Adoption and Use of a Computer-Mediated Communication System by Contact North Site Coordinators

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Abstract

This paper describes some of the factors underlying successful use of the CoSy computer-mediated communication system in the Ontario Govern-ment's Contact North/Contact Nord Distance Education Project by 11 women who, in a relatively short period of time, acquired sufficient competence with CoSy to make

conferencing an integral part of their role as community educators. Their very positive response to the technological demands of the job runs counter to expectations developed in much of the literature on women, work, and technology. For the most part, previous research has characterized women's relationship with technology as antagonistic. Our description of the process of adoption and use of CoSy at Contact North provides an alternative understanding of the initial relationship between characteristics of the individual and the machine. The reasons underlying resistance to technological change are an important source of knowledge; but equally important is the basis for enthusiasm that can greet new technological conditions of work. Rather than representing barriers to be overcome or problems to be surmounted, computer conferencing systems can offer a congenial setting for establishing the technical competence and positive attitudes that lead to adoption and use decisions.

Abstract

L'article décrit certains des éléments sous-jacent au succès de CoSy, le système de communication par ordinateur du projet d'éducation à distance Contact Nord, utilisé par onze femmes qui, en un temps relativement court, se sont suffisamment familiarisées avec CoSy pour faire de la conférence une partie intégrale de leur rôle d'éducatrices dans leur communauté. Leur réaction très positive envers les nécessités technologiques de ce travail est à l'inverse de ce à quoi on s'attendait, compte tenu des résultats de recherche sur les femmes, le travail et la technologie. Dans l'ensemble, cette recherche a tendu à décrire le rapport des femmes et de la technologie comme étant antagoniste. Notre description du procédé adopté et de l'emploi de CoSy à Contact

Nord fournit une autre approche envers le rapport initial entre les caractéristiques de l'individu et de la machine. Les raisons qui mènent à résister au changement technologique constituent une source importante de connaissance, mais la base de l'enthousiasme avec lequel de nouvelles conditions technologiques de travail peuvent être accueillies est toute aussi importante. Au lieu de représenter des barrières à franchir ou des problèmes à surmonter, les systèmes de conférence par ordinateur peuvent offrir un environnement confortable pour développer la compétence technique et les attitudes positives qui mènent à leur adoption et à leur usage.

Introduction

This paper describes some of the factors underlying successful implementation of a computer-mediated communication system in the Ontario Government's Contact North/Contact Nord Distance Education Project. In its initial plans for linking the community-based learning centres that comprise the Contact North organization, The Ministry of Colleges and Universities elected to include the Guelph CoSy system in its package of communication tools for both administrative and educational purposes (Anderson & Sweet, 1990). While all available communication media - telephone, FAX, audio-conferencing - are employed to some extent, the CoSy system has emerged as an effective, even preferred, means of exchange among the site coordinators who staff the learning centres. The successful implementation of CoSy reflects the generally positive process of adoption and use experienced by the site coordinators. Although computer novices when first hired, all were required to master the hardware and software features of the CoSy system and then to employ the system effectively as an administrative tool. The paper describes the reactions of eleven women who, in a relatively short period of time, acquired a level of competence with CoSy sufficient to make conferencing an integral part of their role as community educators. The coordinators' very positive response to the technological demands of the job runs counter to expectations developed in much of the literature on women, work, and technology. For the most part, previous research has characterized women's relationship with technology as antagonistic (Collis, 1986; Lockheed, 1985; Menzies, 1982). Our description of the process of adoption and use of CoSy at Contact North provides an alternative understanding of the initial relationship between characteristics of the individual and the machine. As Zuboff (1988) suggests, the reasons underlying resistance to technological change are an important source of knowledge; but equally important is the basis for enthusiasm that can greet new technological

conditions of work. Rather than representing barriers to be overcome or problems to be surmounted, computer conferencing systems can offer a congenial setting for establishing the technical competence and positive attitudes that lead to adoption and use decisions.

