitalize upon incorporation of the growing spectrum of data processing techniques designed to aid individual formulation and group consistency of subjective judgments. Typical of these are Interpretive Structural Modeling (ISM), Cross Impact, JUDGE, and various psychometric tools such as Multi-Dimensional Scaling. There has yet to be a merger of these techniques with the computerized conferencing

environment, although some initial work appears to be underway now.

3.5.5 Management, Monitoring, Operations and Command and Control (Turoff)

This is the concept of using a computerized conferencing system as the primary communications medium for day to day operations in an organization; i.e., total integration of the communication process with the information process of the organization. There is no organization where this exists today. However, the use of EMISARI for crisis management by the Office of Emergency Preparedness represents a partial example for a particular organizational function. It may be possible to experiment with this for other functions, and small local government operations such as particular social service programs might make ideal test beds.

3.6 Measures of Benefits (Turoff)

Currently there are very few ways to relate system performance to user oriented benefits. There are only two general criteria that have been employed in one form or another:

- 1) The time or money saved the user over some other alternative.
- 2) The ability to do certain things that cannot be accomplished through some other alternative.

Usually, only the first is considered, even at best; most of the time, even it is ignored, and benefits are focused on the efficiency of the system, leaving out the user altogether. In some specific applications, such as data retrieval, specialized measures such as "precision" and "recall" have been introduced. To date, for conferencing and message systems, the amount of material communicated, and the mode of interaction (i.e., public vs. private) are, perhaps, the only general measures that have been used. While numerous records kept on who communicates with whom, and how often, are also available, we have not reached the point where we understand which benefit measures imply how much information was exchanged (e.g. amount of meaningful material), or what are appropriate measures to reflect the utility to the group as well as the individual. While some measures are likely to be dependent upon the particular system design, it is felt that ultimately we should be able to arrive at some meaningful measures of human group communication applicable to all computerized conferencing systems. It could very well be that this may be dependent on being able to do fairly sophisticated analyses of text as a part of the measurement process. At the moment, this whole question appears to be wide open in terms of making hypotheses about what might be useful measures, and conducting experiments to verify the utility of those measures.

4.0 Social & Economic Implications (Turoff)

We believe the implications of this technology to be far reaching in nature. From one view, it combines all the properties of libraries or printed knowledge with that of the telephone. Both the printed word and the telephone have separately had tremendous impacts on our civilization and its characteristics. This combination of characteristics seems to produce something new as a communications medium, and holds the promise of allowing the society to move into what some have referred to as an 'Information Society'.

In this section, we have broken the implications down into the direct ones and the indirect or lateral considerations that cut across many different areas of application.

4.1 Potential Impacts (Turoff)

This section concerns itself with primary impacts on various social and economic areas. It represents those areas of impacts that appear obvious to those working with this technology. It is very likely that other areas will appear as more use of the technology is made.

4.1.1 Work at Home (Snyder)

The potential for working at home--for "communicating to work" instead of commuting to work--has long been perceived as one of the benefits inherent to the revolution in electronic communications technology. But the presumed benefits--reduced costs to the employee and reduced overhead (commuting) costs to the society as a whole, plus closer family ties--have offered no incentive to the employer to capitalize the necessary hard/software to permit such an innovation, or even to experiment with it. Beyond this, the substantial change in life-style implicit in large numbers of principal wage earners working out of their homes, has apparently not been viewed as a sufficiently attractive inducement to encourage the marketplace to offer such services.

In addition, the total communication/data manipulation requirements of the potential work-at-home market have not been assessed. Such an assessment, particularly in view of the expanding body of knowledge work, would appear to be a very useful line of research, perhaps in conjunction with the general information economics analysis recommended in Section 5.0. The potential communication/transportation trade-off (Section 4.2.2), in conjunction with the energy crisis, would make this an even more compelling object of examination.

There are some specialized work functions which could be carried on at home, and which might provide useful trial applications for initial assessments of the work-at-home concept. Most publishing functions maintain large shops of full and part-time proofreaders and editors. With the general conversion of the publishing trade to electronic composition, the integration of CC into such operations would be relatively simple. Proofreading and technical editing jobs require a relatively high level of education, but generally pay poorly. Further, the sharp fluctuations of workload generally result in uncertain work scheduling, which is why many such workers are hired on a part-time or piecework basis. Often, these jobs are taken as second income sources by middle class housewives whose relatively high general education level, but lack of marketable professional skills suit them for few other white collar jobs.

Given this background, test projects might be undertaken to determine:

1) the economic realities of work-at-home arrangements--do employers save money by not having to provide work-space, and by having a more flexible work-force, in spite of having to pay for the CC facility? What are the income-tax, and other ramifications for the employee?

2) the management realities of work-at-home arrangements--do employees produce quality, timely work when removed from the office environment? Are there communications problems which are not resolvable via CC or telephone? Is work quality more objectively judged under such circumstances?

Ancillary issues which may also be dealt with under such tests include the advantages to single parents or to the children of working spouses who may remain at home, thereby reducing the number of "latch key" children, and children in day care centers, two problems addressed by last years National Research Council Study on Children and Families. The employment of otherwise immobile handicapped and the elderly might also be promoted by "work-at-home" arrangements. In addition to editing and proofreading, CC may also be used in work-at-home arrangements to compose answers to routine public inquiries to public institutions, such as the Veterans Administration, Social Security, and the IRS.

Unfortunately, the work applications proposed above lend themselves largely to second incomes, or subsistence level principal incomes. This means that such applications do not offer an opportunity to test one of the critical concerns most often voiced regarding the work-at-home concept--the effect upon the family. As mentioned in the first paragraph of this section, an initial, intuitive appeal of the work-at-home concept was that the principal wage earner, nominally the father, would be able to spend more time with his family. Experiences with flexitime in Europe, and in this country, have revealed that the increased presence of the household head in the home has lead, in some instances, to increased domestic problems, including alcoholism, physical conflict, and divorce. General studies of the nuclear family in the present socio-economic milieu suggest that the dyadic couple is already over-burdened with emotional stresses which it cannot handle, and that the increased physical presence of the husband/father only exacerbates those problems.

If the situation described in the preceding paragraph is true, then research relating to work-at-home must be directed to the family unit, and the implications of a work-at-home situation for the family. This would include impacts on relationships, attitudes of family members toward the worker-at-home, time-space/work-play requirements of individual family members, changing role requirements, etc. Such research could loom particularly significant if work-at-home, flexitime, or other such arrangements are forced upon us by energy requirements, or if pro-family public policy, now beginning to evolve, should encourage work-at-home arrangements.

4.1.2 Family Applications (Snyder)

There is a growing opinion throughout the nation that the family institution is in a deteriorating state, and that this situation, in turn, is the root cause of a number of other social problems (e.g., teenage pregnancy, juvenile delinquency, declining school performance, etc.). As a result of this opinion, political forces are mobilizing to promote pro-family policies and legislation.

Beyond the work-at-home arrangement, and the potential uses of CC related to education, other significant family uses of CC would appear to depend upon the existence of a CC public utility of some sort, such as might be provided by the post office or the telephone company. Given the requirement of some sort of CC utility, there is one family application of CC which would merit examination, and this is the impact of CC upon the extended family in a mobile society.

The purported deterioration (disappearance) of extended family ties is frequently cited as a source of the weakness, or failure of the nuclear family, as measured by high divorce rates. The extended family's diminution is seen as a function of the physical, social, and economic mobility of our society; a feature which we do not, presumably, wish to do away with. Modern, low-cost communications and transportation technologies are available to permit a continuation of the extended family network, but they do not appear to offer, either singly or in combination, a satisfactory substitute for the day-to-day contact afforded by physical proximity. The question to be addressed by research in this area would be, does CC offer a more effective medium for maintaining the network of extended family relationships?

Research here would probably have to last over a lengthy period, in order to produce reliable results, and would be based upon providing a variety of families with a computer conferencing capability at a nominal cost. The participation of children would be a key factor. Elements to be measured in such a process would be message patterns and content, the development of relationships, changes in family patterns of behavior, values, and attitudes. (What happens to the dynamics within a nuclear family when the children can ask grandmother if daddy was ever spanked, or got bad grades, or played hooky)? One would imagine that the grandparent in a retirement community or a nursing home with CC access to all of his/her children and grandchildren would rapidly become the envy of his/her peers).

The ease of contact and the nearly immediate response time, would not only make CC an ideal medium for the young, but would encourage easy, frequent contact by adults on subjects (family recipes, birth and anniversary dates, family records, etc.) which would be felt to be too trivial for the cost of long distance telephone, and often overlooked in the infrequent letter. Given the relatively heavy capitalization, the benefits to be derived from this sort of application would appear difficult to quantify, at best, and of dubious practical utility. But, if the family is as important an institution to our society as many social scientists believe it is, then the strengthening of the family becomes an extremely important policy goal in itself. Further, use by families would be only one of a numerous range of applications afforded by a general purpose utility, and thus, input from this sort of family-related research would be important to the decision regarding the establishment of such a utility.

4.1.3 Applications for Disadvantaged Members of Society (Hiltz)

How might such systems be utilized to aid in the delivery of social service programs? What kinds of changes in hardware (such as terminals), user interface, or training might be necessary for persons such as the deaf-blind or the mentally retarded? Can systems be used to do current types of social service programs more efficiently or more effectively; can they be used to facilitate services not otherwise easily available, such as peer discussions among homebound persons, or home employment of the mobility-limited?

4.1.3.1. The Physically Handicapped (Hiltz)

What hardware and software would be needed to enable different types of handicapped persons to easily communicate using CC? How can CC be used by the physically handicapped to facilitate their education or job training, their employment, their social interaction and participation in the society at large?

4.1.3.2. Homebound aged (Hiltz)

Can CC be used to enable the homebound aged to engage in part-time or volunteer work which they would enjoy, and which would enable them to remain contributing members of society beyond normal retirement age?

4.2.3.3. Prisoners (Hiltz)

Can CC be used to facilitate counselling type relationships between prisoners and non-prisoners, both professional or non-professional? Can it be used for the education and employment of prisoners, while they are physically incarcerated?

4.1.3.4. Mentally retarded or disturbed (Hiltz)

Can CC systems be used to facilitate the education and social integration of persons who are mentally retarded or mentally disturbed, either in special institutions, or within their own homes?

4.1.4 Organizational Applications (Snyder)

A wide range of organizational applications and research issues were raised in Section 1.1.5. These include work teams and analytical projects, internal written communication systems, participative management, decision process documentation, suggestion systems, research and development. Presuming the existence of a general purpose CC public utility, organizations might ultimately replace the bulk of all routine written communications with Computer Messaging, including billing and bill-paying, in conjunction with an Electronic Funds Transfer System. Such arrangements could be of particular benefit to small businesses, for which record-keeping and accounts maintenance often constitute both the principal overhead cost, and a major source of business failure.

Another potential organizational application relates to government reporting requirements. Small businesses in the U.S. typically must respond to 200-250 different government reporting requirements each year, while large businesses, depending upon their realm of operations, must submit between 450 and 1,000 reports annually. The paperwork burden has given rise to several major Federal efforts toward reduction, including the current Commission on Federal Paperwork. Owing to contemporary political sensitivities associated with the governments' use of computers, and the CFP's final report carefully avoids any recommendations involving the use of computer files or data bases to reduce the paperwork burden, although it does propose using computers to improve Federal data management, and ultimately to permit the interchange of bulk (statistical) data through a standardization of data elements.

An alternative approach to organizational reporting requirements would

involve a CC utility, operated by the government to gather data from organizations, in which the organizations retain control of their own data in their own computers, or in service bureau ("data bank") computers. Such a system is described in greater detail in Section 5.0. The important point of such a system would be that it could double as a record-keeping mechanism for each organization, and an inter-organizational messaging system (ordering, billing, etc.), as well as a reporting network. Given the estimated cost of government reporting (\$8 billion to the government, plus a roughly equivalent amount to the private sector), an economic analysis of the sort proposed in Section 5.0, would appear to be in order, to determine the economic benefits from the creation of a "dispersed commercial data base" for the nation.

Another potential organizational application would be for the Federal government to provide an in-house CC utility for use by grant approval review functions. Such functions are carried on throughout the Federal government, and reflect relatively similar patterns of evaluation and commentary. The process is quite time consuming, and an experimental installation here might speed up the process, and improve the quality of review by permitting greater dialogue among the reviewers. The written record of deliberations might also enhance the integrity of the review process, and would be instructive to grant seekers.

4.1.5 Democratic Processes (Turoff)

There seems to be little doubt that if computerized conferencing were widely available, there would be dramatic impacts on democratic processes. The relationships between the potential design alternatives of systems for this area of application, and the impacts the system may have, is not at all understood at this time. There is need for experimentation in this area if we are to gain any insight into these factors. There are a number of specific applications for which field trials would be possible.

4.1.5.1 Electronic Town Hall (Turoff)

The concept of the 'Electronic Town Hall' has been written about extensively, but attempts at using phones, or phone voting with broadcast TV, appear to be less than satisfactory. The computerized conferencing technology, with a system designed around parliamentary rules of procedure, would appear inviting for experimentation. In order to keep an experiment at a reasonable size initially, smaller organizations such as a college faculty engaged in faculty governance could be considered.

4.1.5.2 Peer Groupings of Community Leaders (Turoff)

In many urban communities, the leadership of various community groups usually have no real opportunity to meet with their counterparts, except in public meetings where images must be maintained. Because of this, it is usually 'city hall' which may negotiate, act as intermediary, or play one group against another. A group of community leaders able to engage in peer group communication could well form more united fronts, eliminate small problems before they become big ones, and perhaps develop a more cohesive urban community, working in cooperation rather than competitiveness.

4.1.5.3 Citizen Advisory Groups (Turoff)

There are some who hold the view that citizen advisory groups to local and

state governments are ineffectual because they do not meet often enough, and usually there is not enough feeling that they will have sufficient influence. Computerized conferencing would allow such groups to hold a continuous meeting between face to face get togethers, and it would also allow government officials to participate selectively in those portions of the discussion where their information, advice, encouragement, or whatever is needed.

4.1.5.4 Lobbying (Turoff)

The costs to put together an effective lobby are currently tremendous, and consequently there are many groups that do not participate as effectively in the political process as others-- groups that are politically disenfranchised. In principle, a computerized conferencing system would make it very easy for individuals interested in the same objective to find one another, and to organize as a group. This could well lead to a much more fluid situation with respect to political alignments. Needless to say, we do not understand implications of this for the political process.

4.1.5.5 Citizen Participation & Aid (Turoff)

One reason citizens do not feel they can participate effectively in the political process is that they, and the community groups they comprise, do not have access to the same knowledge that government officials and industrial or business groups have. While there appear to be scientists, engineers, lawyers, architects and other technical and professional people who are willing to give knowledge and advice to such groups, often they are not located within the given community, and travel would require more time and expense than these people have available. Computerized conferencing would make it possible for citizen groups in different areas to pool the technical and professional talent available to them. This would at least provide the opportunity for citizen groups to obtain more of the facts, and to take better informed positions on complex topics. There is some belief that they are often forced into taking unreasonable positions because of a lack of knowledge.

4.1.5.6 Use by Elected Officials (Turoff)

CC offers many potential benefits to congressmen and other elected officials. One area is the improved ability to stay in touch with advisors among the officials' constituents, who may be located hundreds or thousands of miles away. The second is the potential impact on caucusing and other political negotiation processes, perhaps the most time consuming of the communication activities a legislator engages in. A group wishing to coordinate their activities in support of a particular bill could do so much more efficiently with a computerized conferencing system than with the current limitations of phone and face to face meetings. We have no real understanding of the potential long term impacts of this communication medium upon this form of political negotiation.

4.1.6. Social Services (Hiltz)

What applications are there to aid in the delivery of social services? Some possibilities for experimentation are suggested below.

4.1.6.1 Regional and National Coordination (Hiltz)

Can such systems be used to better integrate the delivery of services to single clients who receive aid and/or counselling from several different social service workers at several different agencies?

4.1.6.2 Access and Information (Hiltz)

The potential social service client now faces a multitude of federal, state, local, and private agencies. Lack of knowledge about where to go for a specific kind of advice or assistance, what programs exist, and eligibility requirements dissuades many persons from seeking assistance at all. Would it be possible to store a directory of services on line, for interactive searching by the public and by social service professionals? Could terminals placed in public libraries and local government offices be made available to the public for searching through this data base; and could this be combined with the ability of a potential client who thinks he/she has found a "match" between needs and programs to send a message to the agency, and fill out an "application form" on-line?

4.1.6.3. Privacy Issues (Hiltz)

How can CC systems be designed to facilitate the sharing of fragmented information and available resources in regard to a specific client who is dealing with several agencies simultaneously without making private information available to unauthorized persons?

4.1.7 Affinity Groups (Snyder)

Throughout our society there are numerous organized "affinity groups", including professional societies, trade associations, public interest groups, etc. These groups constitute common interest communities which are scattered throughout the nation, and which are recognized by social scientists as performing vital functions in our society. CC would offer these groups a way of communicating among their membership in a manner far superior to any present methods (e.g., newsletters, etc.), and should therefore improve the effectiveness with which they meet member needs. Such groups might offer CC to their members on a subscription basis. Members could use such facilities to share experiences and developments in their field of common interest, develop articles for journals (electronic or traditional), etc. .

Trial applications here would offer opportunities to test the effectiveness of CC as an "intelligence gathering" tool, and as an aid to pattern recognition in identifying new social, economic, or physical phenomena. For example, the American Medical Association might provide CC to its members in a given city, on which they might share common symptoms encountered, or particularly effective treatments. Research might measure incidents of various health problems in CC equipped cities versus non-CC equipped communities, to determine whether the greater information sharing affected medical performance. Chambers of Commerce might be linked, particularly among smaller communities, to identify business trends, confidence schemes, etc.

4.1.8 Applications in Research and Development (Enslow)

It is important to note that even when both present and proposed system capabilities are considered, the operational models postulated for computer conferencing applied to information transfer activities bear little relationship to the models of present operation involved with research and

development as they are known today. It is entirely possible that present methods of operation may be modified so that they can be better supported by the automated capabilities, but there are definite limits to the extent of changes in human behavior that can effectively be made to accommodate machine behavior. It will probably be essential to focus initially on only those forms of informal communication which are best supported by the machine system. If these systems become widespread in the area of research and development, it is likely they will bring about significant changes in the human or sociological communication processes that now exist. Precisely what changes will be made, for better or worse, is entirely conjecture at the moment.

4.1.8.1 Scientific and Technical Information Transfer (Enslow)

At the present time, nearly all of the scientific and technical information transfer processes are focused on formal communication, i.e., publication of complete reports or formal papers. Computer conferencing may impact this situation by providing some capability for the exchange of intermediate results prior to the completion of the formal document. The problem with this situation will be whether or not the user or the searcher has knowledge of an on-going project and, therefore, has some indication that there are intermediate results that might be of possible interest. If he or she is closely associated with the researchers preparing the formal results, the exchange of information is probably much more akin to that discussed below in paragraph 4.1.8.4, Invisible Colleges.

There is one factor in the transfer of scientific and technical information that might be greatly facilitated by the use of a computer as the direct distribution or transfer mechanism. At the present time, an author has to reduce the data obtained by observation and publish summary results only. If the complete raw data base were made available on the computer access system, it would then be possible for a user to have access to raw data and compare it with his own results, or investigate it using procedures different from those used by the original author.

4.1.8.2 Technology Transfer (Enslow)

Technology transfer involves both formal and informal modes of communication. The formal mode is represented by manuals, organized training, and technical reports that are necessary for the background information, and the fundamental information required. However, in order to transfer a technology effectively, it is essential that there also be an informal, interactive flow of information between the target group, and those knowledgeable in the technology, on a very short term basis.

A particular aspect of computer conferencing that would be of value in a technology transfer situation would be the ability to have one technology expert in communication with several target groups simultaneously. It would also be possible that the technology expert would not have to travel to the target groups. Similarly, it would be possible for the target group to have access to several complimentary technology experts in different locations all coming to bear on the transfer problem.

It is also important to note that the specific nature of the technology being transferred must be such that it may be supported by written communication. If demonstrations or elaborate graphics presentation capabilities are required, then the computer conferencing system will not be very effective, as the sole means of communication through it could be supplemented by films, videotapes, or slides plus tapes.

