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Social isolation and integration in electronic environments

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Abstract. This paper examines the role of communications technology advances in affecting social interactions in groups and organizations. A discussion of the functions of communication and contact leads to the development of the concept of the 'electronic environment'. Past research identifies issues of a person's need for contact and the costs and benefits of contact in computer-mediated or other electronic communications media. In this paper, these issues focus on social isolation, integration, and feedback between group members as vital aspects of effective group interaction. Understanding of these aspects is presented as a key to appreciating the influence of communications media on organizational and social behaviour. Although the initial focus of this paper is on interactions between individuals within a group, applications are also discussed regarding interactions between groups, or between individuals and others outside the primary group. Examinations of the implications of the concept of electronic environments includes directions for future development and integration of research perspectives.

1. Introduction

All communications media, by definition, operate to permit people the opportunity to exchange ideas and meanings. The communication exchange can be as dynamic and immediate as a face-to-face conversation, or fixed in form and direction of communication, transcending boundaries of time and place as does a book or clay tablet. Modern electronic communications, particularly computer-based information technologies, attempt to increase the amount and range of contact of ideas or symbols exchanged between persons, and thereby decrease the social, physical, and temporal "distance" between them.

The social, physical, and technological barriers to implementing, using, and evaluating a computer-mediated communication system (CMCS) other electronic medium provide significant social as well as technical problems for system designers and administrators, managers of organizations, and behavioural researchers. Legal and ethical concerns related to privacy and access to electronic files are also becoming a major issue surrounding CMCS development and use (LaPlante 1990).

2. Technological advances in communications

Much research has been done in the area of group interaction and task completion, although much of the classic communication research has addressed communication in a face-to-face setting. Computer technology has now advanced to the point where collaborative projects can be completed with the assistance of, and solely through the medium of, a computer network. This distributed communication power allows group members to work together, and successfully accomplish assignments or projects, without having to be in the same physical location. Alternatively, individuals can develop new social and personal contacts without ever meeting in the traditional, physical sense (Sproull and Kiesler 1991a). In addition, the promotion of 'groupware' or 'any electronic or telecommunication tool designed to facilitate the collaboration of workteam members' ('Groupware' 1991:S/3), has led to an increasing emphasis on electronic communications in office settings. However, many predictions of large scale adoption and acceptance of electronic information and CMCS technologies have not materialized (McCarroll 1991).

In September 1990 issue of BYTE magazine, Microsoft CEO Bill Gates predicted that the next big success in computer software would come in the area of group productivity and advanced mail systems (BYTE Summit 1990). Use of CMCS have increased communication between people who already communicate, and also includes people who have not previously been
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3. The role of communication and social interaction in the organization

Interpersonal communications play an especially strong role in organizations, as a method of sharing and maintaining organizational culture (Schein 1990, Sproull and Kiesler 1991b), organizing and clarifying work group tasks (Sundstrom et al. 1990), and reducing work stress (Bradley 1989, Sauter et al. 1990). In particular, the lack of appropriate social support and communication is seen as a primary source of work stress (see Sauter et al. 1990), and that improved support is related to resistance to stress, illness, or pain (see, for example, Feuerstein et al. 1985, Ouellette Kobasa and Puccetti 1983).

However, some estimates (see Eason 1988) suggest that perhaps 20% of CMCS introductions in organizations are fully effective. Marginal success or complete failures often result from inadequate implementation of the CMCS to fulfill the work needs of the organization’s members. These shortcomings can come from inappropriate CMCS purchases, or even incomplete integration of the technological capabilities of the CMCS to accomplish the organization’s intended goals (Maryniak and Caldwell 1992).

4. Perceptions of isolation and social contact

The social and psychosocial effects in the use of any communication technology on individuals and groups are main issues in evaluating how a particular medium is to be implemented, accepted, and used. From a sociotechnical perspective, the use of communication media help to reduce the harmful effects of social isolation among individuals. Isolation, as defined by Altman (1975), is the state where one’s achieved level of contact is lower than one’s desired level of contact. Conversely, invasion exists when achieved contact exceeds desired contact. An individual seeks a state of optimal balance or equilibrium between these two levels through the use of communication media to share ideas and symbols with others.