The women whose reactions form the basis for this report were, at the time the study was conducted, proficient with CoSy and enthusiastic about its administrative efficacy and social "bonding" qualities. The specific objectives of this report, then, are first to profile levels of system use and attitude (Hiltz, Kerr, & Johnson, 1985) and then to construct retrospectively the site coordinators' experiences with the system in terms of two processes: system integration, which describes a progression to competence with the various features of the conferencing system, and social integration, which refers to the cooperative intentions and behaviours of the participants. Before doing so, however, it would be useful to outline the structure and some of the functions of computer-mediated communication systems. This is done with reference to the concept of computer-supported cooperative work (CSCW), a notion that today informs many current workplace applications of electronic communications.

Computer-Mediated Communication Systems

Structure

Numerous articles have been written on the educational applications of computer-mediated communication systems (see e.g. Bernard, 1987; Harasim, 1990; Hiltz, 1986). There also exists a well-developed literature on the application of computer technology in the office setting (Rice, 1987; Zuboff, 1988). Whether one has a pedagogical or administrative perspective, the organizational structure of computer-mediated communication (CMC) systems is essentially the same. The elements of a CMC network have been presented by Johansen (1988) and by Kaufman (1989) in both business and educational contexts. Some of the functions supported by CMC systems discussed by these authors are listed here to indicate the range of activities possible within an electronic work environment:

1. directory - for identifying participants on the system and finding addresses where messages are to be sent

2. electronic mail - for one-to-one or one-to-many communication

3. conferences - for group discussions, with a permanent record of the interaction. These may be structured in a variety of ways, incorporating various topics and activities either work-related or social

4. private work spaces - for collecting ideas and personal files

5. word processing - for composing or modifying messages or documents

6. bulletin board - for access to announcements of general or particular interest

7. newsletter or journal - for access to articles or papers of general or particular interest

8. data bases - for access to data or information on a variety of topics

9. voting or polling - for determining degree of support for an issue or course of action; or for gaining consensus in the decision-making process.

Conferencing operates much like the well-known E-Mail networks. Both allow individuals and groups to carry on discussions with the aid of modem-equipped personal computers connected by a packet switched system to a mainframe computer. Conferencing, however, allows much more extensive dialogue among participants: "many-to-many" exchanges as compared to simple dialogue. In addition, the software can be used to organize and structure inputs, outputs, and communication patterns in a variety of ways. This is helpful in adjusting the administrative traffic that flows through an organization, especially a distributed one like Contact North. It also promotes cooperative interaction in dealing with the practical problems that characterize much of the work in an educational organization (Dunn & Hamilton, 1985). The extent to which a "collective intelligence" is successfully constructed in conferencing reflects both the interactive and asynchronous nature of the medium. As Turoff (1989) points out, asynchronicity is not just a matter of convenience. Its real value lies in a structure that allows each individual to work on problems after his or her own fashion before joining an on-line group where the problem-solving processes employed may be very different. How the conference is structured, then, reflects the nature of the task and the collective capacities and styles of participants. Relationships among these elements may be understood in the context of computer-supported cooperative work (CSCW) projects.

Function

There is a limited but growing body of research on the role of computermediated systems in the workplace organized around the CSCW concept. Greif (1988), Engelbart & Lehtman (1988), and others define CSCW as the study and development of systems to encourage organizational collaboration. Johansen (1988) employs the term "groupware" to describe specialized computer aids designed for the use of collaborative work groups. Some of the features of the "virtual" or

electronic workplace are:

- tasks are optimally grouped and not differentiated, requiring a repertoire of general skills rather than specialization

- individuals can better regulate their own time

- a participative management style is possible

- collegiality is possible

- innovative and risk-taking behaviour is possible.