Another problem that should be considered is the method of funding the technology transfer operation. This is often accomplished by the purchase of a license in which the availability of consultants is assumed. However, in computer conferencing systems for technology transfers with many other applications, it is obvious that new management structures would be required.

4.1.8.3 Controlled Experiments (Enslow)

A major problem in the entire area of R & D Information is a lack of knowledge about exactly how information sources are utilized and how the information obtained from those sources is utilized in the research. It is entirely possible that the use of computer conferencing systems containing perhaps more capabilities than those presently envisioned will be extremely useful in the performance or in the execution of controlled experiments on the exact nature of knowledge transfer.

Another important aspect of the use of communications in controlled experiments will be the capability to examine group interaction and group communication among individuals not directly involved in research and development activities, but rather involved in other activities which have a requirement for informal communication with researchers. The existence of computerized conferencing systems provides an opportunity for the study of these processes. without imposing upon those involved severe requirements in being subjected to observation and interviews. This medium may significantly advance the opportunity to study and understand human communication processes involved with complex issues and material.

4.1.8.4 Invisible Colleges (Enslow)

Communications within the invisible colleges of the elite in various fields is almost totally informal. The final product of these communications among the experts in the field is usually a piece of formal communication such as a report or published paper. The "members" of the invisible college often place a much higher importance on the informal communication that they have with other members during the preparation of the formal documents than they do upon the actual content of the formal document itself. Computer conferencing systems can certainly provide more internal access than present mail systems. However, if the mode of communication between the members of the invisible colleges includes audio, or face to face meetings at workshops, then the computer communication system will have to compete with these other means for acceptance by the invisible college.

One interesting possibility is that of having controlled external access to the deliberations and communications of the invisible college. It would then be possible for those on the "second tier of expertise" to be able to note what is transpiring among the leaders in their field. There is some question, though, that such external access would be resisted by the members of the invisible college due to "egotism" or "elitism". There is also the problem that the leading scientists in a field often retain that eminence by sharing their intermediate results, producing only complete, finished results which become the pacing documents in the field. Because of this and various other influences that currently inhibit the informal scientific communication process, there must be considerable attention paid to the institutional, management, and administrative environment in which these systems operate.

4.1.8.5 Collaborative Authorship (Enslow)

Many of the present research workers, having intimate contact with data processing systems, are already utilizing the data-sen processing system as a mechanical secretary for the preparation and editing of their technical reports. It is a small step from this situation to the one in which two or more authors (in physically separated locations) collaborate on the preparation of a document utilizing an editing and document preparation system residing in a computer conferencing system. The important question here is whether or not the computer conferencing system used in this way can appear sufficiently attractive to the non-computer user that they will adopt it for the joint preparation of papers, replacing the present system of utilizing the mails.

In addition to acquiring the text handling and editing capabilities of an automated system, the utilization of a computer conferencing system to support collaborative authorship would allow the joint authors to interact at a much deeper level than they presently do by mailing manuscripts back and forth. The ability of the computer conferencing system to provide a string of comments targeted on individual words or sentences within a document would support this facility, as contrasted to the present situation in which the second author may provide a complete rewrite of the document for his colleague to consider.

4.1.8.6 The Electronic Journal (Enslow)

The electronic journal would provide a replacement for (or at least a supplement) forms of formal communication, and would be a natural outgrowth of the success of several of the above discussed applications. The problems that would be associated with an electronic journal have to do primarily with the fact that the presence of an electronic journal alone is probably not enough to attract the users of the system. It must be included with many other capabilities, such as supporting communications within the invisible college, collaborative authorship, access to data bases, and perhaps computational capabilities. Although the ideas and concepts of the electronic journal are extremely attractive, it is not at all clear that the present models for its implementation will be suitable in practice. Nor is it clear that the mere automation of what we currently conceive of as a journal is the desirable model for these systems. The very nature of the submission review and publication processes might be modified as a result of the introduction of this technology.

4.1.8.7 Problems and Impediments to R & D Applications (Enslow)

Just as with all other applications for computer conferencing, it will be necessary for the users to utilize the computer conferencing system and its other capabilities on a regular basis in order to become and remain proficient in their use. Several of the applications described above are actually occasional use situations only, and it is not clear that the continuity of use will be sufficient to develop proficiency with the system. Some of this problem may be alleviated by improvements in the user interface as discussed elsewhere in this paper, but it is clear that the utilization of the system by active workers in other fields who depend solely on the results that they may hope to obtain from its use. If their goal oriented use is not rewarded with a very short term return on their investment, such use is not likely to be fostered and continued.

4.1.9. Education (Hiltz)

How can computerized conferencing be combined with computer assisted instruction to serve educational functions? What impacts will this have upon

the content and cost of education, and upon its effectiveness?

4.1.9.1. Secondary Level (Hiltz)

Might language classes use CC to converse with their peers in another language? (for example, a French class in the U.S. might have a conference with an English class in Quebec). Will this increase the motivation for learning a foreign language, and the effectiveness of language training?

Could students use CC to work with officials, experts, and other students on a city-wide or regional problem that would help them to apply their training?

4.1.9.2. College Level (Hiltz)

Can CC be used to supplement or replace the traditional format of lecture and discussion in the classroom? How might it be used to facilitate supervision of independent research projects that are faculty-guided?

4.1.9.3. Continuing or Professional Education (Hiltz)

Can computerized conferences and on-line Delphis be considered a form of continuing education?

How much do participants learn from taking part in computerized conferences, as compared to seminars or meetings on professional topics? Or from acting as an on-line reviewer for articles or proposals, as compared to the traditional non-interactive form of reviewing?

Does participation as an "observer only" member of a conference serve as an educational channel for "continuing education"? Does this observer status have any negative or positive effects upon the active participants in the conference?

4.2 Lateral Considerations (Turoff)

The introduction of a computerized conferencing system of a particular design has some predictable implications for the social system as a whole. In this section we have collected the issues which are potentially generalizable, and where research should be directed at seeking results that are not application or organizationally specific. How to design research efforts which can exhibit those things that can be generalized is very much a major challenge at the moment.

4.2.1 Transportation/Communication Tradeoffs (McKendree)

In parallel with the advent and growth of electronic and computer technologies, an increasing proportion of the working population has been engaged in the creation, transfer, processing, and/or storage of information. It appears probable that many workers in information-intensive functions of industry and government (as well as managers, professionals, and other executives) could "telecommute", given the availability of remote access via terminals to the information for which they are responsible. The questions thus opened for research include:

* Can computerized conferencing be substituted for some portion of

- urban commuter traffic?
- * Can such a substitution reduce commuter congestion and lower employee costs of employment?
- * What are the costs and benefits to the organization of conferencing/telecommunications as an alternative to transportation?
 What kinds or amounts of new capital investment would be needed provide the required communications support, including second telephones for most homes and calls averaging several hours a day for "tele-commuters"?
- What might be the impact on the capital investment necessary for roads, airports, etc.?
- * Since substitution is dependent on the ability of workers to perform their work in a telecommunications environment and their willingness to do so, what are suitable measures or predictors of effectiveness and how may they be applied?
 How might this affect the demand for shared or part-time jobs?
 A field experiment might be carried out by a very large organization (e.g. insurance company) which might invest in terminals and a CC-supplemented information processing system. The alternative of work at home could then be tried on either a voluntary or a controlled basis.

4.2.2 Conferencing/Communications Media Tradeoffs (Snyder)

What impacts will CC have on newspapers, journals, T.V., or long distance telephone calls? That is, to what extent will use of the new medium replace current communications priorities, and to what extent will it be "added on"? Basically, this issue should first be dealt with in conjunction with the economic and policy development analyses described in Section 5.0. Such a process will determine the viability of such tradeoffs, and help to identify specific attractive trial applications. The simple economic trade-offs, however, cannot be regarded as the sole measure of the benefits to be derived from conversion to CC in any context. As indicated in Section 5.0, the impact upon information productivity may be far more significant. The principal research here should be aimed simply at identifying gross measures of potential costs, and benefits in terms of energy and human/dollar resources.

4.2.3 Energy/Communication Tradeoffs (Snyder)

First order components of the energy problem are the amount of energy available and the amount of energy consumed. While CC presumably cannot add directly to the available supply of energy, it does offer a potential for reducing consumption by converting message traffic from the physical movement of message media (or people) to electronic movement. The ratio of improved efficiency is simple enough to calculate for any given type of message under a range of system sizes and configurations, and the total numbers of messages involved can also be calculated, so that the potential impact of CC on the energy situation can be estimated. If this estimate suggests that the generalized adoption of CC would be cost-effective in terms of energy saved, we would then proceed with a macro-system feasibility analysis. Such an analysis is necessary to avoid wasting time on detailed studies or tests of applications which may appear attractive, but which the nation as a whole could not achieve, owing to physical or social constraints. For example, the electric car was seen by many as a solution to the energy crisis and a means of substantially reducing air pollution, until a simple series of calculations revealed that it would be physically and fiscally impossible for the U.S. to provide sufficient electric generating capacity to meet the nations' electrical transportation

needs for nearly 100 years. Thus the mass conversion of the U.S. Automotive Industry from internal combustion to electric power was demonstrated to be a non-viable alternative, and extensive research planned for this area was subsequently cut back sharply. Similarly, the conversion of the U.S. mail and other message systems from physical to electronic mode would have to be subject to such a feasibility study before it could be determined whether or not to proceed with the whole range of issues implicit in such a conversion (e.g. privacy, censorship, copyright, sunshine/access, security, industry structure, etc.).

4.2.4 New Employment Options (Snyder)

A technology as powerful as CC, in its ultimate development, may create a wide range of employment options, depending upon its secondary and tertiary impacts. However, at base, the technology will give rise to several basic types of jobs.

1. System Monitors - Research should be done to determine the ideal performance skills for monitors of CC's. Do such skills vary with types of applications? Certainly, within given technical and scientific fields, knowledge of the field may be necessary for effective functioning. Another question to be raised is whether differing types of monitors will be needed for different CC functions. For example, in a purposeful CC aimed at producing a specific finished product, some inter-personal skills, as in small-group dynamics, may be necessary; while for message systems such as might be run by professional groups, other skills relating to pattern recognition, etc. might be more appropriate. For CC's such as the latter, the System Monitor function could constitute an entire staff of statisticians, etc.

2. Information Entrepreneurs - Given the development of large scale, general purpose CC's, we could see the development of commercial information industry--particularly as our expanding knowledge base increases the number and range of subtle or esoteric combinations of information which have economic value to decision-makers. This is critical significance, economically and scientifically, as CC may be the only mode through which experts can adequately inform "knowledge consumers" in our institutional decision processes. There are implications here for the mid and upper level staff functions in large institutions, which are currently the source of most "expert information" for such institutions. The scale of such a new commercial class would be suggested by the information economics analysis proposed in Section 5.0.

4.2.5 Management and Policy Practices (McKendree)

The concept of a working conference with supervision which endures as a cohesive, productive organizational entity, challenges many traditional/conventional concepts of management, policy, and practices. Some of the suggestions for research include task definition and assignment, allocation of the manager's time, the role of the first line supervisor, documentation and approval, reporting and control, and resources allocation.

4.2.5.1 Task Definition and Assignment (McKendree)

Can a manager's classification of work (manageable activities which are further divided into manageable jobs) long survive the fluidity and adaptability which is a major strength of the conferencing medium? Will groups addressing such activities and jobs be able to maintain their organizational structure, or will they be able to function really well only as individual

knowledge workers? (Peter Drucker says that a knowledge professional has to motivate himself. No one can direct him. He has to direct himself. He is the guardian of his own standards, of his own performance and of his own objectives.)

4.2.5.2 Allocation of Manager's Time (McKendree)

Will CC improve the quality of management by increasing the percentage of the manager's time available for managing? Or will the demands of the medium take so much time for administration that the manager's own contribution is reduced? For example, a manager motivates and communicates- he makes a team of the people who are responsible for various jobs through the use of managerial techniques. His relations to the people with whom he works are an important part of his job, as are the "people decisions" he makes regarding pay, placement, and promotion. All of these require frequent communication through channels with his subordinates, colleagues and superiors.

Given that different managers allocate their time in different ways, how will CC tend to affect the ways in which managers spend their time?

4.2.5.3 The Role of the First Line Supervisor (McKendree)

Will the medium of CC, through almost instant information feedback on worker performance, make self-control more than normally necessary? Or will the pattern of communications lead to management monitoring as a tool of control and dominance?

What may emerge is a role for first-line supervision which is the provision of information, of direction, of arbitration, and a channel for contact and information flow to and from those outside the conference.

4.2.5.4 Documentation and Approval (McKendree)

Information made available to one member of a conference is made available to all. Communications amongst conferees are a matter of archival record. These can be referred to, if necessary, for confirmation. Some means of permissiveness or forgiveness of the past in order to get on with the work of the present should still be exercised by management.

In a medium where everything is "on the record", some changes in documentation requirements and approval processes will be necessary. What are the best models for this aspect of the practice of management of conferences? Why? (eg. research memoranda, parliamentary records).

4.2.5.5 Resource Allocation (McKendree)

How would resource allocation and consumption be affected by distributing the work force via computerized conferencing? How would travel patterns be altered? How would telecommunications patterns be altered? How would computer resources be allocated? How would secretarial resources be allocated?

4.2.5.6 Reporting and Control (McKendree)

How might management controls be effected so as to optimize the effectiveness of computerized conferencing? How might project reporting and

evaluation of progress be automated? How might personal time, technical time, and/or case time reporting be introduced? How would the more qualitative types of information required by managers to evaluate performance be obtained? What would be the impact of failure to realize some of these requirements on the usefulness of CC to managers?

4.2.5.7 Organizational Policies (McKendree)

Organizational policies toward employment of computerized conferencing on a full time basis will determine to a great extent its usefulness and acceptance.

What are some potential policies toward a radical change in work practices, for example? Should job descriptions be re-written in certain cases (eg. can two handicapped persons apply for one job)? Will accounting for personal time be more automated with CC (or less)? [Are 8 one-hour periods of work equivalent to 1 eight-hour period? Is making oneself available for synchronous conferencing within certain hours of the day a practical measure of performance?] What will be the requirements for compensation at overtime rates?

Can computerized conferencing and electronic mail coexist in the same organizational policy framework? Will communications and information services be kept separate from data processing services within the organization? What should top management's policy be?

4.2.6 Social Engineering (Turoff)

Computerized Conferencing systems ultimately provide the missing link between experimentation and application in the social sciences. They allow an experimenter to design a complete human system, and enforce the use of that system on the subjects. Once such a system has been designed, tested and experimented with, it becomes a relatively easy process to move the system into an operational environment. Today, there is often little correspondence between what the social scientists can accomplish in the laboratory and what can be imposed from that into the real world. Whereas the traditional view of changes in communication systems has been one of incremental improvements in current systems and a resulting minor impact on the behavior and values of those involved, computerized conferencing systems offer the potential for promoting and influencing behavior and value changes on the part of their users through the design of the system. For those that practice what is called "social engineering" (the conscious effort to modify behavior and values in order to improve a human situation), this technology offers a new and powerful tool, transcending anything available to date. Lest some costly mistakes be made, there is need for carefully controlled laboratory experiments into the potentials of computerized conferencing systems through their design to influence value changes. It would appear most promising to look at areas where the human communications already involve, at least implicitly, strong considerations of value such as: Negotiation and Competition; Sensitivity Training; therapy and other highly charged human communication situations.

4.2.7 Consumer Education and Marketing (Hiltz)

Given a general resistance to change and the fear and distrust of computers among the public, how can CC systems be introduced so that people

gain a clear understanding of both their capabilities and their limitations or dangers? Can a basic knowledge of computers in general, and of CC systems in particular, be integrated into the educational curriculum at the elementary or high school level? What can be done for adults no longer within the formal education system?

4.2.7.1. Responsibility (Hiltz)

Who is responsible for education on computerized conferencing in general? Computer firms? Software firms? The federal government? Local school systems? Universities or institutes with contracts or research in the computer area?

4.2.7.2. Means of public education (Hiltz)

What channels or means are most effective for public education in these areas? Courses at the high school level? Formal courses in the adult education curriculum? T.V. and radio spots or programs? Free public lectures or demonstrations for large groups? Computer-assisted self-education programs using terminals located in libraries or other points of public access?

4.2.8 Measures of Benefits (Turoff)

It is not clear what the appropriate measures might be if one wished to wished to ascribe either benefits or disadvantages, at a societal or economic level, to computerized conferencing systems. How does one relate the impact, in a measurable sense, to a reduction in transportation requirements, or to further isolation and decay of the central city? How do we relate the potential educational benefits to the homebound handicapped to their future potential as burden or non-burden upon the society in an economic sense? How do we weigh the potential enjoyment of such systems by mobility limited aged, or the benefits for the youngsters they may be communicating with as pseudo-grandparents? We know that in these systems there are properties of mass, where the greater the communicating population is, the richer is the diversity of offerings, and the greater the probability of groups forming that have unique common interests. Very little has been done to experiment with these particular phenomena and arrive at appropriate measures pertaining to multi-group effects, and the movement of people into and out of discussions. Most systems to date have been designed for, or experimented with, on fairly homogeneous populations. It would be desirable to see systems designed and experimented with on heterogeneous populations, where mobility is a feature emphasized in the design. We do not have measures of benefits that take into account features such as mass of user population, heterogeneity, mobility, and flexibility inherent in the system design.

5.0 Regulations, Policy & Laws (Turoff)

The future of CC technology and its utilization will be largely determined by decisions concerning regulations, laws, and controlling policy. Whether systems will emerge competitively, or whether monopolies will be created, could easily be a function of the results of debates already under way. At the extremes, one can consider computerized conferencing as a logical extension to the Post Office ("Electronic Mail"); or as a logical extension to "teleconferencing"; or as a new medium (computerized conferencing). Obviously, those of us working in the field are emotionally biased toward the latter view. Our professional position is, however, that the decisions governing the future of this technology should not be made in ignorance, or as a result of certain words or names creating impressions of a limited pigeon hole in which this area is thought to belong. A significant research effort will be needed to determine how various policy, regulatory, and legislative alternatives will effect CC.

We foresee, also, that in the next decade there will be a major emphasis on a new class of rights for individuals in our society--these are the "information" rights. Information is now becoming both an important concept from the "property" viewpoint and the "civil" viewpoint, and combines all the issues associated with property and civil rights.

5.1 Industry Structure (Turoff)

There is little doubt these systems will change the nature of how industry functions, and will also create new industrial services. While there are many suppositions that have been made, there has been little in depth examination of these areas.

5.1.1 Character of the Service Industry (Turoff)

There is an issue here of what sort of industry will evolve to offer these services, and the answer lies between a complete single industry offering one integrated nationwide system (telephone or post office model) vs. a vast multitude of independent, frequently incompatible, offerings and services in different application areas (representative of the computer industry today.) There are views to the effect that the greatest benefits are derived from one system with one interface for all users, and opposing views that tailored systems for specific application areas are the most beneficial. This should not be resolved on the surface, but requires a deeper examination of the costs of evolving and maintaining either extreme and/or various intermediates for the society as a whole. One can argue that the design of these systems depends only upon the software or the system, and therefore this situation is not characterized by the fixed hardware capital investment typical of other communication industries. Yet software is a form of capital investment we do not, as yet, understand as well as physical items, in terms of management and economic considerations.

5.1.2 Character of the User Industry (Turoff)

Less obvious is the impact this technology will have on the nature of industry in general. We foresee possible dramatic shifts in the information processes between suppliers and consumers at the industrial level, and

possibilities that the basic character of certain service industries involved in matching buyers and sellers, or maintaining markets, will alter dramatically. Past experience with computers leads one to believe that the very nature of the market place will change, and many of our theoretical insights into its current behavior will have to be re-examined, and probably modified. Does an EFT system, for example, drive the independent public accountant out of business, or does it enhance his position? We suspect that answers to such questions depend upon how EFT systems are designed, and the regulations governing their operations. Is there a need for a New York Stock Exchange physically in one location, on one floor; or does a computerized conferencing system, designed for that purpose, allow world-wide trading on what becomes one global exchange? What impact do these systems potentially have on other commodity markets, the wholesale business, inventories, etc.?