In this definition, social isolation is subtly but conceptually distinct from physical isolation. While physical isolation is related to the number of interpersonal contacts and population density, social isolation is characterized by a lack of satisfactory exchange of task and emotional information. Physical isolation results from the lack of actual physical contact with one’s environment and other individuals, such as when telephone conversations or written letters must take the place of face-to-face meetings. Social isolation occurs when desires for support, understanding, and other social and emotional aspects of interactions are not met. Thus, an individual can experience social isolation in a crowded setting. Common elements of language, culture, and shared experiences define group and organizational identities (Fine 1979, Schein 1990). If the individual is unable to communicate effectively with others because of differences in language or culture, or a lack of shared experiences, the individual would suffer from social isolation, even if others are physically present.

The experience of isolation depends heavily on the individual’s perceptions of the surrounding environment to specify desired and perceived (as opposed to actual) contact levels (Suedfeld 1987, 1991). Caldwell’s (1990) examination of perceived isolation in National Park Service (NPS) Rangers showed that Rangers’ evaluations of an NPS area differentiated between physical and social isolation. Physical isolation perceptions were well explained ($R^2$ variance estimates of 0.6379) by objective measures of distance of the park area from urban sites and contact indices of park visitors per Ranger. Social isolation, on the other hand, was only partially explained by such indices ($R^2$ variance of 0.3619 explained by one physical distance index).

The distinction between isolation between group members (due to lack of shared experiences or norms) and isolation of one group from other groups is critical. The Ranger data support Bechtle and Ledbetter’s (1980) conceptualization of group isolation as a high ratio of within-group contacts to total contacts, with a limiting case of complete isolation at a ratio of 1.0. These and other findings in the NPS Ranger sample (Caldwell 1990/1991) substantiate the claim that a
prime component of social isolation is the lack of effective and satisfying contact between individuals and the 'outside world'. Group members in the same physical place do not experience isolation within the group; rather, they feel isolated as a group from the rest of the world.

However, the degree of social interaction or actual contact that may be achieved depends on many variables. (In this discussion, the focus is on contact between individual members of a group.) These variables can be classified into five distinct classes or dimensions (Bradley and Robertson 1991, McGrath 1984, Smith and Sainfort 1989):

1. situational determinants of organizational environment and support (regulations, restrictions, development of organizational culture, determinants of costs and benefits);
2. group environment characteristics (group size, interaction patterns, social norms, leadership);
3. task characteristics (immediacy, ambiguity, structure and duration, type and amount of information to be shared, etc.);
4. technology of the medium (ease of use, speed of access, channel capacity, time delay, type of cues that can be transmitted, actual role of the technology in the organization, and the amount of control available);
5. individual characteristics (personality types, occupational status, motivational patterns).

The different interactions between these five dimensions allow examinations of higher levels of complex influences on the degree of social interaction among group members.

Harrison et al. (1988a) have discussed multiple dimensions of privacy in their elaborations of environmental potentials and task requirements. The issue of privacy regulation as an ongoing organizational environment issue is shown in their attempt to operationalize situational discrepancies. Situational discrepancies identify deviations between the needs of the human communicator and the capacity of the medium in a given situation. The productivity needs of the human distinguish task characteristics, individual characteristics, and group environment characteristics of communication. Operating capacities of the medium specify technology factors in implementation; situational constraints characterize the organizational and task environment. This effort attempts to extend the quantification of social penetration and regulation by Altman and Taylor (1973).

Research in CMCS implementation success, therefore, should address the appropriateness of specific media in distinct types of situations with varying task and social information requirements. Maryniak and Caldwell's recent study (1992) built on previous studies of perceived important and desirable characteristics of electronic mail systems (Trevino et al. 1987, Lea 1991). They found reduced acceptance of one system (P-mail') because it was not implemented to provide communications in situations for which electronic mail is most used.