The appeal of CSCW environments to individuals who value participation and collaboration is apparent in this description. A preference for both is needed to deal effectively with the demands of distance education delivery in the Contact North organization where the component learning sites are scattered across Northern Ontario. Site coordinators may be seen as community educators or "animateurs" and in this role encounter a variety of practical problems. Many of these involve decisions about the distribution and use of instructional materials or the organization of general curricular resources. Their job, however, involves extensive dealings with people - both in the community and on-line. The problems encountered in this situation are of a practical, often personal, nature. In short, they are not the well-defined problems of the mathematician or game theorist. Rather than an optimal solution, practical problem resolution requires a process of identification and formulation: the transformation of problems with no apparent goal to ones with a set of hypothetical (and tentative) solutions. Such "messy" problems define much professional work (Dunn & Hamilton, 1985). Medical diagnosis, legal argument, or curriculum planning and development are examples of practical problems encountered by professionals. Increasingly, these are seen to be dealt with most effectively through cooperative means (Johnson & Johnson, 1987). Group problem identification and resolution in a computer-conferencing environment have been discussed by Harasim and Johnson (1986) in their report on the on-line professional development of women teachers in Ontario. Much of this activity required goal-oriented cooperation.

Cooperative goal structures are built upon three areas of interpersonal competence: communication, trust, and controversy skills (Johnson & Johnson, 1975). Effective communication skills may be considered prerequisite in that cooperative intent and the resolution of differing points of view are dependent on clear and unambiguous exchanges. Interestingly, many of the requirements for effective communication are met on-line. For example, one of the criticisms of conferencing concerns the lack of nonverbal signals; however, in many situations miscommunication arises precisely because both forms are available but are not adequately synchronized. The need to make congruent verbal

and nonverbal signals simply doesn't arise on-line. Similarly, text communication tends to be more formal and explicit and to be made with fewer assumptions than verbal exchanges. Trust is a function of group openness, sharing, and supportive actions. All of these reflect a basic cooperative intent. At the same time their presence reinforces initial collaboration. These elements together allow a constructive approach to controversy and to the definition of common problems. In fact, controversies and differences within the group are considered to be "problems-to-be-clarified." In this context, socialization to group processes among employees is of direct benefit to the work of the organization.

The interpersonal dimension is only one element in developing collaborative goal structures. Turoff (1989), McCreary (1989), and others suggest additional considerations of organizational facilitation and regulation. What has emerged from CSCW projects undertaken to date is evidence that communication technology fosters a flatter institutional structure; and socalled "best practice" management styles have emerged to accommodate the redistribution of power in these less hierarchical arrangements (Spenner, 1988). Where employees have been able to distance themselves from direct supervision, they have acquired a greater voice in the management of organizations (but see Zuboff, 1988). For the most part, then, CSCW defines a democratic set of institutional relations that translate into specific opportunities for individual expression. For example, the established cues of authority and status are absent in text-based CMC exchanges. This allows greater participation among those who feel diminished in the face-to-face setting by reason of gender or any one of the many superficial constraints imposed on social interaction.

All such arrangements are predicated on the successful implementation of the communication system. Whenever a new technological form is encountered by novice users, a period of adoption is necessary as new skills and understandings are acquired. This process of CMC adoption and use, as experienced by the site coordinators at Contact North, provides the focus for our research. A description of the acceptance process, however, involves examining not only the development of competence among system users but also the components of a positive attitude toward adoption and use of CMC systems in the workplace (Hiltz, Kerr, & Johnson, 1985).

A Case Study of Cmc Acceptance

Our description of the site coordinators' experiences with the introduction of CoSy is consistent with the work of Hiltz and her colleagues (Hiltz et al., 1985; Kerr & Hiltz, 1982; Turoff, Hiltz, & Mills, 1988). Hiltz constructed a predictive model of the acceptance process as applied to computer conferencing in a variety of educational, research, and business settings. Acceptance was defined as the actual use of the system and a

sense of general satisfaction in its application. Although actual use may be viewed as a connotative indicator of attitude, our specific purpose is limited to describing the attitudinal basis for adoption and use decisions in terms of subjective satisfaction.

Toward this end, the framework constructed by Hiltz to determine system satisfaction was adopted. Overall satisfaction with using CMC systems in the workplace was defined empirically by Hiltz et al. (1985, p. 58) as comprising four dimensions:

1. difficulties in acquiring technical skill

2. difficulties in operating the system

3. increases in work productivity

4. the development of a sense of social cohesion among participants.