5.2 Regulatory Structure (Turoff)

It is not clear that the current regulatory structure in this country can properly handle the impact that computers have already had, let alone the evolution that appears to be taking place toward an information oriented society. In particular, the use of computers for communications appears to fall between the cracks of existing boundaries of what is a computer, and what is a communication system. This is further complicated by the fact that these systems can be utilized as part of certain application areas that have their own unique regulatory characteristics, such as banking and finance.

5.2.1 Public Interest (Turoff)

It appears that the current presumption by lawmakers, regulators, and policy makers is that public use of information systems is not a significant consideration. A separate examination of potential public use of these systems as they may evolve over time, and even some degree of field trials to determine the viability of public services would appear to be in order. Furthermore, an examination should be made of the possible necessity for the average citizen to have access to such systems in order to function as a full member of society a decade hence. Does a person have a right to the use of a terminal, and access to an information system, in the same light as one assumes the citizen has access to phone or a mailbox? In a different vein, it is not clear that current procedures for arriving at regulation in this area allow for adequate representation of the public interest, or even definition of what the term means. Needed here are attempts to specify the factors and measures related to public interest in the areas both of information systems and of communication-information systems, such as computerized conferencing, to provide better mechanisms to make the public aware of these potentials, as well as policy and decision makers. Field trials are perhaps key because they provide the only option for testing the legitimacy of what are largely informed, but subjective, judgements on public use potential--many of them in disagreement.

5.2.2 Regulatory Mechanisms for Information Systems. (Turoff)

To what extent are current regulatory mechanisms and laws sufficient to deal with the total area of Information Systems? Are new mechanisms needed, and if so, what should be their nature? Does the role of the FCC, Federal Reserve Board, and other regulatory bodies really provide for the consideration of the public welfare or interest when it comes to information systems that cut across existing regulatory bodies? To date, the problems arising from information systems have been dealt with largely on a case-by-case basis, which has led to potential inconsistencies in such areas as privacy and freedom of information.

Computerized Conferencing represents one illustration of the uncertainties stemming from the morass of regulations in this area, and the resulting inhibition of development. The whole subject area of the regulation of information systems, or even the lack of any single government body with policy-setting jurisdiction in this area, should be examined with an eye towards developing improved policy formation and regulatory mechanisms.

5.2.3 Roles of Federal, State and Local Governments (Turoff)

A re-examination is needed of the impact of state and local regulation or law-making as it may impact on any potential federal policies and regulations for CC. As has been demonstrated with "data-pack", state regulatory bodies can serve as a vehicle for circumventing federal regulation. The meaning of inter- and intra-state systems becomes very unclear in terms of computerized conferencing, and is even now an issue for EFT systems. At the very least, the consequences of potential local and state policies that differ between states should be delineated in terms of their impact on industry and future potential service offerings. If vendors have to deal with more than 50 state and local agencies for service offerings in this area, it will largely eliminate any possibility of a wide range of competitive nationwide services.

5.3 Public Use and Public Interest (Turoff)

Should policy and regulations be designed so as to encourage public use, or should they assume that only businesses and large organizations will utilize these media? To what extent can the generation of policy be conducted in such a manner as to assure that the public interest is served, rather than the vested interests of vendors and other organized groups?

5.3.1. Charging policies (Turoff)

Should offerers of conferencing services, and of value added networks, be permitted to assess high monthly minimal use fees, thus essentially prohibiting use by the general public?

Should large users subsidize small household users, as business phones supposedly subsidize the household phones?

Should telephone companies be allowed to charge for connect time on local telephone calls for residential users, rather than giving unlimited local message units (as now), or charges proportionate to the line capacity actually used?

5.3.2. Public Use and the X Rating (Turoff)

If the public is to have access to conferences, should they come under censorship regulation to prevent children from being exposed to obscene or harmful content?

Should on-line games be regulated to limit the amount of violence they involve?

Should conferences or games be "rated" so that potential participants are warned about possibly offensive or harmful content? If so, by whom (industry, local or state government; regulatory agencies; the person entering the material, etc.)?

Public conferencing systems, which would be rescinded for misconduct?

5.4 International Considerations (Turoff)

Many other countries treat communications differently than we do here in United States. In many countries the degree of government control is much stronger, and the postal and phone systems are often part of the same organization. As a result, there may be a high degree of inequity in the availability, and cost to users, of these systems on a country by country basis.

At the same time, there appear to be numerous potential uses of these systems on an international basis: professional information transfer and exchange, business applications, and even potential public use. There has been no overall analysis of the application potential for international use, and thus no resulting understanding of potential benefits. Policies could be set in some countries because of lost opportunities for business and industry. Some better understanding is needed of the potential impacts, both potential impacts on developing countries and multinational organizations or both a professional and industrial nature.

5.5 Standards (Turoff)

Since standards can have a heavy impact on the ability to make service offerings, the issues of how standards are set, by whom, and what impact they may have on future possibilities, deserve special treatment. Furthermore, in the specific area of providing human communications, there may evolve a need for higher level standards than mere hardware interfacing, so that users can transfer textual material between different communication systems. The degree to which the government is obligated to set and enforce standards in the computer field is also open to investigation, as is the indirect effect of standards for the equipment and systems purchased by the government. The power of existing institutions to set standards, either explicitly or implicitly, could very well serve as a barrier to entry into the field by new institutions.

5.6 Privacy & Security (Turoff)

In addition to the obvious requirement to prevent anyone from gaining access to communications not intended for that individual, there is the more subtle issue of the information that may be inferred about an individual from his or her communication behavior, and the pattern of who the individual communicates with. The ability to retrieve selectively the names of individuals behaving in certain ways leads to the possibility of address lists for commercial or other purposes, in which the value of a single name upon the list may be worth tens of dollars, instead of the fraction of a cent typical of today's mailing list industry. This would appear to be far too great an economic incentive to leave the issue to natural processes, warranting careful examination both of potential abuses, and of possible laws needed to head them off. Since this technology can be interpreted by lawyers as mail, phone, or data processing, it is unclear how current laws and regulations will apply.

5.7 Freedom of Speech and Censorship (Turoff)

These issues presumably arise only under cases where cc is employed as a public or common carrier system, since, in proprietary applications, the system owners would be free to dictate the nature of the use and the content of

message traffic. (Of course, the integrity of information from any source which ultimately impacts upon the public is always a matter of legitimate public concern. Thus the integrity of the record of all traffic on even a proprietary CC system may be a legal issue.)

Incorporation of a computer into communications potentially enables introduction of automatic censorship, e.g. the computer might be programmed to review a message for certain words, and refuse to accept it if they are present. No human need be involved in such a process, except the writer. Within laws governing the FCC, this would appear to be a legal action, while for the post office, the opposite appears to be true. It would also be possible that local systems could have standards imposed by local communities that would differ throughout the country. Unless appropriate national policies, regulations, and laws are developed, the evolution of rights in this area is likely to follow a very haphazard and reactive pattern.

Censorship could also occur indirectly through economic constraints or access rules that would, in effect, deny certain individuals, groups, or institutions use of the service.

5.8 Legality of Communications and Liability (Turoff)

To what extent can an organization or individual be held responsible for the content of a message or comment that the computer indicates she or he originated? What is the liability when a piece of communication is not properly delivered, and a financial loss results to someone? What is the minimum service warranty for such systems? The fact that we are dealing with free form written text only adds another dimension to the many issues that still exist for data processing systems in terms of the liability for errors on the part of the direct suppliers of service, the hardware and/or software producers, and the networks over which information is supplied. One of the significant technological issues deserving further attention is the design of both hardware and software which is better able to detect the source or cause of an error.

5.9 Ownership of Information & Copyright (Turoff)

The evolution of CC systems, and their ability to attract professional writers, authors, journalists, and educators into developing written material for use in them, will depend in part upon the rights of ownership for the material entered. These systems provide an excellent mechanism for compensating authors based upon how much their material is utilized. They could also vastly reduce intermediate institutional control over what material is to be published by eliminating the decision functions normally supplied by publishers and newspapers, replacing them with a service that makes no direct judgment on material entered, and only compensates according to some formula approach. This is likely to change, not eliminate, the nature of journalistic and publishing practices in this country. However, any changes will be very sensitive to the specific resolution of the ownership and copyright issue.

The new copyright law, when considered in conjunction with the characteristics inherent to a computer conferencing system, would appear to have been drafted with CC in mind. Assuming the technical/physical integrity of a CC system, a computer conferencing system would clearly function to establish both the chronological order of ideation, as well as the sources constituent portions of any work created wholly on the system. In fact, the detailed chronological record provided by the CCS will conceivably serve as a forcing factor in promoting the use of computer conferencing under the new

Of course, the copyright laws apply to created forms of information. The law already presumes personal data to be the property of the individual to whom it relates. Recent precedent (since the 1930's) suggests, however, that such claim to ownership is diluted, or lost altogether, when such data enters "the stream of commerce", since the individual can no longer maintain "constructive control" of the information. (Note: The courts have also felt that some "personal" information is in fact, a matter of public record, and thus not personal property. Such information includes residential address, marital status, gender, number of children, etc.. Most personal information concerning financial matters, educational, employment and medical records, etc., would be regarded as personal property.) An information utility would permit the individual or institution to maintain constructive control of his/her/its information property, and thereby restore much personal privacy lost under the "stream of commerce" argument.

In summary, the advent of computer conferencing and allied technologies suggests the need for extensive legal research to re-examine the entire concept of information ownership under the renewed potential for individuals and institutions to constructively control the flow of information concerning themselves, and the use to which such information is put. It is particularly important that such research be done in the fullest context of legal precedent, since individual court cases often turn on subtle points of the law, which tend to obscure the treatment of privacy and information ownership that is implicit in the total body of the law.

5.10 Rights of Access, Sunshine Laws & Freedom of Information (Turoff)

Within the public sector, particularly at the Federal and State levels, there is increasing public access to the records of policy and decision-making. There are also growing costs associated with this openness, relating to the maintenance of new documentation required by law and regulation, and the costs of retrieving publicly accessible records.

If computerized conferencing constitutes a meeting of a group of people, then in principle "Sunshine Laws" apply. If it constitutes a series of messages in a "tele" like service, they presumably would not apply. However, if it is an exchange of correspondence, other rules and regulations may apply. We do not have the answers, at present, and to date there has been no work done on how such regulations would apply to this medium, and what impact they would have on its development. Can a public interest group eavesdrop on CC communications medium between government and industrial individuals involved in a committee to establish some public standard? Are they entitled to review a log of who messaged whom? Requirements of these types could have dramatic impact on the design and operational costs of the systems. To a government operated system, would a message entered by a non-government employee, addressed to a government employee, constitute data maintained on an individual (the writer) in a government data base? This area contains nothing but unanswered questions.

5.11 Roles of Institutions (Snyder)

The present institutional infrastructure of the information sector of our economy has evolved piecemeal over the years, in conjunction with the emergence of new communication technologies. The most critical institutions in this

infrastructure are those involved with the provision of communications media (e.g., the postal service, the broadcast industry, telephone and telegraph, etc.), and those charged with the regulation of those media (e.g., the FCC, state utilities commissions, OTP, etc.) If we were to proceed on the basis of previous actions, we might begin to discuss the creation of yet another service industry (CC networks), or debate the issue of whether the postal service, or the telephone company, should control this new media. We would also begin to consider a long-needed revision of the Communications Act of 1934, and the need for creating additional State and Federal bureaucracies to regulate the new media. But, as was suggested in Section 5.0, the concern for the media represents an inadequate perception of the critical issues at stake, and if pursued to its logical conclusions will lead to a pointless, ill-informed debate, which will produce an inadequate and profitless solution. The institutions currently involved in the communications field are sharply constrained by present regulatory measures, and most are seeking ways of expanding their realm of operations. Issues of national and public interest, and of economic productivity and growth, could all be lost in the jurisdictional dispute which is certain to arise in the absence of a policy development process which addresses the significance of the messages, rather than the media. This is not to say that a thorough analysis of the economic functions of information will eliminate the potential for jurisdictional disputes; to the contrary, such an analysis may raise issues which are inimical to one or more of the existing communications power centers. The important point is that the public debate be adequately informed, whatever its outcome. This can happen only if the economic significance of information is thoroughly considered.

5.12 Economics of Information (Turoff)

As we move into the "information society", in which the efficient production and effective marketing of knowledge becomes an increasingly important economic function, computer conferencing would offer a mechanism for both knowledge production and marketing. But we do not have an integrated body of principles, laws, regulations, etc. relating to the ownership, sale/lease, and pricing of data and information. A new body of laws is emerging in the area of intellectual property, from the new U.S. Copyright Laws, to the pending California Patent Law which would assure individual inventors a percentage of the royalties on their creations, even if they were developed while the inventor was employed, and funded entirely by his/her employer.

In summary, even if there were no CC technology to assess, we are seriously in need of a thorough policy analysis regarding the economic implications of information production. Although such an analysis transcends the immediate concern for CC, it is nevertheless essential if we are to determine where the public's interest lies with regard to the use of Computer Conferencing. We need to know the answers to such basic questions as:

- 1) How much does our economy spend on the creation of all kinds of information- (e.g. management information, social and economic indicators, basic and applied research, etc.)?

- 2) What is the value of this information to our economy? What benefits does it engender?

- 3) What are the long term trends over the past 10-20 years, regarding the total amount of resources we have spent on information? What changes, if any, has this represented in the relative proportion of our GNP which we have spent on information? (Basically, are we becoming more dependent on information, or remaining relatively stable in this regard?)

4) What is the productivity rate in the information sector of the economy? Is it lower, the same, or higher than for the other principle sectors of our economy? (i.e. Is our information productivity lagging behind productivity rates in other sectors of the economy, and if so, would improvements in information productivity be disproportionately beneficial to the economy?) Do other nations have higher information productivity than the U.S.? Does the size or relative efficiency of the information element or a given economic sector appear to be instrumental in its overall efficiency/productivity?

It is only through research aimed at answering these kinds of questions that we can begin to assess the real importance of new information technologies such as Computer Conferencing. But beyond this, it is only when we understand the true value of information to our society that we can meaningfully address issues of public use and public interest relating to the production, ownership, pricing, and access to information. This includes the basic questions of privacy, information security, questions of sunshine and secrecy, etc.. One program officer at NSF has estimated that more than 50% of our total GNP is involved in the production, storage, retrieval, mobilization, transmission, and imparting of information throughout the society. (This estimate includes not only the information production and management functions of our institutions, but the publishing and educational sectors of our economy as well). If this estimate is correct, and the gross measures that are currently available suggest that it is, then any technology which may enhance our information productivity or efficiency of utilization can be a powerful and disproportionately significant tool for our society.

5.13 Immediate Policy Issues (Turoff)

The following topics represent policy items that have been and are now under active discussion. It is not clear, however, that the current discussion reflects the complete range of future potentials that efforts in computerized conferencing may open up. As a result, there is a considerable danger that decisions may be made that unintentionally close the doors on future potential benefits for society. It is not research that is needed here as much as a mechanism for transferring more of the knowledge that already exists into the minds of those who will be influencing, or making decisions affecting these areas.

5.13.1 The Federal Communications Commission Computer Inquiry (Turoff)

The FCC is developing guidelines that will establish the boundary of its statutory power between the data processing industry, which it cannot regulate, and the communication industry, in which the law requires the FCC to regulate all interstate services offered for hire. The rules currently proposed by the FCC fail to even mention computer media, thus leaving in doubt the question of whether computer media services must be tariffed as common carrier services.

5.13.2 A Post Office Monopoly in Electronic Mail (Turoff)

Because of the U.S. Postal Service's growing deficit, Congressional postal committees seem to be seriously disposed toward either subsidizing USPS entry

into electronic mail, or giving the USPS a monopoly in this area, through an extension of the Private Express Statutes.

5.13.3 Computer Media Regulation Subsumed under EFT Regulation(Turoff)

EFT regulation is beginning to sprout at the state level and, to a lesser extent, at the Federal Level. Some language in proposed bills would unintentionally put computer media under EFT. Should this be stopped or encouraged?

5.13.4 The New Copyright Law (Turoff)

Interpretation of the new copyright law as it applies to computerized conferencing systems leaves open a series of questions, and would appear to produce different results, depending on whether a person is using a CRT display terminal as opposed to a hard copy terminal. The legal interpretation of this law can have profound effect on the commercial availability and application of these systems.

5.13.5 Radio Transmission of Digital Data (Turoff)

The limitations imposed by the FCC on the transmission of digital data by radio would appear to be an artificial constraint on the development of new system concepts, and on the potential for public use of this mechanism of communication.

6.0 Technology Design & Implementation (McKendree)

There have been several computerized conferencing systems implemented to date. Almost all have led to greater demands for additional capabilities. Satisfying these demands means exponential growth behavior in the complexity of the resulting program, with associated penalties of unreliability, increased programmer effort, and often user inconvenience.

An over-all rationale is needed to guide CC system designers through the incredibly rich choices facing them in their implementation of individual conferencing facilities and communication structures. Where should one begin in implementation, and what functions should be added gradually?

6.1 User Facilities (McKendree)

The requirements for coupling the processing capacity of a computer to the needs of CC participants will vary according to the nature of problems addressed by the conferees, access to additional computer data resources and analytical routines, and the volume of communications among them.

What technical approaches are most promising to reduce the impact of large amounts of information in the Computerized Conference?

6.1.1 Text Processing and Abstracting (McKendree)

The need for abstracting incoming messages and comments increases as the volume increases; this is not much different from other forms of communication in so far as information overload management is concerned. However, a look at what kinds of filtering mechanisms will be needed should be attempted, e.g. automatic forwarding of items to pre-designated individuals if they meet certain qualifications (e.g. key words in the "subject line"). Should such automatic filters be made adaptable to the individual? What happens if they aren't?

6.1.2 Information Retrieval and Handling (McKendree)

Whether or not a conference begins with a set of logical guidelines to help focus the discussion, associations between items will evolve as the discussion evolves. Analysis routines are needed to permit altering associations among previously entered items. Handled at the individual user level, an associative structure for a conference could be built up and modified on a personal needs basis. Handled by the Conference Facilitator (responsible for large amounts of information and many conferences), association analysis would seem to require techniques from linguistics, artificial intelligence, and/or data structures.

6.1.3 Graphics (McKendree)

There is a general question about adapting existing sophisticated systems which use graphics terminals so as to rely on CC as a secondary support system. The primary system would continue to be the one for which the terminal was originally designed. For example, on-line planning in a military war room characterized by data-base interaction capabilities, and relatively high speed

display screens (eg. 9600 baud) would be a primary system. Another example would be computer aided instruction (eg. PLATO).

6.2 User Interfaces (McKendree)

CC has a possible future of increasingly widespread use over the next ten years, when computer terminals will likely cost about as much as color TV sets. Computerized conferencing should benefit research communities, Government agencies, business organizations, handicapped people, doctors, housewives, students, et al..

What system/user interface is appropriate for beginners? What modifications are necessary to enable mastery of all CC features? Is it feasible to provide a basic interface which can sustain the user from initial training, through casual use, to sophisticated operations for coping with information overload, and the complexities of conferencing structures? How should the interface be tailored to support specialized groups? How can richness/flexibility be accommodated by an easily used, generalized interface?

6.2.1 Terminal Design (McKendree)

Given the variety and lowering costs of terminal logical designs, what are the logic building blocks for interfacing with text displays of different speeds (bandwidths)? How shall terminal functions, including special function keys, be tailored for generalized languages (e.g. menu choices, symbolic commands), vs. problem oriented languages (eg natural/English, system-supplied formats for user completion).

What subset of conferencing inputs might be effectively served by speech recognition devices? To what outputs could digital voice/voice answerback be effectively applied?

6.2.2 Local Intelligence (McKendree)

What should be the division of labor between the computer local to the terminal, the remote computer, and, perhaps, an intermediate processor? Does the computer send forward all characters that are typed, or only those that are different from the ones in the original message (or if in a graphics mode, only those commands or characters which change present display)? No matter when the data enters the conferencing system, it must have a format that reduces the total amount of information that flows on the communication lines. At the same time, the extent of local intelligence must be compatible with centralized management of conference software. (cf. 6.2.4 Tailorable Interfaces)

6.2.3 Interfaces with Devices for the Handicapped (McKendree)

Braille is used by fewer than 50,000 persons in the U.S., but there are approximately 350,000 legally blind people in the country. These people could be provided with specialized terminals, with coded information transfer capabilities applied to reception, and to expression. For example, the Cybernetics Research Institute terminal DEBLICOM transfers information to the user via vibrotactile stimuli, using the same keyboard by which messages are entered.

