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Human communication on computer networks is an evolving technology rich in possibilities. Computer companies have not always been leaders in exploring these possibilities, many of which were first identified by playful or curious users who came up with unexpected applications.

The French Minitel network is one of the most successful instances of such informal innovation. The designers of the network did not anticipate the popularity of messaging, which was introduced by hackers and grew explosively, at one point generating nearly half the revenues of the system.¹

A similar story is told by Quarterman (chap. 3 of this volume) about the Internet, host to millions of scholars and researchers around the world. No one planned this development, which grew up more or less spontaneously around programs with a different mission.

Users thus played an unusually active role in the early development of computer-mediated communication, and their contribution is likely to be decisive for its future (see Harasim, chap. 2). They have shifted the emphasis from strictly utilitarian applications toward enhancing human contact and understanding on a planetary scale.

This chapter discusses one of the earliest educational experiments in international networking. In 1982 the La Jolla, California-based Western Behavioral Sciences Institute (WBSI) opened the first educational program employing the computer as its chief communications medium. During nearly ten years of activity, hundreds of highly placed executives from all over the world worked in its online courses with prominent university faculty. Together these users invented a new ap-

plication of the computer that continues to influence our understanding of its potential. The history of this remarkable experiment follows.

The WBSI Experience

Planning for The School of Management and Strategic Studies began in late 1981 under the leadership of Richard Farson, president of WBSI.² At the time, CMC was still an untested educational technology, with the exception of some informal experimentation on Control Data's Plato system and a course in writing offered on The Source, an online service, in 1981.

absences from their jobs. The electronic delivery system provided these executives with an exciting initiation to computers through a communications application suited to their skills and interests.

Courses were focused on such issues as technology and development, the global economic and social environment, and systems thinking. These subjects were chosen because of their particular relevance to leadership in a rapidly changing and ever more complex world. Professors from major universities were recruited, primarily in the "soft" social sciences. Most of them found computer conferencing to be an effective educational medium. Over the years many participants have testified to the value of what they learned at WBSI.

The initial format consisted of a two-year program: four six-month sessions online, each composed of thematically related month-long courses with a running commentary by a communications specialist. Each six-month session was introduced by a week of face-to-face seminars in La Jolla. During that week participants met the faculty for the coming term and learned to use the computer. The cost was set at nearly \$25,000 for the two years.

The plans were ambitious and innovative, but the experiment got off to a rough start. The first session began in January 1982 with a stellar group of eight participants, including a Los Angeles City Councilman, a director of the Venezuelan national oil company, the presidents of several small high-tech companies, and vice presidents from some larger mainline firms. But all told, more faculty and staff than students attended the initial face-to-face seminar.

The real problems began when the participants returned home. Since no one had ever been taught on a computer network before, there were no models. The first courses consisted of either professorial monologues that made interesting reading but were unsatisfactory as computer conferences or telegraphic questions followed by days of inactivity while the teachers waited for responses. Meanwhile, various technical problems inhibited the participants from joining in the conversation, such as it was.

Recall that these were the early days of the personal computer. We used modified Apple IIE's with 48K of RAM and 300 baud Hayes modems—donated by Dennis Hayes who was himself a participant—to access the Electronic Information Exchange System (EIES) network at the New Jersey Institute of Technology. EIES offered an early experimental version of the sort of communication service later popularized by The Source and CompuServe. This setup was so complex, it took a full page of instructions just to sign on and many more pages to list the basic EIES commands.

Somehow, we got through that first term. We were fortunate in having sympathetic technical support staff who patiently instructed the participants online or over the phone whenever they needed help. Pedagogical questions were addressed in a closed faculty conference in intense and sometimes contentious discussions that finally yielded an innovative interactive teaching style appropriate to the medium.

By the second term, the group had more than doubled in size and there was hope of developing a viable program. Eventually over 150 participants from twenty-six countries were active, with a comparable number of faculty and staff at least nominally available online. WBSI was off and running.

The school quickly evolved in unexpected ways. Several clients—for example, Digital Equipment Corporation and the United States Army—sent many new participants each year in an attempt to broaden their intellectual reach. Where else could they hope to find professors from Harvard, Yale, and the University of California, a Jonas Salk, a Carl Rogers, and a Stewart Brand, all available in an information-age setting? WBSI became a kind of academic supplement to the training departments of these organizations.