In fact, these dimensions appear as stages in the acceptance process. The first two dimensions, primarily concerned with technical operations, are logically antecedent to any assessment of the system's relevance to work: gains in productivity follow from effective use of the system.

Social cohesion similarly is a consequence of enthusiastic on-line participation and cooperative intent among system users, at least in part. Social cohesion is a much more diffuse construct than productivity; nevertheless, the extent to which the system allows users to interact and collaborate in the conduct of their work undoubtedly shapes the nature and extent of community feeling.

Sweet and Anderson (1989) discussed the development of productivity and social cohesion indicators in terms of system and social integration processes. System integration describes the adaptations that users must make to the unique conditions of communicating on-line. For example, the loss of visual cues requires considerable adjustment by some individuals. As well, system integration refers to those competencies, such as editing and uploading a file, that are needed to operate the system effectively. Social integration emphasizes cooperative skills presumed to underlie satisfying personal relationships and effective collaborative activity. The profile of acceptance developed below builds on the conditional relation-ship between integration processes and indicators of satisfaction.

Data, Participants, and Setting

The data employed in this report were generated as part of a more

extensive search for successful adoption and use strategies that could be applied to the implementation of communications technologies required in an organization such as Contact North (Anderson, in press; Anderson & Sweet, 1990). These studies involved the site coordinators and other staff at the Western Regional Office of Contact North, all of whom used the CoSy system in their work. Data were gathered from three sources: computergenerated usage data; responses to a survey that included belief statement items, drawn for the most part from Hiltz et al. (1985); and open ended items that invited comment on various aspects of learning and using the CoSy system. A detailed description of the data sources and the respondents is available (Sweet & Anderson, 1989; Halenda, 1990). In this paper we present only an outline of the component variables of integration and satisfaction in order to profile acceptance for the 11 women site coordinators.

The participants had little experience with computers generally and none at all with CMC prior to joining Contact North. Three had been employed as coordinators for nearly two years at the time of the study, whereas the rest had been on the job for six months or less. The minimum was four months. Nevertheless, all had reached a level of competence with CoSy sufficient to use the system effectively in communicating with one another.

The actual skills required and the process of skill acquisition are discussed by Sweet and Anderson (1989) with reference to stages of competence in computer communications. Ranging in age from 24 years to 46 years, all had significant work experience as well as a variety of life experiences that well equipped them for the task of community educator. Although we assessed a variety of individual difference variables - locus of control, learning style, and general computer attitudes - these are not elaborated. However, it should be noted that the stated preference (Grasha, 1984) of all participants was for cooperative as opposed to competitive or independent activity. Level of education varied: most were university graduates or had some college training. One was a high school graduate. The fact that a teaching degree or certificate was not required emphasizes the uniqueness of the coordinator's position as community educator.

Although not expected to be teachers in a formal sense, they were very much educational leaders in their communities, acting as counsellors to the students. The requirements of this role made extensive demands on the skill and personal resources of individual coordinators. To a considerable degree, these pressures were alleviated through contact with their colleagues on CoSy.

In addition to belonging to the "open" conferences on CoSy, the coordinators were members of two "closed" conferences dealing with their specific concerns. Here they could discuss technical problems, needs of the community, training methodology, and, in the all-important

"electronic coffeeroom," everything from the latest movie (cassette) to the weather (usually white, always cold). The supportive atmosphere that characterized network relationships and the sense of community that developed underlies our discussion of their satisfaction with the system.

Profile of System Satisfaction

As suggested by Hiltz et al. (1985), acceptance is indicated by use and satisfaction. To establish that the system was employed as an important communication vehicle by the participants, we summarized the record of sign-ons and time on-line automatically logged by the computer. For various reasons, number of sign-ons was selected as the better indicator of use (Hiltz, 1990). The coordinators were requested to sign on the CoSy system at least once per week. In fact, the level of system use was much greater. The record of CoSy system sign-ons was assessed for a one month period prior to the survey and indicated a much higher level of use than was actually requested by the regional director. The median number of sign-ons for the period was 24. This apparent enthusiasm for conferencing was echoed in the responses to the survey items and in the anecdotal comments made by the site coordinators about their satisfaction in using the system.