Some terminals already available to the handicapped have a non-standard

(or obsolete-standard) code, not compatible with present day generations of computer systems.

The adequacy of present conferencing system design concepts for serving the handicapped needs to be explored by incorporating one or another special purpose terminals. Just as with other computer users, the success of a teleconference system for the handicapped may depend on some very small, but important, human engineering features at the user interface.

Desirable research products would include answers to such questions as: How much "intelligence" should be in the terminal? How much should reside in conferencing software? What is a reasonable design to begin with, to which functions can be added? What about training, and/or computer-aided instruction? What about speed of data display generation - when should it be slower than 30 cps for user convenience, when should it be faster?

6.2.4 Tailorable Interfaces (McKendree)

A particularly desirable software feature for conference facilitation is a simple language to enable a non-programmer to design and specify a communication structure for computerized conferencing, in just a few days.

Present systems are quite limited as to the features and parameters which the facilitator can specify at the start of a conference. Subsequent revisions, eg. as a conference shifts from problem definition into project management, are currently performed by reprogramming (3 weeks to 3 months delay) or, perhaps, by moving the conferees to a different system (requiring retraining of users, and a loss of continuity in the discussion).

A second problem which needs to be addressed is a simple means for individual users to tailor their own services (eg. to block out unwanted procedures, or to customize their terminal's functions to their preferences).

6.3 Implementation Tools (Enslow)

At the present time, there are very few software tools that support specifically either the design or implementation of computer conferencing systems. The lack of these tools has had a number of results--high implementation costs, long development time, inefficient systems, unreliable systems, systems that are difficult or impossible to transport-- and the high costs associated with implementation make it difficult to correct these deficiencies by the most suitable means, namely, redesign and reimplementation.

Discussed below are some of the specific tools that require further research, as well as some of the system attributes that would be provided by a satisfactory suite of such tools.

6.3.1 Information Structures (Enslow)

As was stated above, a computer conferencing system is actually a file manipulation system. When evaluating a hardware/software environment in which to implement a computer conferencing system, the evaluator should pay as much attention to the availability of good useable information structures, such as pointers, files, etc., as he does to a good communications interface.

6.3.1.1 Special Requirements for Computer Conferencing (Turoff)

There are many unique and specific features of computer hardware and executive level software which greatly influence the performance and inherent capabilities of a computerized conferencing system. Examples are: the existence of core-to-core transfers of variable length records without having to go through index records; the nature of I/O control; the ability to test and set an indicator in one machine operation; and the software ability for two or more users to be modifying the same storage location at essentially the same time, as perceived by the user. The existence, or non-existence of such features, or a slight change in the characteristics of how such features actually behave, can have a significant impact upon performance, to the extent that major redesign at a higher level in a conference system must occur, if the system is to be implemented on a different machine. As yet, applications of this type have had very little influence on the architecture and associated executive software of what may be termed general purpose machines. We are probably at a stage now where a review of the internal designs of different conference systems could produce a more coherent perspective on the "ideal" configuration. Such a study might well serve to influence the designs of future computer configurations.

6.3.1.2 Interfaces with File Systems (Turoff)

A properly designed computerized conferencing system appears to accommodate two opposing views of the associated file system. For some purposes, the system must view the set of files as one large file, with no boundaries or divisions, and a standardized structure for all items in the file. For other purposes, the file must be viewed as consisting of very different files, each having unique characteristics. Because of the way most file systems are put together, the only workable approach is usually to treat the file as one massive uniform file, and build the substructures at the application level. Attempts to utilize file substructures at the systems level often lead to tremendous inefficiencies, since any one user of a computerized conferencing system can be in a mode where s/he is using the system as one large file. As a result of unsuitable system file structures, computerized conferencing programs are far more complex in nature than should ideally be the case. Often it is considerations of security and integration of files in a time sharing environment that lead to system level file designs which inhibit utility in the computerized conferencing environment.

The design of suitable file structures at the systems level is thus an area that seriously deserves further refinement and review.

6.3.2 Software Effort and Language Development (Enslow)

At the present time, there is little direct support available in the form of special languages or procedures for the development of computer conferencing systems. It is not entirely clear that the requirements or needs of the computer conferencing system are drastically different from those encountered in other interactive inquiry question-answering systems. However, there is little support available for the implementation for those systems either. Two of the aspects of a computer conferencing system make it highly desirable to have more effective direct support of its implementation. These are: the complex nature of the interaction that can result from providing programs to service a large number of users concurrently; and the very highly dynamic nature of the system in that it must respond to user wants and requirements, so that it is continually under modification. However, those users that are accustomed to the system in its present form do not want to be aware of any modifications being made.

6.3.2.1 Requirements for a Special Systems Implementation Language (Enslow)

Although much of the current work on the control of concurrent processes and special languages for the development of concurrent processing systems is applicable to computer communication systems development, there are several features of the programs within computer conferencing that warrant a special language. This is probably best exemplified by recognizing that a computer conferencing system is almost totally a file access and file manipulating system, with very little computation being performed. It is complicated by the problems of multiple users interacting with files and, upon occasion, interacting with one another. Requirements include: accessing multiple files and still retaining systems security as well as system integrity, advancing pointers through the system, dealing with unreliable communication lengths, and the development of procedures for backup and restart. The classical work in the area of concurrent processes is focused on rigorous models for the sharing of resources. What is necessary in a computer conferencing system programming language is support for easy development of interaction models.

6.3.3 Operating System Interface (Enslow)

The present practice for the implementation of most application systems is to accept the operating system interface as provided by the standard operating system. The expense and skill required to develop a special operating system usually justifies such a decision; however, a computer conferencing system places some special demands on these interfaces that deserve special attention, and require additional research to determine the best way to meet them. Two of these special aspects of operating system interfaces are discussed below.

A general observation is that the operating system should be under control of the high-level language utilized for the implementation of the applications system. It should not be necessary to make frequent transitions into the domain of the operating system command language to accomplish this.

6.3.3.1 Control of User Interface by Application Program (Enslow)

For excellent reasons of economy, efficiency, security, and standardization, all hardware interfaces are under control of the operating system. Although this is normally a desirable situation, and even acceptable in part to the computer conferencing system if the standard file system adequately supports CC functions, having the user hardware interface controlled by the operating system is generally unacceptable to any system attempting to create a highly hospitable user operating interface. There are a number of conditions of the user interface that are detected by the hardware, such as depression of the BREAK key or an interruption in communications. It is essential that upon the occurrence of events such as these, control be returned to the computer conference system with an indication of what has transpired. This is necessary in order that the user not be connected to some level of the operating system shell and be presented with a totally foreign operating environment. This capability is partially present in some current operating systems; however, more general availability of their mode of operation would be of high value to all applications systems interacting directly with user terminals. All too often the only alternative is to construct a special operating system.

6.3.3.2 Protection (Enslow)

The economic success of a computer conferencing system will certainly depend on its ability to simultaneously serve various conferences, as well as multiple members active in each. In order to do this effectively, there must be a very high degree of protection provided at all boundaries. How to best provide a high level of protection in a "standard" multiple user system is not yet well established, and the situation here is greatly exacerbated by the fact that efficiency and response time requirements will probably require both that a single user have several files open at the same time, and that there be several concurrent/simultaneous users of single files.

6.3.4 Highly Available Systems (Enslow)

System availability is certainly one of the characteristics most important to a useful computer conferencing system. The system must also be highly reliable; one that provides the user access to all system capabilities a high proportion of the time, but is unreliable and constantly forcing the user to reinitiate and repeat work is definitely unacceptable. The specific manner in which reliability and availability are interrelated in the CC context is somewhat different from their normal relationships, and solutions found appropriate in other types of systems will often not be acceptable here. It is also essential that the means used to attain these two goals in a computer conferencing system not have undesirable side effects on another important system characteristic, namely, the presentation of an extremely simple and hospitable user interface.

System availability and reliability will be achieved by an integrated and balanced hardware/software approach. Unfortunately, only a small amount of the limited work already done in these areas is directly applicable. Some specific research areas and goals are discussed below.

6.3.4.1 Multiple Processors (Enslow)

The provision of multiple processors providing 100% backup capability is certainly a minimum necessity. The unsolved problems of switching over and utilizing the alternate hardware lie primarily in the area of control software. The prompt detection of a processor failure is not too difficult; the problem is the rapid reestablishment of the operating environment in the replacement system with minimum effects on the user such as rollback, or even worse, reinitiation. Because of the differences in the interaction of reliability and availability in computer conferencing systems, there is also a large amount of research work required on basic system concepts.

6.3.4.2 Data Base Switching (Enslow)

The problem of data base switching is closely associated with the problems of multiple processors. Some of the specific aspects of this problem area are the switching of "open" files, and the requirement to be able to recover from the interruption of a critical operation such as file updating or modification. The latter goal might be met by having all such operations performed on a copy of the original, with redesignation of the modified copy being contingent upon successful completion of the operation, but it is not clear that this is the most efficient nor the most reliable technique.

6.3.4.3 Problems of Communication System Breaks (Enslow)

Because of the extremely large differences between the reaction times of

processors and those for communication systems, short communication failures (e.g. momentary loss of the carrier signal) may go undetected by the communications equipment or user; however, most current operating systems consider the reestablished circuit as a new contact and force the user through the complete sign-on procedure. One purpose of this procedure is to maintain the security standards of the system. Although this is certainly a desirable goal, the repetition of the log-in procedures has very negative effects on the user. Often a rather complex series of efforts is necessary in order to reestablish the user's operating environment, and to correct the actions taken by the operating system and the application program subsequent to the automatic log-out decision.

The research required must focus on the detection of a possible non-user-caused communication interruption, the criteria and actions necessary to establish an intermediate "possible disconnect" state, and the procedures that will reestablish a suitable environment for the user to continue with a minimum of loss or repetition.

6.3.5 System Modification and Portability (Enslow)

The difficulties and problems attendant to modification (including enhancement as well as correction of errors) and/or movement to a new operating environment of the computer conferencing software system comprise one of the major factors in its life-cycle cost. One of the most promising approaches to the solutions for both the modification/ maintenance and the portability problems is the use of a high-level implementation language that is designed so as not to be hardware dependent. In addressing these problems, the need is reinforced for language features that support modularity, and that allow explicit definition of the hardware operating environment.

6.3.6 Adaptive Processing & Artificial Intelligence (Turoff)

To date, there has been almost no effort to introduce adaptive or AI processing techniques into the context of computerized conferencing systems. Yet the potential for capitalizing upon these approaches would seem to be great, because the nature of a communication process via a computer system is such as to generate a steady stream of information about the behaviour of the individuals involved. This may arise from tracking the data on the way individuals organize data, who they communicate with, how they vote, what they search for, etc.. We believe some of the real benefits, and also some of the dangers, of computerized conferencing will become evident only when we have a better understanding of how some of the data generated by the operation of the system can be used, on a real time basis, to draw inferences on what is taking place. While most current AI efforts strive for techniques that operate independent of human interaction, the computerized conferencing environment offers the opportunity to evolve techniques where human judgement can be an integral part of the processing. This may produce somewhat different objectives and orientations from current AI approaches to problems. Also, there would appear to be a need to encourage more interchange between those working in psychometric and associated efforts in quantifying and measuring human behavior on the one hand, and those in the computer areas of AI, pattern recognition and heuristics on the other.

Typical questions that could be addressed both for understanding potential benefits as well as potential dangers are:

- 1) Could a system infer that a given individual may desire to communicate with someone s/he has not been communicating with?

- 2) Can value systems of individuals be inferred from their behaviour in a CC?
- 3) Can communications be selectively directed to individuals as a result of content profiles the system has developed for them based upon their behaviour over time?
- 4) Can the computer detect emerging subgroups that are exhibiting patterns of behaviour internally consistent, but different from those of the other system participants?
- 5) Can the system automatically adapt the terminal interface to suit the degree of skill exercised by the user?
- 6) Can the system provide heuristic aids to problem solving groups, drawing upon the content of messages they generate in exploring their problems?
- 7) Can the system automatically "draft" abstracts of lengthy messages or journal papers, to help solve the information overload problem?
- 8) Can the system help in detecting and resolving definitional inconsistencies encountered when using multiple external data bases?
- 9) Can the system provide automatic translation of common words and phrases for multi-lingual conferences?

6.3.7 Distributed Processing Systems and Networks of Processors (Enslow)

The concept of using a network of interconnected processors to provide computer conferencing services is appealing from several points of view: operations, economics, system availability, etc.. However, in order to be useful, the network of processing resources and data base storage devices must be configured and operated as an integrated system. If this is done to the extent that will probably be necessary for a computer conferencing system operational environment, the resulting system will meet, or be very close to, the definition for a "distributed data processing system" as presented by Enslow [Distributed Data Processing, INFOTECH, 1977]. That definition will not be given in toto here; suffice it to say that a distributed data processing system is a monolithic network or reconfigurable resources operating under a unified, but distributed control system in a manner that can best be described as "cooperative autonomy". A distributed data processing system provides almost the complete list of improvements sought after for a computer conferencing system (as well as many other interactive systems)--high availability, good throughput and response time, modular upgrade and growth, economical use of smaller processors, etc. These are in addition to the fact that the existence and composition of the distributed system is totally invisible to the user who operates it, as if there is one single source of service for all his requests which he enters by name of the work to be accomplished and not the name(s) of the server(s).

6.3.7.1 Advantages (Enslow)

Perhaps the strongest motivation for the interest in networks of processors is the desire to exploit the computational power that current mini-processors are delivering, at a lower unit cost than that encountered with large mainframe systems. This economic motivation is complemented by other expectations for the network, such as reliability and availability improvements, and the general exploitation of the modular nature of a network system of processors and data storage devices.

Some of the other advantages attributed to distributed data processing

systems are:

- Improved system performance--faster response time, greater throughput
- High system availability
- High system reliability
- Reduced network costs
- Graceful system degradation/fail-soft
- Ease of modular, incremental growth
- Configuration flexibility
- Resource sharing
- Automatic load sharing
- Adaptability to changes in workload
- Incremental replacement and/or upgrading of components (both hardware and software)
- Ease of expansion in both capacity and function
- Ease of introducing new functions
- Good response to temporary overloads

6.3.7.2 Problems (Enslow)

The major problem with the use of a distributed data processing system as defined above, is that there is nothing today which meets all of those qualifications, or even a major portion of them. Although the sales literature abounds with statements that various vendors' "distributed" systems will provide "numerous advantages", the systems currently being delivered fall far short of the capabilities being sought. A large number of unsolved problems remain in both the operating systems and the data base management systems for "true" distributed data processing systems, and there is no indication that very much attention is being directed toward their solution. The operating system for the overall system has to be absolutely monolithic, i.e., no hierarchy even on a transient basis. The concept of cooperative autonomy has to govern at almost all levels of control. Several of the presently utilized concepts of system communication and system integrity have to be reexamined and modified. There are some relatively simple questions that are difficult to answer if there is truly no hierarchy, e.g., how is an illegal (or misspelled) request for service recognized if no single component ever has TOTAL knowledge about the entire system and its capabilities?

The problems involving data base management are equally difficult. How is a fragmented data base organized and used? How are updates of replicated data bases synchronized?

For a more complete discussion of this particular subject the reader is referred to Enslow [op. cit.].

6.4 External Integration Problems (Enslow)

In order to gain wide acceptance, it is probably essential that computer conferencing systems not be just another specialized system type, offering a limited and narrow range of services. There are already strong indications that the "attractiveness" of the CC system could be enhanced by providing it with capabilities to act as the access and utilization moderator for the utilization of other, external systems, providing other types of specialized services. Examples of two categories of such services are discussed below, along with a few comments on presently identified difficulties in their use.

6.4.1 Utilization of External Data Bases (Enslow)

It has been stated by some that the success of the system will depend heavily on the number, diversity, and quality of the data bases to which its users have access. It is not feasible to move large data bases physically into a CC system, so the system must provide access to EXTERNAL data bases. It should also be noted that the access to data bases through the system must provide additional features over and above those obtained by accessing them directly, if such access is to have any positive value in the evaluation of the computer conferencing system. Some of the additional benefits that MIGHT be provided by the CC system are the presentation to the user of a consistent and uniform interface for the access of ALL data bases, and the ability to manipulate collectively the output from several different data bases.

There has been little work done in this area, and there are many difficult problems to be solved. A few of these are discussed below.

6.4.1.1 Access Interfaces (Enslow)

The most straightforward solution to the design of a single interface that could be mapped into several others is to establish it as the superset of all elements in all of the target interfaces. There are extreme problems with this approach, however; e.g., how does the user know which items do not have to be stated for the particular system he wishes to access? Further problems are created by the variations in the treatment of default options between the different target systems. The contradictions often present in definitions of the same term utilized in two different access control sequences only serve to exacerbate the situation.

It appears quite likely that the solution to this problem will require a multi-branch and multi-level man-machine dialogue utilizing artificial intelligence techniques. At the present time, no work addressing this problem, either directly or indirectly, has been identified.

6.4.1.2 Data Base Organization and Cross-Mapping (Enslow)

Even after obtaining access to the data base and the output delivered in response to a properly formed inquiry, it may not be possible to use that output. The form and organization of the output is directly affected by the form and organization of the data base itself. If this output is to be combined with output from another system, or if it is to be operated on by a common set of manipulating routines, then another major mapping problem exists in converting all possible outputs into a standard form. The design of a suitable standard form is comparable in difficulty with the design of appropriate mapping or transformation procedures. Some of the problems that are encountered in this stem from variations in the hierarchies of indexing between systems that follow the same organizational concepts, even to the point of having an exact inversion of the levels for identical indexing factors. A further problem is created by the variations in vocabulary.

There is some work in progress at the present time to develop mapping and translation techniques to address these problems. An additional factor of importance in this situation is the problem of generalized implementations that are efficient.

6.4.2 Use of Modeling/Simulation Systems and Other Processing Tools (Enslow)

Just as the access to various data bases increases the value of the CC system, so also with access to both general and special purpose

Programming/processing systems. In this case it is also necessary that the CC system provide a hospitable and reasonably uniform user interface consistent with other user interfaces. It is a reasonable assumption that the CC system will only provide the access interface, with other user services such as "HELP" and error diagnostics being provided by the target system.

6.4.2.1 Language Interfaces--Programming and Control (Enslow)

It is reasonable to expect the user to be proficient in the programming language of the target system (or else he should not be using it). Further, it can be assumed that he is proficient in the specific implementation of that language found in the target system. What is not yet clear, is whether or not it will be necessary for the user to be fully proficient in the command language of the target system, and the use of those commands explicitly. The work thus far on standardization of operating system command languages has not made very much progress, although there has been some success with the design, implementation, and use of a special command language of limited capabilities for a small subset of target computers.

It is not clear that standardization of the respective languages will provide complete solutions to these interface problems. The efforts and results thus far in standardizing programming languages bear clear testimony to that fact. This topic is going to require a large amount of study, and a full consideration of the complete spectrum of problems involved- including problems such as how to provide editing capabilities in the CC system for a "large" number of other input language formats, and the implementation and operation of an access interface that is transparent to the transmission of all communications with the target system, including special characters that may have a special control function in the CC host.

6.4.2.2 Data Definitions and Formats (Enslow)

Two features of a programming system that are quite often implementation dependent are the options available for data definition, and the options available for input and output formats. The comments relative to this aspect of the use of an external processing system are very similar to those given above in paragraph 6.4.1.2 in the discussion of the use of the output from external data bases. The reader is referred to that paragraph for details.

6.5 Off Line Activities: Technology, Design and Policy Issues (Enslow)

Early investigations of CC have centered upon on-line interactive use in terms of CC system requirements and user terminal interfaces; but it is probable that users and user organizations will develop off-line activities to back up, and enhance their utilization of CC. In addition, CC systems may develop some off-line activities for the sake of economy- at least until the time that very low cost memory capacity is achieved. This raises several potential areas for discussion that may affect future CC design.