As time went on, WBSI discovered that it was engaged not just in providing an educational program but more fundamentally in building a new type of virtual community. The bonds between participants were

so strong that most continued on as alumni members at the end of the course and returned to La Jolla year after year.

What was the attraction? The WBSI network was composed of an odd mix of businesspeople, executives, military officers, research administrators, and scholarship participants from the public sector. They formed a new kind of international club with a high premium placed on frank, intelligent talk.

The members' offline activities, their politics, and their ideas about life were often very different, but all of them enjoyed exchanging ideas with each other and the faculty. CMC made it possible for them to stay together in spirit while separated by continents.

Using laptop computers, participants could even connect with the group while traveling, and enrich the discussion with reports from remote parts of the world. Members stationed abroad were sometimes among the most active, for example, our correspondent in a remote corner of the Arabian peninsula who had few companions in his desert station.

The common language was English; native speakers were forgiving of foreign participants' minor errors. The presence of these foreigners made an enormous difference. One cannot easily imagine the impact of Colombians and Japanese on discussions of drug policy or trade. Certain kinds of clichés became impossible. The usual rhetoric, inspired by television journalism, gave way to the authority of local experience. Serious reflection became possible as we gained insight into the meaning of events for participants.³

WBSI went through many crises as the years passed, but the participants themselves helped us to survive and grow. In the end, the loss of several important sources of support and the continuing recession were too much for the institute's fragile finances. It finally closed in November 1991.

In the remainder of this chapter, I discuss some of the things this experience taught us about community building, pedagogy, and software design. These lessons may perhaps help others attempting to build similar networks in the future.

Building a Community

Online groups need not form a community to work effectively together so long as the members have well-defined roles in performing a shared

task. But both roles and tasks were unclear at WBSI. Although officially a non-degree-granting educational program, for many participants it was more of a club or a subscriber-written magazine than a school. In such a group, nothing short of personal loyalty could hold the participants together and sustain the educational activity in which they were nominally engaged. Thus WBSI had to become a vigorous community to survive at all.

How did a community emerge out of this diverse collection of strong personalities scattered over the globe? WBSI attempted to create a warm personal atmosphere at the face-to-face seminars; however, these efforts may have been less important than certain unintended consequences of the program design. In fact, without wanting to, we put the participants through a shared ordeal that brought them together more closely than anything we could have planned.

In most cases, the participants first encountered either computers or CMC through WBSI. Important people though they were, our training program placed them all in the embarrassing position of children on the first day of school. Soon they formed a brave band of technological adventurers with a whole new vocabulary to describe the complexities, frustrations, and excitement of communication by computer.

This frontier solidarity was amplified by our initial problems with delivering the courses. We had always bragged about the experimental character of the program; now the participants were finding out just how experimental it really was. But because they were prepared, they tried to help rather than withdraw in disappointment. And once they became deeply involved in saving the program, they naturally identified strongly with it and each other. It was really "their" program, a fact that constituted the group as such and assigned it a common mission.

To facilitate participant involvement, WBSI created a so-called meta-conference in which everyone was invited to offer suggestions and to communicate about anything that did not fit into the regular conferences. This type of free discussion conference has become commonplace in online educational programs. Often called the "cafe conference," it has a wide variety of uses, from debating current events to dealing with personal problems or complaining about the program itself. The cafe conference is an important transmission belt for an emerging online culture. Participants feel fully represented as human

beings on a system that welcomes them in this way, rather than excluding all but their professional contributions.

In 1985, a group of WBSI participants formed a private conference for more intimate personal discussion and support, a sort of online encounter group. There they could talk freely about life events that affected them deeply. One participant, for example, lost his job as vice president of a large firm, and his situation was discussed for several weeks. Another died of cancer, joining his friends online till the end. Participants learned to understand better the dilemmas of foreign members of the group whose personal and national crises were often intertwined. This was particularly true of our Colombian participants whose lives were tragically altered by the civil strife in their country.

The "COM" or "community" group, as it was called, was led at first by a professional psychologist expert in working with encounter groups. He found that the participants were more supportive of each other but revealed less of themselves than was customary in a face-to-face setting. He concluded that this was because of their commitment to remaining together, unlike the casual acquaintances involved in a brief encounter. In a very real sense, WBSI had invented a new social form. The experiment was so successful that other COM groups were formed, and this feature was added to the program. It too became an important factor in WBSI's transformation into a community.