Relationship Between Integration and Satisfaction

Although in this analysis we present the perspective of those women who were employed as site coordinators, the relationship between acceptance and process indicators is first established for all members of Contact North, including the Regional Coordinating Centre staff in Thunder Bay who were participants in the general conferencing activities of the organization. Within the framework of this relationship, shown in , the basis for satisfaction with the CoSy system as a working tool is then elaborated

for the women site coordinators.

Table 1 presents relationships between global indicators of satisfaction and integration. These are summary statistics. Component variables of both satisfaction and integration are discussed in greater detail with the presentation of profiles in the sections immediately following. It may be seen from the correlations in Table 1 that cooperative intent is related both to perceptions of improved productivity and a sense of social cohesion. Although one would expect cooperation to be associated with work that involved group discussion, reference, and decision making, it is important to note that cooperation also is positively associated with feelings of personal contact among the coordinators. In contrast, indicators of system integration are not consistent across dimensions of

satisfaction. Competence in using the CoSy system does not appear to be especially salient. This was not unexpected. Although some staff members had greater experience with CoSy than others, all had acquired sufficient skill to manage the system's hardware and software features. In other words, everyone had reached a threshold of competence such that differences in system expertise did not affect communication. Like all CMC systems, CoSy does have some operating limitations. However, the relationship between ease of system use and social cohesion suggests these do not unduly constrain social interaction. None of the correlations are strong enough to establish a definitive set of relations. Nevertheless, given the limitations of sample size, instrumentation, and an inherently complex and highly interactive work situation, the pattern of association is encouraging to a view of CMC as technically manageable in a work context and as promoting, even requiring, collaborative activity and supportive attitudes - a view consistent with the concept of computer-supported collaborative work.

Productivity and Social Cohesion

Satisfaction with the actual outcomes of using CMC as a communication tool require:

- a perception of the system's utility or, more specifically, some evidence of improved productivity through savings in time or improved quality of service and

- a sense of social cohesion among users based on the ability to freely express one's point of view, as well as a feeling of having established some measure of personal contact with other system users. Composites for these components of system satisfaction are shown in the 11 women site coordinators.

Time efficiencies and perceptions of improved quality in the conduct of the coordinators' work indicate their favourable assessment of the contribution conferencing makes to their effectiveness. As indicated in Table 2, these components of productivity are highly rated. Similarly, social cohesion components receive a positive rating. Results were quite uniform across the seven-point, bi-polar scales used in the study. The anecdotal comments of the coordinators offer further insights.

In many ways, increased productivity is the "bottom line" for any service agency and a number of coordinators' comments were directed toward matters of effectiveness and efficiency:

I don't have to play telephone tag anymore; There is a direct and immediate contact with Thunder Bay. If I need something or want to send something, it goes right away. And I can get an answer that

afternoon or next morning.

As a widely distributed distance education institution, Contact North necessarily relies on the judgement of the coordinators for its effective operation. Many decisions at the sites have to be made immediately if they are to be responsive to local conditions. Certainly, site coordinators exercise a good deal of autonomy in their job; but the process of coping with community educational problems was made easier in the knowledge that one could call on others for advice. In the words of one coordinator: "When I'm stuck with a problem I can't handle, there's always someone on the system who has an answer!" The supportive atmosphere that one hopes to find in an institution was established and maintained at Contact North by means of CoSy.

Important as collaboration is to administrative efficiency at Contact North, it occurs within a context of community feeling that was established prima-rily through CoSy. Much of the isolation that people would naturally feel from working in such a geographically distributed organization was over-come by the personal nature of the exchanges that were possible through CoSy, most obviously in the "coffee room" conference. A surprisingly complete social network was established in this way. Evidence for the richness of these electronic exchanges was apparent at the annual site coordinators' meeting in Thunder Bay where the coordinators had a chance to "put a face" to the on-line personality they had come to know so well.