6.5.1 Off-Line Text Preparation (Enslow)

In what situations would users prefer to prepare text materials off-line to avoid transmission charges, or to utilize features of extant user-location hardware and software? How would this affect system configuration in terms of acceptance of materials prepared off-line, decrease in number of users who must be accommodated at a given time, decrease in core storage requirements?

6.5.1.1 Simple Message Preparation (Enslow)

To what extent, and in what situations, would users prefer to compose and edit msgs. off-line and then transfer to CC, perhaps at high speed?

For example:

Would off-line preparation assist user organizations that will have in-house word-processing systems to avoid learning an additional set of word-processing commands, and additional training of personnel that this would require?

Would off-line capability encourage greater use of secretarial personnel in preparation activities?

6.5.1.2 Complex Message Preparation (Enslow)

Some users may wish to insert more complex materials into a CC network. These might consist of extensive verbal text materials, tabular displays of numerical data, or graphics. If the user previously has prepared these materials electronically for other applications, he/she is likely to want to make a simple transfer, rather than go through the arduous task of reentering, editing, and proofreading the materials.

For example:

To what extent would acceptance of off-line preparation facilitate sharing of more extensive materials?

What hardware/software requirements would a CC system encounter in accepting graphic materials prepared off-line?

6.5.2 Off-Line Storage (Hiltz)

In what situations would some users wish to retrieve CC materials and utilize off-line programming packages to conduct such activities as content analysis, modelling, statistical analysis? (I.e., undertake activities with programs that may not be available through the CC system.) How desirable is it to store older CC materials off-line?

For example:

Would users wish to maintain records of discontinued conferences in:
hard copy?

on tape (user location)?

on tape (system location- to be mounted on request)?

6.5.2.1 Ownership of Stored Entries (Hiltz)

Ownership and authorship rights of individual entries in CC are far from clear, but the ownership question of conference transcripts will be even more complex.

For example:

Should indexes or search routines of outdated taped conferences be provided?

How would access privileges to archives be determined?

Will librarians acquire conference proceedings?
Will users build up libraries of past conferences?
At some future date, will scholars donate their CC entries to an electronic manuscripts library?
Will the Supreme Court have to decide on a president's right to retain CC transcripts?

6.5.2.2 Duration of Access (Hiltz)

How will duration of active on-line access be determined?

For example:

Will users have to support access beyond a certain period? Will users be given options to copy or to establish off-line storage for inactive data files? What protocols will develop in determining when a CC file, or selected entries, may be erased?

6.5.3 Data Transfer (Hiltz)

Users could employ CC mechanisms to access other data banks for both the insertion and retrieval of information, but some may wish to perform transfer operations through the user hardware.

For example:

If CC evolves into a multiple-system configuration, would some users prefer to transfer data from one CC system to another, e.g., for security reasons, would they just as soon not have system"A" know that equivalent data is being used in system"B"?

Would user transfer help forestall fears of threats to privacy through CC system interfacing capabilities?

Would certain kinds of transfer be more economical if performed by the user, rather than the CC system?

If users can transfer data from one CC system to another without the assistance of CC facilitators, will this cause problems of redundancy

6.6 Future Technology (Enslow)

Some of the technological advances seen on the horizon should improve the situation for computer conferencing.

The lists below are not intended to be a complete survey of all advances expected, but are oriented instead towards items that appear especially promising for CC systems.

6.6.1 Communications (Enslow)

The important factors here are cost and ease of use. The charges for connect time and for operation of a suitable terminal will usually be the highest costs involved with the use of the system. Another important factor is ease of use of the terminal itself, which includes matters such as the placement of the keys (e.g., BREAK immediately adjacent to SHIFT), and non-uniform selection of special functions to be included on the keyboard.

6.6.1.1 Networks (Enslow)

The existence of large, widespread, IN-PLACE common-user networks is almost essential for the establishment of computer conferencing. In addition to leased lines being too costly, the problems of arranging them for the wide diversity and dispersion of users would be almost impossible for the system operator to overcome. The continued expansion of systems such as TELENET provides a highly satisfactory solution to the distribution problem. Of equal importance is the adoption of standards by the various networks that will permit their interconnection. Computer conferencing systems are an almost ideal customer for terminal-oriented networks, and it is hard to visualize how CC systems could survive economically without them.

6.6.1.2 Terminals (Enslow)

Improvements which are currently, or soon to be, available in terminals will improve the situation with respect to connect time and ease of use; but this will also increase their cost. There is not yet enough information available to determine if the associated decreases in transmission charges will offset these hardware cost increases.

Some advances that will impact use of terminals in computer conferencing systems are:

- Local buffering for off-line preparation of messages and high-speed transmission/reception.
- Local intelligence to support operations such as editing, and challenging of users when they do something "dumb" or potentially catastrophic.
- Automatic disconnect and reconnection to avoid unwanted connect time during prolonged "think periods."

6.6.2 Data Processing Equipment (Enslow)

The pertinent impacts of future data processing will derive primarily from the economics of such equipment. The costs of equivalent processing power continue to fall as a result both of fabrication technology, and of quantity production of those systems currently classified as minicomputers. The capabilities available today in such systems have far surpassed those of the large mainframe systems of a few years ago. Two of the most important aspects of future hardware systems appear to be the sizing of individual systems and the use of redundant equipment to improve availability.

6.6.2.1 Economics of System Sizing (Enslow)

Perhaps the two most important characteristics of the central data processor in a computer conferencing system are: 1) the ability to handle a large number of users with satisfactory response time and 2) the ability to store on-line economically the large data files involved.

The system characteristics most important in establishing response time for a large number of terminals are the size and speed of primary memory. Whereas a few years ago a cost-effectiveness trade-off study between computational power and memory size (Amdahl's constant) indicated a desirable ratio of one megabyte of primary memory for each one million instructions per second of central processor power, (1Mb/1Mips), recent memory cost improvements result in a target ratio of 2Mb/1Mips, and projections are for the ratio to

increase to 4-to-1 in the near future. Systems well equipped to serve as efficient central processors are thus available, and at very economical prices.

The progress is not as clear-cut with respect to on-line storage. Economically attractive systems, such as minicomputers, now have greatly increased maximum on-line storage available; however, the improvements have not been as great in the storage devices themselves. The cost vs. capacity for such devices has shown certain effects of scaling (bits stored per dollar = $k \cdot \text{cost}^{2.9}$), but this effect has often been attained at the expense of device performance. The availability of a large, low-cost, primary memory may make it possible to compensate for these performance drops, and still exploit the lower costs of the large capacity units.

6.6.2.2 Highly Available Systems (Enslow)

The economics of all types of data processing hardware components are making it much more feasible to provide redundancy, or other forms of hardware back-up capabilities. However, the prospects for the software necessary to control and utilize such equipment are not very good. There is some work in progress on operating systems for the more standard form of multiprocessors; however, as was pointed out above in paragraph 6.3.4, the goals and requirements for highly available systems to support computer conferencing are unique, and will require special attention.

6.6.3 Conclusion (Turoff)

The overall prospects from future technology augur well for the improvement and practical implementation of computer conferencing; it remains only to carry out the research necessary for resolving the problems that are inherent in this exciting new medium, precisely because it is so new, and promises so much.

BIBLIOGRAPHY ON COMPUTERIZED CONFERENCING

This bibliography covers published material in the area of computerized conferencing, message systems, electronic mail and other closely related subjects. The only exception is a few items in the area of electronic townhalls and citizen participation systems where the authors were referring to needs that seem to be met by this particular technology.

The major efforts in this area are represented by:

- 1) The early work at the Office of Emergency Preparedness
- 2) The major efforts at the Institute for the Future and the New Jersey Institute for Technology.
- 3) The work at Bell Canada which is not totally represented through publications because of the company confidential nature of some of that effort.
- 4) The emergence of concern in this area in recent years on ARPA net and associated organizations like MIT and the Stanford Research Institute

Smaller efforts worthy of note are:

- 1) The early work from a CAI direction at Northwestern and the University of Illinois.
- 2) The recent emergence of a program in this area at the University of Michigan.
- 3) A general increase in publications by individuals in an assortment of organizations and institutions.

Items in this bibliography have a key word title containing the last name of the principal author or authors, the last two digits of the year in which it was published and the principal organization responsible for the work reported in the publication regardless of the authors affiliations. This latter in some cases is judgmental and open to disagreement or correction. While an attempt has been made to list only papers that have been published or accepted for publication in a few cases where an unpublished paper represents the only source of information on the work the paper has been included.

Any corrections or additions to this listing should be sent to Murray Turoff at the New Jersey Institute of Technology, 323 High St. Newark, N.J. 07102. This bibliography is maintained on EIES for the benefit of EIES users. Contributors of new additions to it may request to be sent updates of this BIBLIOGRAPHY.

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APPENDIX

A SELECTION OF COMMENTS FROM CONFERENCES:

71 DESIGN AND TECHNOLOGY

72 APPLICATIONS

73 POLICY AND REGULATION

SELECTED BY JULIAN M. SCHER AND ROXANNE HILTZ

ASSOCIATE DIRECTORS

NJIT COMPUTERIZED CONFERENCING & COMMUNICATIONS CENTER

Summary:

In the following pages , we have sought to capture the flavor of the discussions which transpired during the year in the NSF-sponsored computerized conferences. The order of the presentation of selected conference comments begins with conference 72, proceeds to 71 , and then conference 73; within each conference, selected, and sometimes edited down comments are arranged in chronological order. Comments have been selected to present some examples of areas of agreement and disagreement. They also show the "intertwining" of several topics simultaneously in a typical discussion, and the tendency to disagree quite openly.

THE AUTHOR OF EACH COMMENT IS LISTED IN THE HEADING OF EACH ENTRY

Note: The author is in no way responsible for any quotes which may have been taken out of context.

I propose that in the initial few weeks of this discussion, we do two things:

try to generate a complete list of all the issues we may want to cover

try to organize or re-conceptualize all the separate issues under a more general framework.

For starters, I will list the 17 , unorganized, hodgepodge possible issues that were included in the proposal. Then, one possible way of organizing them.

1. "work at home" feasibility studies
2. Impact of computerized conferencing on perceptions of males and females in management discussion.
3. Potentials of controlled laboratory experiments versus field trials.
4. Communication/transportation substitutability experiments
5. Merger and role of computerized conferencing with decision analysis models or simulations.
6. Paperless office systems and decentralization of management and work functions (organizational impacts)
7. Experiments with psychotherapy and other group dynamic approaches to individual and collective problems.
8. Impacts on productivity.
9. Possible uses in education.
10. Scenarios for impact on social structures of scientific communities.
11. Mixing of computer conferencing with audio and video channels.
12. Task environments for positive and negative acceptance.
13. Impact on hierarchical organizations, labor unions, etc.
14. Impact on the psychological well-being and social integration of users and user groups.
15. impact on urban decay/decentralization
16. citizen impacts
17. impact upon the internal dynamics and structure of decision making groups, and the role of leadership.

C72CC4 ROXANNE HILTZ 1/24/76 10:41 AM

There is a whole issue left out, and that is the interaction of design features with the possible applications and impacts. That is, these systems differ so much in features and user protocols that one cannot at this point make generalizations about reactions to computerized conferencing "in general" without specifying what kind of system. There is a tremendous difference between the use of the ARPA net for "electronic mail"; the Forum/planet system with simple message and conference capabilities and limited commands for the user to learn; and the EIES system, with Notebooks, Bulletins, Public conferences, complex editing and review capabilities, etc. available to the user which presents more complexity to the new user.

C72CC7 H.E. BAMFORD 11/30/76

I suggest that the manner or mode of application is actually a generalization of the issue Roxanne "left out". It is not just systems which vary, and thereby limit generalization. For a given system, each using community finds its own pattern of usage, and within the community each individual does the same. Only the most tentative generalization, therefore, is possible from experience with computer conferencing in a situation not subject to artificial experimental controls.

C72CC2 ROXANNE HILTZ 11/24/76 10:12 AM

Applications and Impacts was described in the Proposal for this Workshop as follows:

Applications and Impacts is concerned with the use and utility of computerized conferencing for different objectives and user communities. It will be concerned with what sort of experimental, evaluation, and assessment efforts can be conducted, and how they can be coordinated to gain insights into various hypotheses about the utility of these systems under differing requirements for human communications. The potential impacts with which the conference will be concerned will be not only the intended consequences for productivity, but also the social and psychological impacts involved for individuals, the groups participating, and the society as a whole. We are further instructed that the objectives of the workshop are to produce a kind of hierarchy or research agenda.

1. Issues that are significant, unresolved by current knowledge, and susceptible to clarification by a managed program of research and evaluation efforts.

2. Specific research efforts that are worthy of doing because of a reasonable chance of producing useful knowledge for basic issues
3. Interface problems with research activities in other areas for which directed efforts at more cross fertilization may be needed, or seem to be desirable.

4. Pure or risky research efforts where payoffs are unclear, but where efforts appear to be warranted to broaden the general knowledge base and/or where major breakthroughs could possibly emerge.

MY COMMENTS CONCERN THE IMPACT OF COMPUTER CONFERENCING UPON FAMILY AND FRIENDSHIP NETWORKS IN OUR SOCIETY.

ONE CONSEQUENCE OF OUR HIGHLY MOBILE AND RAPIDLY CHANGING SOCIETY IS THE MORE RAPID DISINTEGRATION OF FAMILY AND FRIENDSHIP TIES THAN HAD BEEN THE CASE IN SIMPLER TIMES. MOST OF US TODAY CONSIDER OURSELVES VERY FORTUNATE IF WE RETAIN FRIENDSHIPS OVER THE YEARS, RECOGNIZING AT THE SAME TIME THE "INEVITABILITY" OF PROBLEMS IMPOSED BY DISTANCE (FOR ALL BUT THE VERY WEALTHY, MONEY CONSTRAINS TRAVEL AND EXTENDED PHONE VISITS; LETTER-WRITING BECOMES TEDIOUS.)

THE PLIGHT OF THE EXTENDED FAMILY IN OUR SOCIETY, AND THE CONSEQUENCES OF ITS DISINTEGRATION, ARE WELL KNOWN.

WOULD THE WIDESPREAD USE OF COMPUTER CONFERENCING IMPACT UPON THESE TWO SOCIAL PROBLEMS?

I HYPOTHEZIZE THE FOLLOWING:

- 1) THE MEAN DURATION OF FRIENDSHIPS WILL BE LONGER IN A "COMPUTER CONFERENCE SOCIETY" THAN AT PRESENT.
- 2) FRIENDSHIPS TERMINATED IN A "COMPUTER CONFERENCE SOCIETY" ARE MORE LIKELY TO BE A FUNCTION OF CHANGED INTERESTS THAN DISTANCE
- 3) BECAUSE FRIENDSHIP AND FAMILY TIES WILL ENDURE, THERE WILL BE A CONCOMITANT INCREASE IN:
 - A) INDIVIDUAL ABILITY TO COPE WITH FRIENDSHIPS FUNCTIONING AS SUPPORT MECHANISMS
 - B) INDIVIDUAL "HAPPINESS" (SATISFACTIONS, ADJUSTMENTS)
 - C) SOCIAL COHESION (WITH SPILLOVER FOR EFFICIENCY , EFFECTIVENESS, ETC.
- 4) THERE WILL BE A DECREASE IN:
 - A) INDIVIDUAL LONELINESS, PSYCHOLOGICAL PROBLEMS, SUICIDE RATES, MARITAL UNHAPPINESS, AS TRAVELLING PARTNERS RETAIN CONTACT, ETC.
 - B) THE FREQUENCY AND SIGNIFICANCE OF SOCIAL PROBLEMS (JUVENILE DELINQUENCY, ALCOHOLISM, DIVORCE, SUICIDE, ETC.)

WILL THE HYPOTHEZIZED RESULTS DIFFER BY SUCH VARIABLES AS SEX, AGE, AND RACE?

(WILL COMPUTER CONFERENCING REALLY CHANGE THE WORLD?)

: C72CC12 RONALD UHLIG 12/13/76 6:21 PM

This is a comment on item 10. My comments are based on two years of using computer based message systems on the ARPANET as a way of life. Inevitably a part of that use has to do with communicating with friends. As a result of that use, I suspect the impact of computer conferencing will not be as great a help as the hypotheses might imply. Much of what we do with computer based message systems is really computer conferencing. We carry out extended conversations on particular items or groups of items. One of our findings is that we have a great deal to learn about the etiquette of such conversations. For example, humor is sometimes essential to communicating. Some people try to inject it into a computer conversation by adding the word "chuckle" or (in a few cases I have seen) "giggle" in parentheses. I have also seen cases in which a freindship has been severely strained by the receiver misunderstanding what the sender meant. One of my very good friends, with whom I communicate on a daily basis, usually several times a day, via computer, and I have had some out and out "fights" because of misunderstandings. Our conversations have degenerated into "alternating monologues" at times. Of course, this happens in face-to-face communications too, but the narrowness of the computer conferencing bandwidth may make it happen faster.

:C72CC15 ROXANNE HILTZ 12/14/76 2:40 PM

Perhaps we can begin commenting on each other's statements as well as making our opening statements.
ref. 7c

I am afraid that I must take strong issue with the point of view expressed by Dr. Bamford. Carried to its logical conclusion, the statement that "for a given system each community finds its own pattern of usage, and within the community each individual does the same. Only the most tentative generalization, therefore, is possible". . . means that there is no possibility for a subject matter for sociology. The basic premise of sociology is that it is indeed the case that human behavior is determined by such things as norms and structural arrangements. Specifically, it is the starting assumption that one can arrive at generalizations about the use of/reaction to/ impact of c.c. on individuals and user groups that will indeed apply to most individuals and most groups; and that the exceptions will themselves be subject to general principles, once we can gain enough insight.

C72 CC18 RONALD UHLIG 12/17/76 1:26 PM

I take serious issue with Roxanne's statement in Item 4 that "there is a tremendous difference between the use of the ARPA Net for 'electronic mail' ...and the EIES system". (I really do mean to include everything in those three dots). I am more familiar with the ARPANET system right now (part of message lost) However, let me say that from fairly extensive reading of the literature on computer conferencing I find that our experience with approximately 200 managers, who are not computerniks, but who are using ARPANET message systems for multi-person conversations which are really conferences, match very closely with the findings of research done by the FORMUM/PLANET groups (e.g. Jacques Vallee's papers), and the things published by Murray Turoff. The major differences that I have observed have to do almost completely with "bandwidth". Operating on a message system at 2400 bits per second is qualitatively different from operating at 300 baud. Your work is

organized differently, and your perceptions are different. I have a feeling that real public acceptance of computer conferencing (I mean outside of a business, i.e. for personal use), is going to require the intermixing of digital voice for those cases where the written word is not powerful enough. Lest I be misunderstood, I am on public record as stating that I believe the introduction of computer based message systems will have as profound an impact on society during the next 100 years as the introduction of the telephone has had on society during the last 100 years. Except I don't believe it will take so long as 100 years for a comparable amount of change to occur.

C72 CC21 MURRAY TUROFF 12/18/76 11:41 AM

The first two examples of computerized conferencing systems were

- 1) Delphi Conferencing
- 2) EMISARI

The first was a very highly structured communication system with a classification and retrieval structure focused around the policy delphi model- it had very little correspondance in 1970 to the message systems then available. In fact, it did not allow any messaging -as everything was common to a group, and voting and association were required on all items.

The Emisari was tailored around management reporting and analyses of what was happening, and also had a very definite structure for what, and who could communicate, as well as extensive data analyses and retrieval built in as part of the communication process. The communication structure in that system could be modified at any time by management. EIES, when it gets the notebooks and Bulletins, will be closer to that level of system than it is now. The direction ARPA has taken the past few years appears to indicate that there is recognition that a message system can do a lot more than send messages, and some of the features added do replicate the conferencing abilities. Perhaps neither the word message systems nor computerized conferencing systems are appropriate to what we are talking about in the literal sense. The fact is that computers placed in the communication process allow a high degree of structure and facility to be incorporated into the process, hopefully to facilitate what it is any group of humans desire to communicate about. The current systems have not even scratched the surface of what is possible. My own future model involves a multitude of systems all very different in nature for various purposes. This is very different from our current perception of a communication system, such as the telephone or the mail, which tends to be highly standardized. For the objectives of this conference, I would encourage you not to get bogged down in the nature of current systems, but to project into the future on what is possible and desirable to experiment with.