The Maryniak and Caldwell research also identified situational differences in appropriateness of both electronic mail and other media. Taha and Caldwell (1992), extending this research to a broader survey sample, demonstrated a significant situation by medium interaction in medium acceptance across 12 media and 8 situations. These studies indicate a strong conceptual relationship between specific communications tools and specific organizational contexts in evaluating social contacts and acceptability of those contacts involving electronic communications media.

5. Isolation in physical and electronic environments

The absence of an effective communication medium compatible with the individual's needs for information sharing can lead, in part, to social or physical isolation. This information sharing must support both social and task requirements of the required interactions, be supported by the organizational culture and facilities, and be capable of transmitting the necessary cues to ensure the accurate transmission and interpretation of messages.

Several researchers (Perry 1992a, Sproull and Kiesler 1991a) discuss how electronic media can serve to reduce isolation. In most cases cited, persons who are relatively remote or not in frequent physical contact with others who share their interests (such as individual researchers at small universities) gain more benefits from electronic communications. For these persons, the change is from inadequate contact and initial isolation to improved contact and new experiences with similar types of researchers. The process of using electronic communications within a group to provide a new set of shared understandings can provide too many opportunities for workers with previously adequate contact levels. With increasing speed of communications, the danger multiplies that a specific scientist or engineer will miss significant developments because of vacation or illness, or not sufficiently reflect on them because of increased information load (Perry 1992a). The lack of delay or 'inertia' in these high-speed information exchanges can reduce the ability for group members to have a common set of shared experiences.
In situations such as space travel or other physically remote groups, physical access to the group by others will be highly limited or non-existent. Therefore, mediated communications such as computer-supported communication and information links (the 'electronic environment') will be the dominant style of communication and contact. However, communication in electronic environments comes with its own difficulties, depending on the types and levels of mediation, channel capacity of the medium, and the form of the communication itself. A crucial issue in this context is that, for any ongoing group, communication serves social maintenance functions. Maintenance of emotional and physical health of group members, in addition to task functions to achieve the mission goals of the group, are achieved through effective group communication (see Feuerstein et al. 1985, McGrath 1984, and Ouellette Kobasa and Puccetti 1983 for overviews of this area).

6. Suggested costs and benefits of electronic communications environments

In many locations, electronic mail systems are used to replace other forms of communication, such as reaching persons by telephone or arranging face-to-face meetings (Schaeffermeyer and Sewell 1988). One of the primary differences between older forms of communication and that of a CMCS is that CMCS does not convey as much information about non-verbal aspects of face-to-face or telephone communication, such as physical characteristics, age, gender, and socioeconomic status. Some authors have demonstrated CMCS use resulting in increased communication flow and improved efficiency in directing information to the appropriate persons. These benefits have been related to increases in quality, quantity, and rate of work, and improved general organizational communication in those studies (see, for example, Rice et al. 1989, Rice and Shook 1988). However, not all decision-making tasks and group interactions benefit from these changes in the communication process; in fact, the benefits of improved organizational communications also can undermine organizational (or even government) structure (Perry 1992a,b).

Effectiveness of a CMCS is related to the tasks associated with the communication process. Because CMCS can provide the opportunity to contact any member of the organization directly, CMCS use can reduce costs associated with bureaucratic delays or losses. Maximum benefit from the CMCS only comes with knowledge of how the communication system is currently being used, and where improvement can be expected (Malone and Rockart 1991, Sproull and Kiesler 1991a). Improvements related to adoption of a CMCS depend on users' knowledge of the communications base which the CMCS will provide, as well as users' expectations of the CMCS capabilities and usability to study how these organizational costs and benefits relate the communications process (Rice 1990).

The message sender's and receiver's non-verbal reactions are eliminated by the use of the CMCS. Because visual and auditory cues are not available to group members, the status of an individual group member is not as easy to assess and has less of an effect on the overall group interaction (Balasubramanian 1987, Rice 1987). This lack of influence can lead to greater accuracy of decisions (in choice-dilemma problems with expert-defined correct answers) and less expression of dominance relationships on the part of group members, as compared to face-to-face interaction (Rice 1984). However, the difficulty in assessing status may be detrimental when designs or decisions involve distribution of power or implementing authority (Balasubramanian 1987).