CoSy had a final contribution to make for at least some of the women involved. Individual as well as group needs have to be accommodated in any organization, and at Contact North the communication difficulties many people experience in public exchanges are overcome through the conferencing medium:

I suffer terribly from `stage fright' so I dread face-to-face or public speaking contact. I am able (on CoSy) to compose my answers if I so wish, or I can answer spontaneously.

System and Social Integration

Although most previous research has emphasized barriers to adoption and use of CMC, Bennett (1972) and Hiltz (1984) describe the acceptance process as a progression to competence: individuals initially learn to operate the system, following which they are able to adapt its unique communication features to the requirements of their work.

Consistent with this view, system integration is seen initially to involve the process of acquiring skills needed to manage system hardware and software. A minimum level of competence is needed before CMC can be applied in the work setting (Sweet & Anderson, 1989). As shown in Table

1 the level of competence displayed by site coordinators was not related to satisfaction. This indicated that they had progressed beyond the beginning stages of acquisition and were intent upon applying the system. The aspect of system integration dealt with in , then, involves the ability of coordinators to utilize the specific features of the CoSy system most effectively in their work. The System Application entry in Table 3 is a composite of three aspects of computer conferencing often seen as requiring accommodation or understanding on the part of the user. In that sense they may be seen as barriers to effective use (McCreary & van Duren, 1987; Harasim, 1987). They are loss of visual cues, information overload, and comprehension of system structure and operating principles. From the rather lower median value assigned this dimension, it would appear that some djustment on the part of the coordinators is necessary but not of influencing their overall satisfaction with the system.

The application of cooperative skills would logically contribute to the development of social cohesion among group members. However, it is most obviously an essential ingredient of successful collaborative work. The Communication and Cooperation entries in Table 3 refer to two aspects of cooperative goal structures discussed by Johnson and Johnson (1975). Message clarity and completeness are necessary for useful communication and both depend on timely feedback. Cooperative intent is realized by evidence of openness, trust, and sharing. The responses of the coordinators clearly indicated they perceived the form and content of messages received to be adequate and the actions of their colleagues as cooperative.

Johnson and Johnson (1975) refer also to the necessity of group members possessing skills to resolve differences of opinion and view. Because we lacked the resources to do so, we did not investigate these directly in our research. We did, however, elaborate the degree of openness perceived by coordinators in their dealings with other participants. A uniformly positive response was obtained in comments and in response to items that assessed matters of support and acceptance. For example, a recognition and acceptance of the strengths and weaknesses of other group members and reports that one's contribution (either social or intellectual) were recognized. From these a basis for conflict resolution may be inferred.

Summary and Conclusion

In describing the attitudinal basis for CMC adoption and use decisions by the Contact North site coordinators, we considered two aspects of satisfaction with computer communications in their work setting: an increase in productivity conferred by the CoSy system and the development of a sense of social cohesion. The processes of system and social integration were proposed as antecedent to productivity gains and enhanced community feeling. System integration was discussed in terms

of the coordinators' acquisition of competence with the CoSy system and their ability to utilize its features effectively in the work situation. Discussion of social integration considered evidence of cooperative intent and its prerequisite display of effective communication.

The 11 women who participated in this study were enthusiastic users of CoSy and their positive reactions to the technology appear to be grounded not only in the instrumental value of CMC but also in its potential to enhance the social dimension of work.

The account of 11 site coordinators' experiences with the introduction of CoSy occurs within the context of a much larger issue of technological implementation in the workplace and the opportunities for women that such development offers. Distance education especially is a field in which technology will shape organizational structure and influence professional opportunity. It also is a field in which women currently play a major role in the design, development, and delivery of programs.

The case study presented in this paper contributes to a positive view of the relationship between technology and women, a view that in the past has not been presented as generally positive. Attitudes toward technologies like CMC and associated concepts of computer-supported collaborative work certainly will influence the future professional position of women in distance education and, consequently, the potential impact of the field as an alternative form of education.

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