

## Computer conferencing and productivity in science

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### The « crisis » in communication

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There are stages in the history of any human organization when the key to its growth and development or even its survival is regular and rapid communication. Typically, these stages occur at times of transition when its goals, options, strategies and even its organizational form are subject to discussion and debate. At such times discussion is necessary to generate ideas, air conflicts, explore alternatives and develop policies and plans out of the consenses of involved persons.

For organizations that are concentrated entirely in one particular locale, such communication demands can be met by arranging frequent meetings and conferences. For organizations that are large and geographically dispersed, however, arrangement for regular communication among interested parties may be a good deal more difficult. Similarly, the process of forming new organizations, particularly if they are nationwide or worldwide, raises special communications problems.

Fields of scientific study are, in the context of this discussion, just like any other kind of organization. If a field is well established, what Kuhn (1970) has called a « normal » field of science, its practitioners can get on with their day-to-day activities of generating knowledge. Such a field has consenses. Its initiates agree upon its goals, standards, procedures and norms, and too much communication simply interferes with getting the job done.

But when a field is in a state of « revolution » when its norms are changing, or when it is newly emerging and developing norms, rapid regular communication is absolutely essential to its progress. And again, like other organizations, if its members are many and spread out over vast geographic areas,

problems of arranging such communication loom large.

Of course, in any organization — scientific or otherwise — most problems can be solved with enough money. The need for regular and rapid communication can be solved by moving all the interested parties to a common locale — either frequently, but temporarily, for meetings and conferences — or more or less permanently as a condition of their employment.

During the fat days of the 1950s and 1960s American scientists were frequently moved from one university to another in the interest of building a « critical mass » of scholars interested in a particular problem. Those who did not move and even some who did seemed, however, to spend most of their days during that period in some other locale attending some meeting or other. Those were good days and many new specialties and new perspectives on old problems emerged.

Today, however, our belts have been tightened. Universities have seemingly gone out of the employment business altogether and hardly anyone is able to finance frequent national or international conferences anymore. The development of new fields of scientific study and the engineering of revolutionary changes in established fields have become difficult enterprises. Much of the creative part of science-building has ground to a halt.

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### Computer conferencing

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Recent developments in communication and computer technologies can now provide an economically attractive alternative to face-to-face conferencing in such situations. It is called computer conferencing. It involves the use of a computer to facilitate the communication among the members of a group of participants. Each participant types notes or messages on a terminal located in his or her home or office. Messages are routed over phone lines and stored and/or passed on to their targets by the computer. Such a system, then, aids in the composition and transmission of ideas and information

A number of computer conferencing systems are currently up and running (Johansen, Vallee, Spangler and Shirts, 1977). Among these, the Electronic Information Exchange (E.I.E.) system at New Jersey Institute of Technology (Turoff, 1977) is designed specifically to provide the sort of service to scientists that is needed by those working on the kinds of problems that require rapid and regular communication.

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### Example : social networks

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A number of experimental trials of the E.I.E. system using various communities of scientists is currently in the planning stage. Among these, one is designed specifically to explore the use of computer conferencing to facilitate communication in an emerging field of science. Forty social scientists who are interested in the study of social networks will be communicating regularly by means of a computer for the period of one year.

The networks perspective is engaging the attention of social scientists throughout the world. Major centers are developing in Britain, the United States, Canada, Germany, Holland and the Scandanavian countries, and small groups or individuals are working in France, Israel, Japan, Korea, Australia, Mexico and some South American countries as well. These social scientists represent the disciplines of anthropology, communications science, human geography, information science, applied mathematics, political science, social psychology and sociology. Notwithstanding the heterogeneity in their backgrounds, they are all beginning to recognize a common interest in the study of social networks. They are increasingly concerned with the forms or structures of the social relations that link persons together into networks and with the processes through which such networks emerge, evolve and exhibit consequences for human behavior. The facilitation of rapid regular communication among interested participants is of signal importance for the development of the study of social networks. Currently, communication among students of social networks is

and frequently restricted to small subsets of collaborators who happen to be geographically proximate or previously established as collaborators within a traditional discipline. Individual productivity, therefore, suffers and contributions to the collective effort are minimal.

The project will start with a one-day face-to-face conference in Bethlehem, Pennsylvania, among all participants. The conference will be oriented toward planning for the evaluation of electronic information exchange on scientific growth. It will include the outside evaluators and will set the stage for ongoing project evaluation throughout the course of the experiment.