C72 CC26 H. E. BAMFORD 12/18/76 3:29 PM

Ref. 15C: I don't think that my statement in 7C about the difficulty of generalization from particular experiences with EIE necessarily implies "that there is no possibility for a subject matter for sociology." If it did, I would not regard that as a reduction ad absurdum, but all I had in mind was to criticize the controlled experiment as a basis for practical decisions on the use of EIE.

The controlled experiment is probably the surest route to generalization, but from the point of view of the experimental subject it is only a game, at best. The generalizations it will support, therefore, are generalizations about behavior in a game, not about the operational use of EIE.

That, I believe, may well prove so specific to the operational circumstances as to defy useful generalization beyond those circumstances. While a community's experience in an operational trial of EIE may be decisive for the community and individuals involved, for others it can be no more than indicative.

C72 CC27 MURRAY TUOFF 12/18/76 4:50 PM

I tend to agree with Bamford that it is almost impossible to conceive of a fully controlled experiment for "real" world groups, where the outcomes or objectives of the communication process can not be pinned down well enough prior to the experiment to set up the controls. However, there is a class of real world situations where the controlled experiment can be used effectively, and I would hope some of those can be brought out in this discussion. An example that I have mentioned elsewhere is:

Deaf Children usually come out of the educational process with a poor command of written English. It has been hypothesized that the reason for this is that at an early age they feel no real subconscious motivation to learning the written English. As a consequence, the level of employment they can obtain is usually (only as a generalization) below what their mental capacity really is. The issue is then posed: would the introduction of a system like computerized conferencing to deaf children in their home change their motivation to learning the written language because of its utility to communicate with their peers.

This example is more specific than should be dealt with here, except as illustration. The real issue seems to be what the characteristics are of situations which could tell whether controlled experiments are or are not, useful for determining the utility of this medium.

C72 CC32 RONALD UHLIG 12/23/76 11:08 AM

Ref 22C. Roxanne asked me to expand on what I meant by the statement that use of CC is qualitatively different at higher bit rates. What I mean is that the behaviour of the individual user at the terminal is different, in the sense that the user can and will do much more at a terminal with a higher bit rate (and, that means a wider communications bandwidth). I can give a few concrete examples. I use terminals primarily at the 300 bits per second rate. Occasionally, however, I use 2400 bit per second terminals. When I use the higher speed, I can afford the time to look at much more information. I can scan information and decide whether I want to look in depth. At the lower speed, I tend to have to much to do to sit in front of the terminal and wait while something prints out. So, I will start it printing, go away and do other things and then come back to read it when it is done printing. At that point, I can first scan it, and then read in depth what I want to. If I could normally operate at 2400 bits per second, I could come much closer to actually doing away with paper.

This actually has an impact on this conference. It takes me so long to scan back through old items, when I'm operating at 300 bps, that I simply tend not to do it. What I'm really saying is that the slow speed constrains me in such a way that I can't afford the time to do many things which are really desirable in normal human communication. One area in which research is needed, in my opinion, is what is the optimal speed for matching the terminal to the

kind of human to human communication that should be done using CC. I believe that there is some optimal range of speeds. I recognize the severe budget constraints which force most of us to use 300 bps right now, but to make a strained comparison, I doubt that airplanes would have had the impact they now have on society, if they still flew at the 50 to 100 mile per hour speed with which they started out.

C72 CC33 ROXANNE HILTZ 12/27/76 7:09 PM

Ron

Could you expand on what kind of research design you think would be appropriate and reasonably priced in order to test the optimum speeds questions treated in 32 c?

Or does anyone else have reflections on the relative importance of this research issue and the way in which it might be investigated?

C72 CC37 ELAINE KERR 1/4/77 5:13

RE 32C. I THINK RON'S COMMENTS ABOUT BIT RATES MAY BE SIGNIFICANT IN A DIFFERENT SENSE, RE THE ORGANIZATION OF LARGE AMOUNTS OF PAPER AND COPING WITH INFORMATION OVERLOAD, BOTH OF WHICH SEEM TO BE CONSEQUENCES OF C.C.

THE USE OF MESSAGE TITLES, LENGTH, AND FIRST LINES (NOW BEING DEVELOPED) SHOULD ALLOW US TO SCAN, AND THUS INCORPORATE SOME OF THE ADVANTAGES OF THE HIGHER BIT RATE.

RE THE TIME PROBLEM OF SCANNING OLD ITEMS: HOW DO YOU ORGANIZE YOUR EYES OUTPUT? (I CUT & PASTE INTO FOLDERS ORGANIZED BY GROUP, PERSON, & TOPIC FORM; HOW DO OTHERS DO IT? WHAT ARE THE PROS & CONS OF EACH METHOD?) I SCAN OLD MESSAGES & CONFERENCE ENTRIES FAIRLY EASILY THIS WAY, ALTHOUGH I DO OCCASIONALLY GET "HUNG UP." BUT PERHAPS SOME OTHER METHODS ARE EVEN MORE INEFFICIENT? ANYWAY, I DO BELIEVE THAT DIFFERENT WAYS OF COPING WITH THE OUTPUT IMPACTS ON THE USAGE OF THE SYSTEM.

C72 CC38 RON UHLIG 1/10/77 7:41

REF ITEM 33. IT IS NOT AT ALL CLEAR HOW AN EXPERIMENT SHOULD BE DESIGNED TO CHECK OUT THE EFFECTS OF HIGH SPEED VERSUS LOW SPEED TERMINALS. THE PROBLEM, AS I SEE IT, IS TO DECIDE ON WHAT IS TO BE MEASURED. ONE POSSIBLE MEASURE MIGHT BE THE NUMBER OF REFERENCES TO ITEMS IN A "DATA BANK". FOR EXAMPLE, IN THIS CONFERENCE, IF ANYONE HAD ACCESS TO HIGH SPEED TERMINALS YOU COULD MEASURE HOW MANY REFERENCES WERE MADE TO OLD ITEMS BY THOSE PEOPLE, VERSUS HOW MANY REFERENCES WERE MADE BY THE "LOW SPEED TERMINAL" PEOPLE TO THE SAME SET OF ITEMS. ACTUALLY, I FEEL REASONABLY CERTAIN THAT I KNOW THE OUTCOME OF THAT. MORE IMPORTANT, MAYBE, WOULD BE TO DEVELOP SOME WAY OF MEASURING WHAT THAT MEANS IN TERMS OF INFORMATION TRANSFER. MY HYPOTHESIS IS THAT HIGHER BANDWIDTH AND MORE INFORMATION TRANSFER GO TOGETHER.

C72 CC40 JACQUES VALLEE 1/11/77 6:55 PM

After the holidays, organizing the new office, etc, I came back to this conference and my reactions illustrate Ron Uhlig's bandwidth issue: the new

messages filled 27 single-spaced pages and I felt 1) a heightened need to communicate, 2) considerable physical as well as intellectual "distance" with some parts of the discussion and 3) a lack of skill in appropriate commands to use to respond. Either a face-to-face discussion or a phone call would have been adequate to get me the information I needed, but neither cc nor the phone seem adequate, somehow, to discuss the "social" issues the discussion is already raising.

C72 CC42 JACQUES VALLEE 1/11/77 7:19 PM

There is much to say on the differences between ARPANET mail and conferencing. Since I've already written my comments on this in a paper for the AAAS-SGSR meeting in Denver next month, I'll take Roxanne's advice, and mail a copy to all of you, rather than attempting to summarize the arguments here. I continue to maintain with Murray that the differences between electronic mail and computer conferencing are fundamental and genuine, although their task environments overlap considerably. (The paper is called: "Functional Characteristics of Computer Communications in Two On-Line Communities: The Outlook for Computer Conferencing on ARPANET and PLATO.")

C72 CC46 ROBERT JOHANSEN 1/17/77 7:50 PM

re 43 and 15C: I heartily agree with this point. We have to look for clever ways to assess longer range effects, when all we really have are varied degrees of "new users". In a current study we are doing of the effects of computer conferencing on the working patterns of energy researchers, we are finding the following sorts of dynamics:

Computer conferencing:

Allows flexible participation BUT Doesn't require regular participation (this is a crucial factor for busy researchers--witness the participation in this conference).

Encourages equal participation BUT requires strong leadership

Increased contact with distant colleagues BUT (sometimes) too much contact with colleagues

Promotes precise communication BUT inhibits confidential communication (the "saying it in writing" taboo still has some meaning)

C72 CC47 RABY PANKO 1/19/77 2:42 PM

Re: Bandwidth, etc. I just entered this conference for the first time and was deluged. Only three things registered as I went through all this verbiage, and I will comment only on those, leaving the rest flow right past me into oblivion. I think that's a shame. This is a recurrent problem in all computer conferences I have been in -- a tendency for the on-line record to become a pipeline of nutrients too full to nourish the user.

Elaine Kerr, or at least I believe it was her, has referred several times to people who won't touch computer conferencing as being imbedded in a "written tradition." Bull. All conferencing systems I have been involved in impose incredible amounts of communication overhead on the user, with comparatively little benefit. When a system isn't used, my guess is that it either stinks or has no purpose at the time it is used. I have asked a number of really excellent people to take part in my session only to be rejected because they are sick of freebie conferences that take up 10% to 40% of their working time and seem to be programmed in Yugoslavian (that's not a swipe at EIES, by the way). And they're right.

C72 CC49 ANDY HARDY 1/20/77 1:53 PM

My thinking is that the major factor involved in this increased information load is the non-linearity of the conversation that occurs in computer conferencing. In normal voice communication, the threads of conversation seem much more interrelated. Conversation in computer conferences is much more disjointed (alinear). This is not necessarily a bad thing. I believe that it can be overcome and put to use.

I think that the nonlinear communication pattern is related to another thing that I have observed in many instances. It often seems very difficult to have a group using computer conferencing to arrive at an agreement on issues that are important to that group. It is very easy for us to enter in ideas in this conference. I think that it would prove to be a difficult task to reach a consensus on important matters that would come up in this conference.

I guess these are the areas which are of most interest to me as a researcher.

C72 CC51 RONALD UHLIG 1/21/77 10:18 AM

These thoughts were triggered by items 47, 48, and 49. Both my boss and I have observed our own attitudes change as the volume of our on-line communication has changed. When we received 10 messages a day, we were "wildly" enthusiastic. (I'm deliberately overstating, to make my point). However, now that we receive more like 30 messages a day (and some of them may be 2 to 5 pages long), we find our attitudes changing. For example, we are finding a desire to "filter" incoming messages through our secretary (or automatically), so that everything that needs attention will get it, even if we cannot give it our personal attention. I'm not sure whether there is anything different about cc versus other forms of communication insofar as communication overload is concerned. However, it might be well to look at what kinds of filtering mechanisms will be needed. I think we can take it as given that such mechanisms will arise. The only question is how they arise, i.e. in a "planned" or "unplanned" manner. We are developing automatic "forwarding" mechanisms now, which will take an incoming message and automatically forward it to a predesignated individual if it contains certain keywords in the "Subject" line. Those mechanisms could, of course, also scan the body of the message for the same keywords.

EDITORS' NOTE:

Conference 72 continued on for several months, experiencing the addition of many new participants, and the "drop-out" of some of the earlier ones. There were a total of 285 comments when it ended. At one point, there was an attempt to force some "focus" and "closure" through formal voting. This was not entirely successful- the results are discussed below.

C72 CC131 ROXANNE HILTZ 3/19/77 3:49 PM

I am going to start entering two types of items for voting and discussion, which I would like you to respond to in the "bunches" in which they are

entered. Please respond by a private, anonymous message to me. I will feed back synthesized results when everyone has "voted".

One type of item will be a statement, drawn from a referenced conference comment or comments, which you are asked to respond to on a Likert scale.

1= strongly agree

2=agree

3=don't know; cannot say; neutral

4=disagree

5=strongly disagree

Then I want you to tell me in one or two sentences WHY you give the answer you do.

You can return your answers in the form

1=3 statement

meaning question 1, my answer is three, cannot say (followed by reason).

The second type of item will be a description of a research issue.

More about them when we come to some.

1. "For a given computerized conferencing system, each using community finds its own pattern of useage, and within the community each individual does the same. Only the most tentative generalization, therefore, is possible from experience with computerized conferencing." (ref., cs. 7,8,15,48)

2. Availability of home terminals and use of computerized conferencing systems within the home will facilitate the maintenance of ties among friends and family who are geographically dispersed. (ref. 10, 11).

3. Widespread acceptance of computerized conferencing will require much faster terminals and /or voice components (meaning a much more expensive communications charge for wider bandwidths). c. 18; 19, point 4;32)

4. The generalizations supportable by controlled experiments are generalizations about behaviour in what is to the subjects only a game, at best; not generalizable to operational use of a system like EIES. (26,58

5. Impacts on individual and small group behaviour are best studied by controlled experiments, whereas other impacts, such as societal- level effects, are best studied by other methods, such as modelling. (76, 14)

Here is the first set of research issues. I will try to briefly describe a subject for research on applications and impacts of computerized conferencing that has been proposed, and give complete comment reference. I want you to enter a quantified judgment on a one to 100 scale, on two dimensions.

A. Importance or Desirability

Zero means a completely unimportant line of research, in your opinion. 100 would be the topmost priority, in your opinion, in terms of its potential ability to tell us such things as what kinds of systems should be built, where they should or should not be used, what their effects will be. Then I want you to add a comment (one or two sentences) on Why you judged the item the way you did.

B. Feasibility

Leaving aside the question of cost, how likely do you think it is that fairly definitive research results on this issue could be obtained?

zero = not feasible at all at the present time

100 = no problem at all to do it, given time and money and qualified researchers.

For the comment on this rating, please tell me what research method or combination of methods you are assuming would be best for exploring this issue. If you cannot make a quantified judgment because you feel you lack sufficient understanding of the issue, tell me what it is you feel unsure about.

Issue One

Initial user receptivity to the system. (see comments 20,23). What factors are related to an initial willingness to try to learn to use a system, to try it out?

6. Importance scale

7. Feasibility scale (and comment)

Issue two

Can a system like computerized conferencing help the deaf or other mobility-limited or handicapped person to learn to communicate and /or to interact with "normal" people in educational or work tasks? (27,34)

8. Desirability

9. Feasibility

Issue three

Impact of the c.c. form of communication upon group productivity in a problem solving task. (c.c. vs. face to face meeting; dependent variables such things as number of ideas generated, time spent working on the problem, etc.) (comment 50, last paragraph)

10. Importance

11. Feasibility

Issue four

"Information Overload"

What are the subjective feelings of people once they begin to receive a great many messages and participate in many conferences simultaneously on systems such as this? What coping mechanisms work to help reduce the feeling of overload (secretaries to enter and retrieve and filter materials; software aids to scan titles, etc. and or see what all is waiting); personal filing systems-- etc. etc.

:C 72 CC221 ROXANNE HILTZ 4/29/77 4:43 PM

One of our jobs in the final report is to produce not only a set of researchable issues, in outline form, but also an indication of which items there is consensus on, and which there is disagreement about, and hopefully the reasons for the disagreements.

Our first attempt at this was a round of voting and comments on the initial set of statements and research issues that we generated. The votes and comments were fed into the conference anonymously. (You can find them in comments 156, 157,158,159,163,175,176 if you want to review the comments). I am going to summarize the aggregated results here. Note that actually only 8 persons voted (one person split the exercise in two parts)

first, here are the first five questions, then I will show the distribution of answers and my interpretation of what we seemed to agree about and disagree about. (Sorry, but I am not about to sit around and calculate standard deviations on eight people)

.*21

1. "For a given computerized conferencing system, each using community finds its own pattern of useage, and within the community each individual does the same. Only the most tentative generalization, therefore, is possible from

experience with computerized conferencing." (ref., cs. 7,8,15,48)

2. Availability of home terminals and use of computerized conferencing systems within the home will facilitate the maintenance of ties among friends and family who are geographically dispersed. (ref. 10, 11).

3. Widespread acceptance of computerized conferencing will require much faster terminals and /or voice components (meaning a much more expensive communications charge for wider bandwidths). c. 18; 19, point 4;32)

4. The generalizations supportable by controlled experiments are generalizations about behaviour in what is to the subjects only a game, at best; not generalizable to operational use of a system like EIES. (26,58

5. Impacts on individual and small group behaviour are best studied by controlled experiments, whereas other impacts, such as societal- level effects, are best studied by other methods, such as modelling.

q	sa	a	dk	d	sd
1	1	1	1	1	4
2	4	2	0	1	1
3	2	2	2	2	2
4	0	2	0	4	2
5	2	0	2	2	2

So-- Most of us seem to think that you can generalize on the basis of experience with individual groups-- That c.c. can be used to maintain friends and family type ties That it is not true that the results of controlled laboratory experiments on cc cannot be generalized to operational conditions But we are in disagreement about the need for "broader bandwidths"; and about what the

:C 72 CC222 ROXANNE HILTZ 4/29/77 4:45 PM

The research issues that we initially generated and voted on are listed fully in comments 132 and 133.
In brief, q.6 is initial receptivity, importance of studies on
7 is feasibility of studies on initial user receptivity

8=handicapped, importance; 9= feasibility
10= effects of c.c. on productivity, imp.; 11= feasibility
12= overload importance; 13-14 = feasibility
15= structuring importance;16=feasibility

q.	person number							8***MEAN***
	1	2	3	4	5	6	7	
6	80	80	80	100	70	90	70	50*** 77.5
7	40	90	80	100	80	30	90	73*** 72.8
8	20	80	20	90	90	100	100	87*** 73.3
9	70	60	50	100	90	80	-	91*** 77.2
10	50	85	90	90	100	90	100	91*** 87
11	20	50	30	100	50	100	70	- *** 60
12	65	50	50	75	80	40	-	91*** 64.4
13	15	-	90	-	60	40	-	84*** 57.8
15	50	100	-	-	10	60	80	95*** 65.8
16	90	70	-	-	100	90	-	92***88.4

We seem to feel that the effects on productivity are the most important issue; research on software structuring and its effects would be the most

feasible to do. But there is just not that much spread in the ratings. I think this is because I did not set up enough rules for voting. Several people rated almost everything high. (ex. person number four ranked four things at the max of 100 and nothing under 75; while person number one gave six out of 10 ratings at under 50%)

We will conclude with a few excerpts from later in the conference, when it had evolved temporarily into a different set of topics for discussion. These discussions were interleaved with the voting and drafting of items for the final report.

:C 72 CCL94 MURRAY TUROFF 4/16/77 11:39 AM

I would like to bring up what may seem like a trivial problem in terms of some of the other items you have been discussing. However, since I started working on systems like this in 1970 it has always been a very personal nagging sort of issue that never goes away and always raises its head.

My intuition (just personal observation) leads me to feel that humor is a key element in promoting group cohesion on systems of this sort. I think in other communication forms we take it very much for granted and are not aware that we have to look carefully at it to determine it's actual degree of necessity to any group communication process.

As opposed to a face to face meeting, humor gets documented in systems of this sort and in practically every system that has ever been built and I believe the ARPANET is included (correct me if I am wrong Ron) there have been specific conferences set up to collect humor and conventional folklore.

There are two types of reactions that this produces that lead to difficulties.

- 1) That Congress might make hay out of government funds being used to support people having fun in such a manner
- 2) That work is not suppose to be fun. (Ethic type)

c 72 cc201 ROBIN CRICKMAN 4/16/77

It seems to me that the concerns Murray raises in Item 194 are a bit overstated. The U.S. military spends a good deal of effort and money on humor since they, too, consider it necessary for morale maintenance. The DOD has lots of detractors in Congress, but the congressmen seldom attack defense for injecting humor into their training and activities that I know of. It can be very troublesome to criticize somebody for humor, because if what was said was really amusing, it is just as likely the public will be charmed by the comment and ignore the criticism. If a job is not getting done, then a CC which was amusing the participants might be a target for criticism; as long as the work was going well, though, I think the humor would be viewed for what it was- a morale maintenance mechanism.