How far can we generalize from these experiences? Certain aspects of the WBSI community probably cannot easily be repeated by other institutions. Computers are no longer such romantic symbols of the technological frontier, and no one today has to begin an online program with the problems we had in 1982. Nevertheless, several features of the experiment are generalizable: the use of conferences for free discussion and personal interchange, and the excitement of international networking, a still unfamiliar and innovative computer application. Programs that engage their participants as persons rather than organizing them around specific tasks ought to be able to generate the sense of ownership necessary to community through similar means.

Inventing a Pedagogy

It is a well-established principle of psychology that people learn a dominant role, such as teaching, primarily through playing the correlated

subordinate role, that is, learning. But since most online teachers have had no prior conferencing experience, they need preparation before facing what Roxanne Hiltz calls a "virtual classroom" (Hiltz, 1986).

Skilled teachers rely implicitly on a host of small social techniques that are unavailable on a computer network. The new online teacher feels like someone who has never been in a classroom before and is suddenly shoved into a room full of students and told to sink or swim. Where should I stand? Why are they waving their hands at me? How do I know if they understand what I am saying? How long do I wait for an answer to my questions? When does the class begin and end? Early public mistakes in such basic matters are bound to be embarrassing and diminish the teacher's authority.

WBSI's first attempts at online teaching were disastrous. Great teachers were helpless in front of a class of sympathetic but sceptical students scattered between Caracas, Philadelphia, and San Francisco. One teacher offered elaborate presentations that resembled written lectures. While interesting, these had the undesirable effect of reducing the participants to silence. In a face-to-face classroom, teachers can determine from subtle clues whether students' silence signifies fascination or daydreaming. But silence on a computer network is unfathomable; it is intensely disturbing to address the electronic void. Hence the "communication anxiety" of conferencing participants, especially those with leadership roles (Feenberg, 1989).

Those who experimented with nondirective techniques had even more disappointing results. No one seemed to understand their all too brief questions, and so they too faced a wall of silence. Later we understood that it takes far more nerve to admit confusion and ask for clarification in a written medium than face-to-face. Days passed as the students and faculty wondered, each in their respective corners, what was going on. The lack of tacit cues such as raised eyebrows or puzzled looks proved fatal to this teaching style in the online environment.

With the encouragement of our consultants, Peter and Trudy Johnson-Lenz, I experimented with introductory comments several screens in length designed to lay down explicit ground rules for discussion, and then posed problems and asked questions illustrated by specific examples. This approach brought in the participants. Once they were talking, the WBSI faculty made further discoveries.

Conferencing participants are uncomfortable unless they can act as if they were substituting writing for speech in some more familiar setting. They must treat the conference as a meeting, a discussion group, even a cocktail party in order to establish shared expectations. Without a reassuring communication model, they are fearful of writing the wrong thing and withdraw into the perfect silence of a blank screen (Feenberg, 1989). With this in mind, faculty imposed a framework of norms and expectations modeled on a college seminar.

To reproduce the seminar environment, one needs online equivalents for such things as opening the discussion with a short orientation session, calling on individuals to speak, assigning work to be delivered in class, getting a sense of the group's wishes, and distributing short readings for discussion and comment.

Just as students are discouraged when their comments are ignored in the classroom, so they react negatively when their online messages get no response. Most faculty accepted responsibility for replying to every otherwise unanswered message, as they would in a classroom.

CMC courses are necessarily based on classroom discussion since students quickly lose interest in lengthy online lectures that would be more appropriately printed and distributed by mail. Teachers and participants learned to input texts of medium length, no more than a page or two, asking questions, responding, commenting on the subject at hand. One hundred to two hundred such texts would compose a typical month-long seminar at WBSI.

As in a regular classroom, the teacher is responsible for provoking and leading discussion. Accordingly, he or she must design an agenda and supply a comment every few days to sustain the interaction. However, strict enforcement of the agenda discourages participation. This points to the central problem and opportunity of teaching in the virtual classroom.

Computer conferences tend to diverge toward multiple monologue unless an active moderator works to keep participants on the subject. But the subject may not be as focused as in a face-to-face setting. Often it consists of several loosely related matters brought up simultaneously in a multithreaded discussion. Each strand represents a participant's persona] path into the conference. To arrest the free flow of such a conversation with frequent calls to order is likely to produce only vexed withdrawal.