This initial, pre-electronic conference has three purposes:

- (1) It is designed to provide the kind of interpersonal ambiance that can lead to easy and full participation on the part of all who are involved. As Hiltz and Turoff (n.d.) have indicated, it is difficult for persons who have not met face-to-face to get to know one another well enough to relax and participate in a computer conference without undue formality. Since we are involving a heterogeneous set of participants, not all of whom are personally acquainted, it would be useful to start with an initial experience that could provide a basis for easy informal communication and later collective efforts.
- (2) This initial conference is designed to provide an explicit group goal. This set of participants is uniquely qualified to make significant contributions to the solution of that problem. The computer conference is, itself, a social network. Moreover, interest in networks of scientists is widespread among the participants; it is, therefore, a natural subject for a collective effort. It can form a basis for group cohesiveness and provide a set of evaluation procedures that may turn out to be useful for other scientific communities as well.
- (3) It affords a natural setting for initial exposure to the computer system. The members of the networks community who lack experience with consoles can be initially exposed with the help of their more experienced colleagues. They can be guided through their first trials and supported in such a way as to minimize any initial anxieties.

At the conclusion of this conference each participant will be encouraged to share a sample of his or her current work on social networks with the others. This initial set of papers will be made available to each participant over the computer network, forming the basis for an initial community wide computer-based conference. These papers will acquaint each participant with how the



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about, providing an opportunity for participants to sort one another out and to form working sub-groups according to substantive interests and styles. The formation of sub-group conferences will, of course, be encouraged.

In addition to facilitating communication among participating scientists, the conferencing system at New Jersey Institute of Technology can be adapted to permit the sharing of data and procedures for data analysis. This sort of exchange can be extremely important in an emerging field.

Often, for example, when a new concept or hypothesis is developed existing data could be used to provide at least an initial test of its utility. In such a case collecting new data is not economical. Among social networks investigators, the current practice involves searching the literature for a person who has appropriate data, phoning or writing for permission to use them, sending a tape through the mail, copying the data to tape and reproducing the code book and sending these materials back through the mail. This is a costly procedure — both in time and in money.

As an alternative, in the context of our experiment with electronic information exchange, the following procedures will be used. Anyone with a large coded data set on his or her home computer will be encouraged to make it available to other participants. Those who agree will provide the project monitor with a codebook and appropriate documentation on access. A computer at the New Jersey Institute of Technology will be programmed to copy appropriate data into the files of any participant who request them. From the viewpoint of the participant who needs data then, the computer intermediary is simply another participant who is eager to share his or her data. Information about available data will be provided

and, on demand, data transfers will be made overnight.

Similar procedures can be used for accessing computer programs for data analysis. Programs for manipulating the large matrices frequently encountered in the study of social networks are expensive to produce. Such an investment is inappropriate if needed programs already exist elsewhere. So again, to the degree that participants are willing to share their programs the computer intermediary can be programmed to act as an access device for available computer programs. Thus a participant with data could send a message to the computer intermediary calling for a particular analytic procedure to be applied to his or her data. In 24 hours or less he or she would receive a message from the intermediary that included the analytic results.

Thus, appropriate programs will be developed to permit access to data or analysis programs by any participant. The New Jersey Institute of Technology has a computer that is prepared to play the sort of intermediary role envisioned here (Turoff, 1977).

## Conclusion

In summary, the potential impact of the system of electronic information exchange on the social networks community is very great. Students of networks are currently at a critical point in their development as a community. Their members are geographically dispersed and are grounded in a large number of traditional disciplines. Moreover, they are only recently aware of the several traditions they represent.

(suite voir page 445 (continued on page 445)).

(Continued from page 435).

## Computer conferencing and productivity in Science

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Social networks scholars are, at this moment, in the process of developing an identity as a single research community.

Thus, the main purpose of this project is to maximize the productivity of individual participants and to encourage the development of a cumulative collective effort. In addition, the facilitation of regular information exchange can be expected to yield a noticeable improvement in the coordination and cumulation of the efforts of the community as a whole. Conflicts can be aired and independent ideas related in a setting that encourages collective effort and the development of agreements about proper ways to proceed.

If the project is successful, therefore, it seems reasonable to expect that a major new organized intellectual force will emerge in social science. ■

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