:C 72 CC204 ROBIN CRICKMAN 4/18/77 10:53 AM
RESEARCH TOOL (REF. 184)

WHAT MIGHT THE EFFECT OF CC BE ON DATA BASE USAGE? WE NOW HAVE LARGE DATA BASES IN NUMEROUS SUBJECTS, WILL CC FACILITATE THE COOPERATIVE USE OF THESE DATA BASES BY RESEARCHERS AT VARIOUS INSTITUTIONS?

:C 72 CC208 ROBERT BEZILLA 4/19/77 2:50 PM

ROBIN CRICKMAN'S STATEMENT (CC72 204) ABOUT USE OF CC FOR DATA BANKS IS VERY WELL TAKEN. THERE IS A NEW EMERGING FIELD OF EVALUATED NUMERICAL DATA BASES THAT ARE BEING CONVERTED TO ON-LINE ACCESS CAPABILITIES. CC COULD BE HELPFUL FOR THESE SYSTEMS IN TWO RESPECTS:

1. THE CC EDITOR/REFEREE/JOURNAL PROCEDURES WOULD APPEAR TO BE TAILOR-MADE FOR THE EVALUATION PROCESS; I.E., THE PROCESS COULD BE EXTENDED INTERNATIONALLY AND NOT CONFINED TO THE PHYSICAL PLANT OF THE DATA CENTER.
2. WITH ON-LINE INTERACTIVE ACCESS VIA CC, USER FEEDBACK COULD BE CONTROLLED AND ANALYZED MORE SYSTEMATICALLY AND BECOME TRULY INTERACTIVE, A PART OF THE EVALUATION PROCESS (ON-GOING), AND A CONTINUOUS INPUT MECHANISM.

:C 72 CC209 ROBERT BEZILLA 4/20/77 11:15 AM

IN REFERENCE TO C72 CC 194 - TUROFF - HUMOR) I CAN'T SUGGEST ANY EXPERIMENTS ON THE USE OF HUMOR IN CC, BUT THE FOLLOWING AREAS OF USE OF HUMOR MAY BE OF HELP TO ANYONE WHO IS WORKING ON THE PROBLEM.

1. HUMOR AS AN ASSESSMENT TOOL
 - A. AS A MEANS OF ASSESSING THE INTELLIGENCE, SOPHISTICATION OF A NEW ACQUAINTANCE IN A SOCIALLY ACCEPTABLE WAY.
 - B. AS A MEANS OF ASSESSING GROUP MEMBERSHIP, I.E., DOES THE NEW ACQUAINTANCE UNDERSTAND THE IN-HUMOR OF THE GROUP.
EXAMPLE: THE MUSICAL JOKES OF THE CLASSICAL COMPOSERS ARE AMUSING ONLY TO THOSE WELL-VERSED IN THEORY AND THE MUSICOLOGY OF THE PERIOD.
2. HUMOR AS A SOCIALIZING MECHANISM
 - A. PREVIOUS SUGGESTIONS ABOUT ITS USE AS AN "ICE BREAKER"
 - B. PREVIOUS SUGGESTIONS ABOUT ITS USE AS A MEANS OF CREATING MULTI-STRANDED RELATIONSHIPS
NOTE: BOTH, HOWEVER, MAY BE CLOSELY RELATED TO THE ASSESSMENT FUNCTION.
3. RHETORIC -- THE USE OF SATIRE, IRONY, SARCASM, ETC. TO UNDERScore, VIVIFY, CALL ATTENTION TO THE POINT ONE IS MAKING.
4. CATHARSIS
 - A. THE SUGGESTIONS THAT GRAFFITI-TYPE OUTLETS ARE NECESSARY FOR PROGRAMMERS
 - B. OBSERVATIONS THAT MOST HOSTILE MSGS. USUALLY INCLUDE A STAB AT HUMOR AT THE END TO HELP REDUCE THE TENSION
 - C. COMIC RELIEF, PERHAPS, TO RELIEVE TENSION IN EXTENDED SESSIONS OR WHEN THE ATMOSPHERE BECOMES UNUSUALLY TENSE.
5. USE AS A REDUCTIO AD ABSURDUM IN TESTING HYPOTHESES GENERATED IN A CONFERENCE.
6. INDUCTION -- MENTAL EXCURSIONS TO THE ABSURD, USE OF HUMOROUS ANALOGIES, ETC. IN THE SEARCH FOR COHESION IN SEEMINGLY UNRELATED IDEAS, IN ATTEMPTING TO SOLVE KNOTTY PROBLEMS

:C 72 CC210 (ANONYMOUS) 4/22/77 4:38 PM

A fellow conference member has semi-seriously proposed that 1 way to increase broadbanded communications is to exchange pictures, so that our images of each other as we communicate would be more than verbal. How could this be designed into future cc's, if feasible? 1 objection might be that it might make the cc too much of a swinger's club, but i think that (the objection) is frivolous.

:C 72 CC213 (ANONYMOUS) 4/22/77 9:47 PM

. the silliness about exchanging pictures shows some people's lack of social finesse or social illiteracy. No sense of what kinds of norms or reciprocal expectations are essential/desirable to be system norms and which are "private" (i.e. off-line business). I for one have been amazed at the amount of communication and cueing and sense of the other is possible on eie systems, without the need for auxiliary or broader band media. Social learning or socialization includes the growing ability to customize or fit types of communications to types of media. In the electronic age, the amount of social learning required may be too much for some. Hence there will be more instances of "inappropriate" (and hence unreciprocated and /or negatively sanctioned) communications, in electronic and other media. One sees inappropriate communications in streets, at work, and in the home too. The dimension of error seems to be that of intimacy-- how much is deemed appropriate where, when , and with whom, -- and via what communications medium.

:C 72 CC215 RAZY PANKO 4/23/77 11:32 AM

I'm confused. Is the idea of exchanging pictures part of the proposed experiment on humor?

:C 72 CC250 ROXANNE HILTZ 5/18/77 2:35 PM

M 18113 LINTON FREEMAN 5/11/77 10:59 AM

AS A LAST MINUTE ENTRANT, I AM HESITANT TO JUMP IN AS A PARTICIPANT. I WILL, THEREFORE, CONFINE MYSELF TO MESSAGES.

THE MOST STRIKING ELEMENT OF THE ENTIRE CONFERENCE FROM THE PERSPECTIVE OF NEW EYES IS ITS TENDENCY TO FRAGMENT. AS A MATTER OF FACT, THE HISTORY OF 72 SHOWS LITTLE BUT THE PRO- LIFERATION OF PERSONAL PERSPECTIVES... THE OUTLINE FOR THE FINAL REPORT SEEMS TO HAVE CAPTURED TOO MUCH OF THE VARIABILITY IN LEVEL OF ANALYSIS, IN STYLE, IN LOGICAL STATUS AND IN DEGREE OF CONCERN WITH APPLICATIONS THAT CHARACTERIZED THE ORIGINAL CONTRIBUTIONS. IT LACKS A CERTAIN DEGREE OF COHERENCE.

At this point we introduce comments from Conference 71 on Design and Technology.

:C71CC6 RICHARD H. WILCOX 2/18/77 12:29 PM

INITIAL "STRAW MAN" ISSUES FOR CONF. #71:

COMPUTERIZED CONFERENCING (CC) SYSTEMS SHOULD BE KEPT AS SIMPLE AS POSSIBLE TO ENCOURAGE AND FACILITATE THEIR WIDEST POSSIBLE USE. ADDITION OF ANY SPECIALIZED FEATURES OR INCREASING THE "COMPUTER POWER" AVAILABLE INTRODUCES SUBSTANTIAL COMPLICATIONS, THE DISADVANTAGES OF WHICH (TO USER SIMPLICITY AND SYSTEM COST) OUTWEIGH THE BENEFITS.

THE PRIMARY DESIGN/IMPLEMENTATION (D/I) PROBLEM IN CC IS TO MINIMIZE THOSE HARDWARE/SOFTWARE ASPECTS OF THE PHYSICAL SYSTEM THAT INHIBIT USEFUL HUMAN COMMUNICATION.

THE PRIMARY D/I PROBLEM IN CC IS TO BRING THE FULL POTENTIAL OF COMPUTERS TO BEAR IN FACILITATING USEFUL HUMAN COMMUNICATION.

THE INCORPORATION OF ACTIVITY MEASURING/MONITORING CAPABILITIES INTO A CC TO FACILITATE R&D ON HUMAN COMMUNICATIONS IS INCOMPATIBLE WITH ETHICAL FACILITATION OF GENUINE OPERATIONAL CONFERENCING.

:C71CC7 RICHARD H. WILCOX 2/18/77 12:42 PM

INITIAL "STRAW MAN" LIST OF "MOST IMPORTANT" R&D AREAS FOR CONF. #71 PARTICIPANTS TO SHOOT AT:

1. INCREASED UNDERSTANDING OF HUMAN CONFERENCE NEEDS (STRUCTURE, FACILITY) TO SERVE AS GUIDELINES FOR HARDWARE/SOFTWARE DESIGN.
2. IMPROVED HUMAN ENGINEERING OF TERMINALS FOR HUMAN INTERFACE WITH SYSTEM.
3. EFFECTIVE INCORPORATION OF FILE HANDLING (GDMS).
4. EFFECTIVE INCORPORATION OF INFORMATION RETRIEVAL.
5. EFFECTIVE INCORPORATION OF COMPUTER POWER FOR COOPERATIVE EQUATION SOLVING, MODELING, SIMULATION, ETC.
6. IMPROVED SECURITY OF COMMUNICATIONS.
7. ECONOMIC INTRODUCTION OF GRAPHIC CAPABILITY.
8. ECONOMIC COMPATIBILITY WITH TV AND STANDARD TELEPHONE FOR WIDESPREAD USE.
9. EFFECTIVE COMMUNICATION OF CC NEEDS AND CAPABILITIES TO POLICY MAKERS, POTENTIAL CUSTOMERS, ETC.
10. EXAMINING THE EFFECTS (BOTH POSITIVE AND NEGATIVE) OF INCREASED FUNCTIONAL CAPABILITIES (EG, 7-COMMAND SYSTEMS VS 70).

: C71 C8 MIKE BALTRUSH 2/23/77 1:36 PM

IN 6 C SPECIALIZED FEATURES INTRODUCES SUBSTANTIAL COMPLICATIONS. WHAT ABOUT THE SITUATION WHERE THE USER REQUESTS THE 'NEW' FEATURE FOR HIS OWN CONVENIENCE? HE IS NOT INTRODUCING COMPLICATIONS FOR ALL USERS, ONLY FOR HIMSELF AND THIS SHOULD EASE HIS WORK LOAD SINCE HE REQUESTED THE FEATURE. HE MAY HAVE TO INTERACT WITH THE COMPUTER PROFESSIONAL (THE RESIDENT WITCH DOCTOR) TO IMPLEMENT THE FEATURE BUT HE SHOULD NOT BE LIMITED BECAUSE WE THINK THAT THIS ADDITION WILL CONFUSE HIM IN THE USE OF THE CC SYSTEM.

THE MINIMIZATION OF ASPECTS THAT HINDER HUMAN COMMUNICATION SHOULD INCLUDE A COURSE ON TYPING SKILLS. THE UNSKILLED TYPIST MAY REBEL AGAINST USING THE SYSTEM SIMPLY BECAUSE HE MAKES MISTAKES AND FEELS EMBARRASSED EVEN THOUGH NO HUMAN SEES THE INTERMEDIATE PRODUCT OF HIS EFFORTS.

IN ACTIVITY MEASURING/MONITORING- HOW ABOUT TRAFFIC ANALYSIS ? IT WOULD ONLY KEEP TRACK OF THE NUMBER OF MESSAGES SENT AND RECEIVED, NOT THEIR CONTENT.

c71cc10 RONALD UHLIG 3/8/77 5:07 PM

ALTHOUGH IT IS PERHAPS NOT IN THE MAINSTREAM OF WHAT THIS CONF WILL BE DISCUSSING, I JUST NOTED A VERY INTERESTING FEATURE OF THE EIES. ON MY TERMINAL, AND MANY OTHERS THE ASTERISK (*) AND THE COLON (:) ARE UPPER CASE AND LOWER CASE, RESPECTIVELY, ON THE SAME KEY. THAT RAISES THE INTERESTING POSSIBILITY OF GIVING THE COMMAND TO ERASE YOUR BUFFER, WHEN YOU ONLY MEANT TO PRINT IT. OF COURSE, EIES PROTECTS AGAINST THAT, BY ASKING "OK TO DELETE?", BUT THE NOVICE USER MIGHT GET VERY CONFUSED OR ACCIDENTALLY EVEN DELETE HIS CAREFULLY PREPARED FIRST MESSAGE, AND THEN GO AWAY AND NEVER COME BACK. THIS IS AN EXAMPLE OF THE KIND OF THING DISCUSSED IN A BEAUTIFUL PAPER BY JACQUES VALLEE GIVEN AT THE ASIS MEETING IN SAN FRANCISCO LAST OCT. THE FATE OF A TELECONFERENCE SYSTEM MAY HANG ON SOME VERY SMALL BUT IMPORTANT HUMAN ENGINEERING FEATURES AT THE USER INTERFACE.

C71 CC11 MURRAY TUROFF 3/9/77 8:32 PM

As a matter of fact that last item was an internal squabble over the location on the keyboard and the desirable symbol to use.

But what I think Ron points up is that there is no decent terminal design for computer terminals that handles largely english text. While the government has probably rightly given up the funding of computer hardware development, maybe some funding of terminal development efforts is still of interest and importance.

C71CC12 PETER ANDERSON 3/10/77 1:43 PM

WE MUST CONCENTRATE ON FUNCTION AND LET FORM FOLLOW. THE PROBLEM HERE IS GETTING GOOD USER MANUALS AND MAYBE CAI SESSIONS. MURRAY'S ORIGINAL ONE-PAGE DESCRIPTION OF EIES INTERACTION & FACILITIES IS A MODEL. WE NEED MORE SUCH STUFF.

:C73CC13 PETER ANDERSON 3/10/77 2:05 PM

RE SPECIAL HARDWARE TEMINALS---

1. WITH INTERACTIVE GRAPHICS, LIGHT PENS, DOODLE BUGS, AND TURTLES, THE SOFTWARE CAN SUPPORT DARN NEAR ANYTHING.

2. THE INTELLIGENCE DOESN'T NEED TO BE IN THE TERMINAL ITSELF; ESPECIALLY IF THE RECEIVING COMPUTER IS DOING THE PRINTING AT THE USER'S CONSOLE. IN THAT CASE, THE VARIOUS SPECIAL CHARACTER KEYS CAN TAKE ON MEANINGS WHICH CAN BE REPRESENTED IN THE SOFTWARE -- AND ECHOED BACK ACCORDINGLY -- AND PHYSICALLY SHOWN BY KEY CAPS AT THE USER'S TERMINAL. THIS APPROACH IS TAKEN, OF COURSE, BY THE HARDWIRED BASIC COMPUTERS, ETC., THAT HAVE 'FOR', ETC., KEYS.

:C73CC14 RA3Y PANKO 3/10/77 3:34 PM

Another comment on computer languages. I think that languages do tend to fall into dialects. There is a fair amount of similarity among ARPANET programs, even those built on other computers. I also think it is possible to rank systems roughly in terms of niceness. If we can simply evolve a nice dialect base devoid of special symbols like those damned "+" signs, we can make systems much easier to use.

12703 M HILARY WILLIAMSON 3/15/77 6:41 PM

Peter, I disagree strongly with #12. Function over form is all very well if all your users are computer scientists, but that is an invalid assumption for users of a communication system such as this. Most users, particularly if they are paying for a system and have some alternatives to choose from, would not put up with an awkward interface. I think function can always be added, if you start with a reasonable design - if you start with a poor interface it is not so easy to resolve, and will have turned off some users to begin with. Re. user manuals, users do not read them! That's why I am not going to edit this message. A good help facility (CAI type if possible) or a sophisticated terminal with a well-designed human interface are better alternatives.

: C71 C16 GEORGE ARNOLD 3/24/77 2:33 PM

RE: 9 C

IN THE CBIE (COMPUTER BASED INFORMATION EXCHANGE) SYSTEM AT COLUMBIA, WE HAVE TAKEN THE APPROACH OF STRUCTURING CONFERENCE COMMUNICATIONS AS A NETWORK, IN WHICH EACH ITEM IS A NODE AND MAY BE LINKED TO ANY NUMBER OF OTHER ITEMS. EACH ITEM HAS A TITLE (A LITTLE LIKE A ONE-LINE ABSTRACT) TO INDICATE WHAT IT'S ABOUT. THE USER ESSENTIALLY BROWSES THROUGH THE NETWORK BY FOLLOWING PATHS WHICH ARE OF INTEREST TO HIM (WHICH HE DETERMINES PRIMARILY FROM THE ITEM TITLES), AND REQUESTING A DISPLAY OF THE TEXT IF HE WISHES. WE HAVE FOUND THIS TO BE A VERY EFFECTIVE TECHNIQUE TO COHERENTLY HANDLE A NUMBER OF THREADS OF DISCUSSION SIMULTANEOUSLY. ALSO, ITEMS MAY CONSIST OF ONLY A TITLE, AND THIS ALLOWS A DISCUSSION TO BE ORGANIZED INTO TOPICS, SUBTOPICS, ETC., IN A HIERARCHICAL FASHION, SOMEWHAT ALONG THE LINES OF A CONFERENCE 'AGENDA', WHICH IS BASICALLY JUST A HIERARCHY OR TREE OF SUBJECTS TO BE DISCUSSED. THE COMPUTER, OF COURSE, ALLOWS THE STRUCTURE TO BE DYNAMIC.

C71 C17 RICHARD WILCOX 3/25/77 6:59 PM

RE NOS. 9 AND 16:

SOME METHOD OF ASSOCIATION AMONG SUCCESSIVE ENTRIES SEEMS TO BE ESSENTIAL IF A SEQUENCE OF INPUTS IS TO HAVE ANY CHANCE OF BEING A USEFUL CONFERENCE. THE APPROACH GEORGE DESCRIBES IN 16 C SOUNDS LIKE A GOOD ONE, IN THAT IT PERMITS THE PRE-ORDAINING OF LOGICAL GUIDELINES TO HELP FOCUS A CONFERENCE,

WITH SUBSEQUENT ENTRIES BEING RELATED TO THOSE GUIDELINES. THE PROBLEM IS THAT IN REAL LIFE OUR ASSOCIATIONS EVOLVE AS THE DISCUSSION EVOLVES--A PRODUCTIVE CONFERENCE (OR AT LEAST A REALLY INNOVATIVE ONE) IS QITE LIKELY TO FINISH UP ALONG LINES NOT FORESEEN AT THE START. WAS IT EDISON WHO OBSERVED THAT GENIUS LIES IN PERCEIVING UNCONVENTIONAL RELATIONSHIPS AMONG CONVENTIONAL ELEMENTS? WHAT I'D REALLY LIKE TO BE ABLE TO DO IN A CONFERENCE IS TO GO BACK AND TRY SOME NEW ASSOCIATIONS AMONG PREVIOUSLY ENTERED ITEMS--AND TO HAVE THE MACHINE DO THE WORK OF PULLING OUT THE ITEMS ONCE I HAVE SPECIFIED THE NEW BASIS TO BE APPLIED. IN OTHER WORDS, WHY CAN'T THE MACHINE HELP ALL OF US TO BE GENII?

C71 C50 TOM HALL 4/20/77 4:18 PM

Let me remind you that before we could even start to implement EIES we had to face the fact that the Interdata system as given would not support such an application. At all. The first effort was to find ways around the limitations of the operating system, and to a tremendous extent the structure of EIES was determined by it's environment, not our desires. This environment changes tremendously between computer systems. The range of variability makes portability a joke. All it takes is one feature out of 1000's to make 20,000 line of portable code worthless.

Note: After this early discussion, C71 turned largely to drafting of prospective items for the report, and comments on them.