Instead of trying to control conversation negatively, the teacher-moderator must periodically offer what are called "weaving comments" to identify the common threads holding the discussion together and giving it unity. Such comments enable participants to move beyond monologic personal viewpoints toward true dialogue and synthesis. Weaving comments also help the group to achieve a sense of accomplishment and direction and supply it with a code for framing its history by establishing a shared boundary between past, present, and future. In advanced courses, teachers may assign this task to the students themselves (Harasim, 1991), but, in any case, someone must perform it. Weaving, I believe, is the key to online pedagogy.

Once we had made these basic discoveries, we tried to share them with new teachers in a "moderating conference" where those who had already taught on the network could prepare the newcomers. For a while I led these conferences. Although we called it training, it actually consisted of giving faculty practice participating in a discussion led by someone else before they faced a virtual classroom.

Among the faculty I trained in this way were dozens of brilliant scholars, most of whom, I am convinced, had never had a serious pedagogical discussion before in their lives. No doubt they had never needed to discuss the theory of an activity that came to them as naturally as classroom teaching. But, confronted with the challenge of an entirely new setting, they enjoyed debating pedagogical issues.

Extensive experience and discussion yielded pedagogical lessons that formed the "lore" of the WBSI school, passed down from one group of teachers to the next. Although some of these lessons would be less relevant to online technical education than to our type of program, any institution that introduces educational CMC should develop a base of practical knowledge among its faculty and encourage its transmission.

Designing an Educational Interface

Computer conferencing was invented to overcome certain limitations of electronic mail (or email). Email substitutes electronic transmission for the delivery of pieces of paper, but it conserves the person-to-person communication model of ordinary postal service. The postal model depends in important respects on the use of paper as a medium. When information is delivered in the form of sealed printed matter, a personal

addressee must break the seal and dispose of the information locally, for example, by filing or forwarding it.

In principle, CMC can dispense with this social structure. The sender transmits his or her message to a host computer where it is deposited in a virtual file shared by all the members of the group, whatever their location. Where users of the host computer all see the same files, one has a bulletin board useful primarily for information exchange on a relatively small scale. Private, topically designated discussion spaces are defined for those with a shared interest on larger systems handling a wider variety of participants and tasks. This structure supports continuous small-group communication over long periods. Hence the name, computer conferencing.

The change from email seems technically trivial, but one should not underestimate the originality of designers such as Murray Turoff and Jacques Vallee who first broke with the postal model and began finally to realize the computer's potential in group communication.

Despite abandoning the person-to-person structure of email, early conferencing systems shared many of its other features. Rationalistic assumptions blinded designers to the specificity of group needs. They believed that they could understand and organize communication logically, on a priori grounds, rather than sociologically, in terms of the realities of actual experience. They took it for granted that users would want to write on the computer equivalent of a blank page, a contextless void. Designers sought the one best way to organize a generic communication process and referred to all messages by such neutral names as topic, item, or comment. It is true that this was a plausible approach in the early days of CMC, given the limitations of the available equipment.

However, most online groups need a familiar framework adapted to their culture and tasks. They are repelled by what might be called contextual deprivation. This problem was masked at first by the fact that experienced computer users, who were the first to try out the new systems, recognized the computer itself as a sufficient context for their interactions. But decontextualization was invariably perceived as confusing and unfriendly by ordinary users, such as the participants in the WBSI school.

The radical difference in outlook between the computing professionals who design programs and the ordinary people who use them shows

up in other ways as well. Under the influence of their engineering culture, software designers create powerful programs that are difficult for these users to master.⁴ But outside engineering itself, simplicity, not power, is a *sine qua non* of successful communications software.

The WBSI experience foreshadowed the type of user resistance that has slowed the progress of educational CMC. Since most educational organizations cannot create their own conferencing system from scratch, they must either impose some engineer's conception of communication on their members or take the risks of trying to adapt an existing system to their own needs. The easier it is for participants to withdraw from the program, the more important it becomes to make the necessary adaptations.

WBSI's first technical director, Darrell Icenogle, addressed this problem by adding an extra layer of simplified commands tailored to our users and sheltering them from the engineering culture embodied in the underlying CMC program. This final command shell ran on the users' terminals. It served both as communications and word-processing software and as an interface to the conferencing system running on the host.

Our discoveries in this domain came in two stages.

In 1983, at the invitation of the Department of Commerce, WBSI organized a six-month computer conference on productivity in the American economy for fifty chief executive officers of Fortune 500 companies. Portable computers were donated by the Kaypro Corporation, a pioneer in that field, and modems by Dennis Hayes. We assumed, correctly, that if executives were difficult to get online, CEOs would represent a worst-case scenario.

To solve this problem we built a radically simplified terminal interface for EIES based on a software product called MIST developed by the Johnson-Lenzes. This program automated the sign-on procedure and included a local wordprocessor with prompted, single-key up- and downloading from the terminal. These features made it possible to abbreviate training without losing the audience. Most of the CEOs were actually able to participate in the program.

Soon the WBSI school had its own interface to EIES called, at first, the "Onion" and later "Passkey." This interface, designed to run on PCs donated by Digital Equipment Corporation (DEC), was in continuous use in one form or another throughout the later history of the school.

It proved extremely helpful in bringing international participants into the program as we could incorporate a wide choice of local sign-on procedures into the terminal program and spare our members some fairly complex technical labor.

In 1987, DEC asked WBSI to evaluate VAX Notes, its own recently released computer conferencing program. DEC also funded the development of a prototype terminal interface for VAX Notes based on Passkey. The result was the Social Factors Project which culminated in the transfer of the WBSI management school from EIES to computers running VAX Notes at the institute.

The aim of the project was to develop a framework for understanding the transformation of the computer from a *tool* for individual users into a *medium* of group activity. Computer conferencing, we argued, requires electronic social environments every bit as complex as the buildings in which face-to-face encounters take place. There is no generic answer to the question of where to put walls, doors, and corridors. Architects and interior designers must devise solutions corresponding to the anticipated needs of each type of user. So too, designers of CMC systems must anticipate the group requirements of the users of their products. The software's social architecture effects the success of online group communication just as the location of chairs, tables, blackboards, and podiums effects face-to-face interaction (Feenberg and Bellman, 1990).

We recommended that DEC develop an advanced conferencing system in which a common interface on the terminal and the host would replace the usual clumsy process of connecting two separate programs. Users would hardly be aware of where they were on this "client/server" system. An integrated hypertext or videotex program would archive incoming material for easy retrieval. Conference moderators such as teachers would enjoy special facilities for organizing their work and tracking participants. Network managers would be able to download programs, directories, and assignments to groups of users at remote locations, periodically retailoring their communications software as the conferencing schedule advanced (Feenberg, 1986).

The interface was to be tailorable to group-specific tasks and needs, such as project management, information exchange, and distance education. Given our expertise in the latter, we concretized these ideas with specifications for an educational version of VAX Notes. We identified features that would be particularly important for this task, such as a

simplified form-making functionality for quickly composing tests, access to mathematical symbols, and so on. We contrasted such features with others that might prove more important for groups engaged in other activities, arguing that in each case the most important functionalities should be "foregrounded" in the menus of the terminal program while the rest would be available to sophisticated users in the background on the host.

DEC did eventually make an experimental in-house version of Passkey incorporating videotex but, surprisingly, their program was slow, clumsy and difficult to use (Blackburn and Mason, 1991). The old culture apparently overwhelmed the new.

Despite this disappointment, our ideas were not entirely stillborn. Whether inspired by Passkey or independent in conception, a number of similar interfaces have been developed over the last few years, and new versions of EIES and Portacom, two early conferencing systems, were recently released with built-in terminal interfaces. Lotus Notes, a new and very powerful business system, was designed from the start to have such an interface. It can fairly be said today that no conferencing system should be considered state-of-the-art without this component.

Conclusion

Traditionally, correspondence courses and night schools have been stepchildren of the academy, despised junior partners of undergraduate residential education. This situation is changing today as lifelong learning becomes a reality for many white collar employees. The effects are also felt by distance education, which has always served a large proportion of adults.

These social trends have improved the climate for networking experiments (Eurich, 1990). As WBSI demonstrated, CMC can create a new kind of planetary classroom in which students and teachers from all over the world will be able to meet and exchange ideas. Distance education need no longer languish in the shadow of conventional college teaching. Given imagination and support, the learning society will emerge as a global computer network.

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