:C 71 CC69 MIKE BALTRUSH 4/25/77 2:51 PM

THE FOLLOWING ASSUMES A DIAL UP SYSTEM, I.E. ONE IN WHICH THE PARTICIPANTS IN COMPUTER CONFERENCING USE A DIAL (OR TOUCH- TONE) PHONE TO ENTER THE CONFERENCE THRU EITHER TELENET OR DIRECTLY TO THE NUMBERS HERE AT NJIT. THE SPEED OF DATA DISPLAY IS LIMITED BY THE MODEM SPEEDS WHICH CAN BE EMPLOYED, COSTS OF CONNECTION VIA THE PHONE COMPANY, AND SERVICES OFFERED BY THE NETWORK SYSTEM USED FOR CROSS COUNTRY COMMUNICATION. WITHOUT EXTENSIVE LINE CONDITIONING (THAT IS DONE BY THE TELEPHONE COMPANY ON REQUEST AND MAKES THE LINE, USUALLY LEASED, OF BETTER QUALITY THAN A STANDARD GRADE LINE AND THEREBY CAPABLE OF HIGHER DATA TRANSMISSION RATES) AN UPPER LIMIT OF 1200 BAUD EXISTS (ABOUT 120 CHARATCTERS PER SECOND) FOR OFF THE SHELF ITEMS WHICH DO NOT REQUIRE SET UP VIA KNOB TWIDDLING AND METER READING. THIS RATE IS FAST ENOUGH FOR MOST TYPING AND TEXT TYPE MATERIALS AND IS A FAIR SPEED FOR GRAPHICS CAPABILITY, BOTH REFRESH AND STORAGE TECHNOLOGIES.

IF FASTER MODEMS ARE NEEDED, THEN BETTER PHONE LINES ARE REQUIRED BOTH OF WHICH ARE AVAILABLE BUT AT HIGHER COST.

IF THE TERMINAL CAN BE LOCAL TO A COMPUTER (EITHER MINI OR MICRO) THE TERMINALS USED CAN OPERATE AT 9600 BAUD (ABOUT 960 CHARACTERS PER SECOND). THIS RATE IS THE FASTEST STANDARD BAUD RATE AVAILABLE . IF HIGHER RATES ARE NEEDED, THE TERMINAL CAN BE CONNECTED TO THE COMPUTER'S MEMORY USING DIRECT MEMORY ACCESS (DMA). THIS REQUIRES THAT THE TERMINAL AND COMPUTER BE VERY CLOSE TOGETHER (LESS THAN 50 FT).

:C 71 CC70 MIKE BALTRUSH 4/25/77 3:17 PM

THIS TOPIC BRINGS TO MIND THE CONNECTION OF HAL ZILOG (THE MICRO- COMPUTER HERE AT NJIT) AND THE CONFERENCING SYSTEM. THE INTENT (AS STATED IN A SO FAR REJECTED PROPOSAL) IS TO USE HAL AS A 'SMART' CONFEREES TO HANDLE THE INTERACTION FOR INTERACTIVE DATA BASES AND MODELS.

THIS WOULD WORK AS FOLLOWS:

1) A MESSAGE WOULD BE SENT TO HAL WITH THE RESPONSES FOR THE SYSTEM THAT THE USER WISHES TO ACCESS.

2) HAL WOULD BE SUPPLIED (ON A ONE TIME BASIS) WITH THE PROTOCOLS FOR THE SYSTEMS HE WAS EXPECTED TO ACCESS. THE MESSAGE WOULD SPECIFY THE SYSTEM AND HAL WOULD DIAL THE PHONE TO ENTER THE SYSTEM.

3) AFTER ANSWERING THE PROTOCOL FOR SIGN ON TO THE SYSTEM, HAL WOULD ACT AS AN INTERACTIVE USER AND ACCEPT THE ANSWERS FOR FORMATTING INTO A CC MESSAGE BACK TO THE ORIGINATOR. WITH THIS CAPABILITY USERS ON THE CC SYSTEM WOULD BE ABLE TO COMMUNICATE WITH OTHER SYSTEMS WITHOUT BEING CONNECTED DIRECTLY (SYNCHRONOUSLY) WITH OTHER SYSTEMS. IF ENTRY INTO OTHER SYSTEMS IS DESIRED WITHOUT A KNOWLEDGE OF THE RESPONSES REQUIRED BY THE TARGET SYSTEM, I THINK THAT A COMPUTER OTHER THAN A MICRO WOULD BE NECESSARY BECAUSE OF THE INTELLIGENCE REQUIRED TO EXTRACT THE REQUEST FROM THE MESSAGE.

OTHER CONFERENCES AND MESSAGES IN OTHER GROUPS HAVE EXPRESSED A DESIRE TO COMMUNICATE WITH OTHER SYSTEMS, PARTICULARLY THOSE WHICH ARE OVERSEAS AND BY SATELLITE. USING A MICRO-COMPUTER SYSTEM TO PERFORM THESE FUNCTIONS ELIMINATES THE NEED (AS SUGGESTED BY OTHER CORRESPONDENTS) FOR PAPER TAPE PUNCHING AND READING TO CONVERT FROM ONE CODE TO ANOTHER.

THE CONVERSION OF PROTOCOLS WOULD BE SIMPLE FOR THE MICRO-COMPUTER TO ACCOMPLISH. THIS WOULD REQUIRE THAT THE MICRO-COMPUTER SYSTEM HAVE KNOWLEDGE OF BOTH FORMATS AND BE AWARE OF THE DIRECTION OF TRANSMISSION. THIS IS BASICALLY A TEXT HANDLING PROBLEM AND LANGUAGES EXIST TO PERFORM THIS FUNCTION.

:C 71 CC72 JOHN D. MCKENDREE 5/ 2/77 12:51 PM

Here is a proposed research item
1.2.5 DATA BASE ADMINISTRATION

Installation of common integrated data bases is an approach to information systems operation which is gaining increased acceptance. Benefits include improved information for management and reduced costs of programming computers. Would computerized conferencing facilitate communication among those responsible for data base administration? Freed from time and place constraints on expressing their requirements, management analysts, systems analysts, and programmers responsible for an on-going reporting operation could come to agreement on details sooner. Proposals for consolidation of data elements, creation of new data elements, and/or scheduling implementation could be reviewed objectively (even anonymously) prior to formal action. Priorities could be voted upon to improve the administration process. Decentralization of data base administrators, programming analysts, and users, would be administratively feasible.

An operational trial would aim at achieving simplified organizational communication about the data resource. It would identify features of computerized conferencing most easily adapted to proposal administration and control. And it would extend the scope of data base administration forward to

longer-range requirements, i.e. prior to hardware and software decisions. User feedback would be built into the design.

Products of the research effort would include: 1. feasibility of conferencing integral with data base administration. 2. quantitative analysis of CC performance. 3. user feedback collected and documented.

:C 71 CC107 HILARY WILLIAMSON 5/24/77 6:53 PM

The following are some comments on the D&I draft paper:

There are 2 modes of interaction with computer conferencing systems - synchronous (a significant subset of the membership is online at the same time) and asynchronous (few members are online at any one point in time. These modes can be perceived to be at 2 ends of a spectrum of conference interaction.

The utility of computer conferencing is commonly perceived to be in the opportunity it provides for asynchronous communication. Synchronous conferencing seems most useful for applications, in which a short time span is involved, and there is some urgency to the discussion. Asynchronous, on the other hand, lends itself more to considered communication, involving a longer time-span, and more feasibility of independent research of a problem. It might be worthwhile (using simulation/modelling techniques) to investigate what sorts of collaborative effort are best supported by these different modes of conferencing, and what categories (cooperative, antagonistic, competitive) they induce. Such an investigation could provide input towards optimization of features for a specific collaborative application, and towards identification, particularly for synchronous conferencing, of what other media could be usefully integrated with the conferencing facility.

At this point we introduce some items from Conference 73 on Policy and Regulation.

C73CC4 CHUCK JACKSON (714) 1/7/77 7:02 PM

One interesting issue that puzzles me a lot in computer conferencing and its regulation is the definition of services. For example, suppose a Time sharing service sold partitions on its machines- machines being hosts on telenet. Now, a customer installs message switching software in the partition. Does this make the time sharing company a common carrier? If not- why not? If this entity is not a common carrier, what about somebody who sells partitions or metered machine usage, but gives away the software? Is such an entity in the communications business?

Ans. Depends not on how they charge, but on how they market and sell their services. The problem arises from the fact that a computer is mutable, through programming, and thus it is hard (perhaps impossible) to specify exactly what service is being purchased from a computer service vendor. In addition, one might also argue that a person selling CPU cycles is no more a communications common carrier than is Collins Radio, even though Collins radios are uncommon carriers.

C73CC6 RA3Y PANKO 1/17/77 3:26 PM

It seems very difficult, to me, to decide when a computer system is a general purpose system and when it is a communication system. Take NLS, for example. NLS is a general purpose office automation system, and indeed many users employ it for a variety of data base/ text editing tasks. But a sizeable number of users employ it only for communication, and they view it only as a communication system. If an NLS salesman encourages a pure communication use of NLS for a given client or, more blatantly, sells NLS as a communication system to a particular client, does this mean that all of NLS should be treated as a common carrier service? This would seem to be well beyond the FCC's authority in the GTE, et. al., interpretation of the first computer inquiry in the courts. Or should the communication feature be separated out of NLS and be offered by a maximunly-separated subsidiary? That would wreak havoc with the use of NLS by organizations who want an integrated office automation system. More broadly, applying maximum separation when any integrated office automation system has a separable communication feature could severely stunt the growth of office automation -- potentially a much larger industry than communications.

C73CC9 RA3Y PANKO 1/17/77 3:48 PM

I believe that the dominant issue raised by computer teleconferencing, computer mail, et. al., is industry structure. When speaking of industry structure, the first question to ask, it seems to me, is whether computer mail is an industry in itself, or whether it is part of office automation. My initial feeling is that computer mail will eventually be manifest primarily as a component of office automation systems, although there weill certainly be a number of independent services that offer primarily computer mail (albeit with a good dollop of text editing, composition and reading tools). There may be some reason to regulate independent computer mail systems, but it would seem counter-productive to regulate an office automation system just because it has a strong communication component. Regulating the communication part of office automation would be analogous to regulating the text-editing portion or data-base portion if IBM had historically been dominant in one of those areas. It just seems intuitively wrong to separate out the communication part.

:C73CC13 RA3Y PANKO 1/19/77 1:52 PM

re: Chuck Jackson's #4

I think you have put your finger on the key issue, Chuck. How do you regulate a communication service offered as part of a time-sharing service. Your idea of looking at the firm's marketing practices seems worth considering, and I would like to see people's comments. One problem I see immediately is how to handle integrated services -- that is, those offering both communication and data processing -- when they are marketed as inherently inseparable systems. Hmm. Perhaps we have reached a point where communication and data processing are truly becoming inseparable, both being parts of unified services. That would make regulation difficult. It might even require an extensive revision of the communication act.

:C73CC18 RA3Y PANKO 1/31/77 12:38 PM

But I would like to offer a scenario for the home market, based on the

phenomenal growth of CB radio. Our FCC participants may be able to correct me, but I believe that one out of five U.S. households has a CB radio. Actually, the number of households is probably less than this, since many households have several CB's, but there are only 70 million households, and in excess of 13 million CB's have been sold. My conjecture, is that CB computer mail -- jan incorrect but evocative and connotative term -- may well emerge.

As I see it, the first thrust of development would stem from hobby computer buffs. As you know, hobby computers are really booming. If somebody were to install a message-switching computer somewhere in the SF bay area, there would be a potential clientele of a few thousand people. These computer buffs regularly communicate in print. Why not in a computer medium? They even have a magazine serving them, so they can be told about the new service.

The first application would be in the mode of CB radio, or just gab. A good analog would be the graffiti conference on this conferencing system and on a good many like it. People would just chat on a party-line system (Murray's first conferencing system was called party-line, wasn't it). And since a community of interests inherently exists, this would probably be followed up with a lot of personal correspondence between people and within special interest groups.

: 21 C LARRY DAY 2/ 3/77 9:42 PM

If computer conferencing or computer mail become a "CB" type of phenomena, how can the regulators deal with a technology/service that is basically underground? In other words, if every terminal and computer network (and many hosts on the nets) are used for computer mail, how can the services be controlled or regulated by an agency that had the mandate?

: 27 C. CHUCK JACKSON (714) 2/ 9/77 8:37 PM

Re: The CB analogy. I don't buy it. Business firms used land mobile radio extensively long before cb took off. Similarly, mailbox has been up and running on computers for at least 10 years (that I can recall). Several versions are commercially available.

e. g. BBN, h Hermes'
STSC Mailbox
Tymshare <I don't know the name>
GE User provided software
and others exist.

There is also an extensive network of terminals about 10 to 20 thousand used by the deaf mostly for terminal to terminal communications. These terminals, combined with computers are a form of household electronic mail or residential computer conferencing.

: 31 C ANDY HARDY (719) 2/12/77 2:20 PM

Dave Dozier, Myself and a friend of ours are not quite certain of FCC regulation of intrastate telephone communication, especially in this case. It is our opinion that while the PUC's regulate rates in intrastate communication, the FCC could probably bootstrap regulatory jurisdiction over "CB computer mail". The Fed's have found all sorts of ingenious ways of establishing federal regulatory authority in areas that one would take as clearly being within state jurisdiction.

: 32 C RA3Y PANKO 2/14/77 12:52 PM

Re: 31. Dave, can you provide a few examples of clearly intrastate services that are regulated by the FEDs? In broadcast TV and CB radio, the FCC has assumed jurisdiction, despite the fact that many transmitters are only intrastate -- or perhaps because many transmitters send signals out of state. In cable television, the Commission did assert jurisdiction over intrastate (even intraco- mmunity) service, on the grounds that it has an impact on the broadcast service, over which it has clear jurisdiction. But most intrastate telephone services, I think, are governed by PUCs. My guess is that the FCC would move to regulate computer mail on national time-sharing networks, but that it would refrain from trying to regulate truly intrastate systems. While intrastate operators might consider that a blessing, it is also true that PUC regulations and charters tend to be a little weird sometimes.

: 53 C DAVE SNYDER (733) 3/18/77 6:51 PM

Ra3y, It seems to me that the principal regulatory issue which is stifling the growth of computer conferencing is the uncertainty about what the ultimate regulations will be. If this is so, then the best prescription would be a consensus agreement for a "regulatory holiday" for some fixed period into the future; say, five years. Under such an arrangement, no fixed regulations would be applied to computer conferencing beyond those which have, and which will continue, to evolve with regard to the general area of data transmission. In other words, let computer con- ferencing evolve in a "free market" environment, subject only to the regulatory constraints applied to all other data communications.

In response to your second question, I do not believe that any new regulations would be necessary at this time if there were a commonly acknowledged regulatory holiday for a relatively brief fixed period. (Let me hasten to observe that I am not all that familiar with the full range of regulatory issues which are currently being debated.) As has been suggested by futurist/planners in a number of fields, the complexities of a modern, high technology, ecology-aware society are such that we can not reasonably anticipate all of the critical impacts arising from the introduction of a new technology or policy. We must therefore make greater use of the "experimental mode", in which carefully monitored, large - scale tests must be undertaken to permit us to learn the benefits, costs, and critical interrelationships associated with such initiatives. Then we can begin to discuss rules and regulations in a meaningful way.

: 54 C EINAR STEFFERUD 3/19/77 3:04 PM

I think the hidden worry is that when you (we) expand the applications to include much of what we now call correspondence, and conversation, and discussion, whether in "conference" or not, we fear that the US Postal Service will decide that we have encroached on their turf.

Now, if we limit our thinking to only "Computer Conferencing" we will have no difficulty in winning our argument with the US Postal Service because conference mode of communication is not reasonably mapped onto the US Postal Service Concept of its Service (Assuming it has one). The problems of possible regulation only appear when we view our new medium as a substitute for first

class mail.

As you note, the manufacturers and many others see that there will exist a huge number of home computers which will serve nicely as mailboxes for an electronic mail "system" (if we assume systematization) and it is not thinkable to me that these will only be used in conference mode. Best, Stef

: 55 C RAZY PANKO 3/21/77 3:20 PM

If you just want a moratorium so you can just build a large-scale system in peace for a while, it is hard to be very sympathetic. A big cc system offered for hire is probably going to be regulated, so it would seem silly to build it in hopes of later nonregulation. And as a designer, I would rather know what I will be able to do under future regulations ASAP, so I can build a survivable system.

: 56 C MURRAY TUROFF 3/21/77 6:34 PM

Just to clarify a point in 55. This system is not commercially available, it is strictly a research system and EIES is not subject to FCC regulation. Neither would a government owned system be.

: 57 C EINAR STEFFERUD 3/21/77 9:29 PM

Murray, would you include corporate use for private purposes in your "non-regulation-prone" applications? Then, what about private clubs? Where and how do you draw the line between Govt, Corporations, other institutions, private clubs, and public use?

And while I am in here, I have to side with Razy about the moratorium. I think you would cause the exact thing you want to avoid by saying, "Go ahead, we promise not to regulate you till you are well into it, and then if we don't like what you have invested in, we will prohibit it!" Doesn't sound proper to me. Best, Stef

: 58 C MURRAY TUROFF 3/21/77 9:43 PM

Obviously, any company that sets up its own internal system is not subject to regulation. The cost of setting up a private system like EIES is from 200,000 to 500,000 dollars depending upon size and level of user population. Compared to other communication system investments it is trivial. Therefore, your concept Steff in 57 about private clubs is a perfectly feasible one, and compares to the investment in a country club, a cheap one at that.

The FCC has no jurisdiction over any privately owned and operated internal communication system, only when it is made available to other parties on a commercial, for fee basis, or when the nature of the physical phenomena is such to interfere with other systems (radio frequencies).

: 61 C DAVID P. SNYDER 3/30/77 1:23 PM

As an alternative to a moratorium, I think that large-scale private applications, as I suggested for professional societies and trade/ industry assns. (Comment 51), and as Murray and Stef discuss in Comments 56 thru 58, could provide extremely useful experience for assessing potential regulatory

requirements. The Am. Med. Assn. and the Am. Bar Assn. come to mind as large professional organizations which might offer CC services to their members on a subscription basis, and where member usage would have immediate professional utility. While general-purpose electronic mail may well be in the distant offing, its general public appeal and economic utility are still uncertain; thus, to try to draw up regulations without some practical experience would entail working in the dark. Futures analysis techniques, such as technology assessment are scarcely rigorous enough to provide adequate guidance for such a task absent such actual experience. ch-/technology/

:C73CC62 RAZY PANKO 4/ 5/77 1:00 PM

Fred Weingarten made an interesting comment in message 14843. He noted that computer media, like cable television and most other new electronic media, are under control of the FCC, and this means that traditional obscenity and other regulations will probably be extended to them (or are already). Fred asks what would happen if we lose our traditionally uncensored media, e.g., newspapers, which have always provided uncensored competition for censored channels? I feel that this is among the most critical policy issues needing study.

:C 73 CC93 DAVID P. SNYDER 5/10/77 12:46 PM

If a sound case were to be made that the immediate application of computer conferencing on a broad scale could reduce commercial travel and commutation needs in the U.S. by, say 25%, in this time of energy crisis, all sorts of traditional or analogical precedents for the implementation of such a technology might be brushed aside in the national interest.

Alas, I have no data to make such a case. But I am aware of some practical applications of teleconferencing by Goldmark in Connecticut and Plessy in the U.K. which have generated some data on the trade-offs between commercial travel and less sophisticated telecom technologies than CC. And, during last winter's deep freeze, employees who could do work at home were encouraged to do so, so that communicating to work is already perceived at policy levels as a practical option under energy-scarce circumstances.

:C 73 CCL20 DAVID AHL 5/17/77 6:07 PM

OK, let's not be paranoid about regulation. As a matter of fact, as far as home computers/smart terminals go, it is essential. Can you see what they'll do to system security? I could program my microcomputer to sit there and throw all kinds of permutations of passwords at the system until it hits one, or use something more sophisticated than a brute-force approach.

:C 73 CCL28 RAZY PANKO 5/23/77 11:23 AM

Regarding Industry Structure: I think this is a very important issue indeed. If Congress and the FCC have an inappropriate image of CC, or if they ignore it and accidentally regulate as part of something else (EFT or computer networks), there is going to be hell to pay. While it may be that the proliferation of intelligent terminals may make all regulations ridiculous, the presence of inappropriate regulation will certainly be able to stop large systems from emerging.