A more dynamic perspective on social penetration and ongoing interactions (see Altman and Taylor 1973) indicates that a lack of social information prevents the development of long-term intimate relationships or shared non-verbal meanings. Some individuals do prefer or intend to limit communication to that provided in CMCS media. However, isolation can be imposed on an individual by using a CMCS to exclude those without the necessary technology or skill to use the CMCS effectively. In addition, computer-mediated communication has been shown to include more inflammatory and uninhibited comments than face-to-face communication (Dubrovsky 1987). Balasubramanian concluded the following: 'Electronic media should be used for problem-solving tasks where the emphasis is on the exchange of information, knowledge, and expertise' (Balasubramanian 1987:1359). Nonetheless, a number of other activities occur utilizing CMCS.

Several authors (for instance, Allen and Hauptman 1987, Daft and Lengel 1986, Fulk et al. 1987, Trevino et al. 1987) discuss aspects of social presence and information richness as distinctions between subjective and objective media characteristics. Social presence (Short et al. 1976) is conceptualized as the extent to which emotional contact or expression between persons is supported by a medium. Information richness relates to the amount of task-related material that can be exchanged and understood by users of a medium. (Shannon and Weaver 1949 have developed the mathematical theory of communication along similar lines).
Although there may be some logical dependence between these characteristics, it may be more profitable to conceive of objective and subjective characteristics as complementary but different dimensions of communications media. An additional issue is that task requirements and types of interaction vary in the level of richness or presence required for effective performance of the task or interaction. Relevant variables include:

1. task ambiguity, immediacy, and information channels required (Trevino et al. 1987);
2. task structure, organizational goals, and task duration (Allen and Hauptman 1987, Keen 1987).

Recent research investigating situational and transmission delay effects on acceptability in communications media demonstrated the distinction between information richness and social presence (Taha and Caldwell 1992). Subjects' ratings of communications media on an information richness scale were correlated with derived indices of medium costs (associated with time delay and benefits (associated with capacity for information and social feedback) which were in turn predictive of medium acceptability. Subjects' ratings of social presence of the same media did not show this correlation. Thus, social presence as commonly described may not be the critical dimension of medium acceptability in many organizational contexts, although information richness is still a valuable component of acceptability.

7. Potentials of electronic interaction and isolation

Research by Spears et al. (1990) suggests that groups formed through CMCS may not prefer face-to-face interaction, due to the conflicts in cues between the CMCS experience and more visual or spontaneous interaction. In addition, anonymous CMCS interactions often generate more critical comments and less personal satisfaction with group interactions than face-to-face groups (Jessup et al. 1990). These pressures may lead some persons to prefer to interact solely through CMCS. Social contact for those persons would then be limited to the information and interactions permitted through that technology.

Researchers such as Daft and Lengel (1986, Trevino et al. 1987), M. Papa (Papa and Papa 1990, Papa and Tracy 1988), and Rice (1984, Rice et al. 1990) point out that much of the communication in organizations depends on these paraverbal or nonverbal cues and that communicators prefer to use media which can transmit those cues. Paraverbal or nonverbal cues that are not available in text-based CMCS could not be transmitted. Performing cue-relevant activities in this situation could result in lower performance. A complete lack of cues which are usually critical to the required activity, but are absent in the CMCS, could lead to total termination of activities. Social interactions which occur only through CMCS could not develop the efficiency and clarity that comes from nonverbal information exchange. This type of exchange is crucial in maintaining satisfying and appropriate levels of social contact in ongoing relationships (Altman and Taylor 1973, Harrison et al. 1988a,b).

Restricting communications to relatively sparse CMCS modes will not sufficiently address the span of tasks required of the small group in the organization. Restriction of group interactions and decision-making to CMCS technologies will not benefit all types of group processes (Archer 1990, Kiesler et al. 1984, Smolensky et al. 1990), and will not be equally appropriate or efficient for all individuals in the organization (Papa and Tracy 1988, Rice et al. 1990, 1989). Additional research suggests that projections of increased cost efficiency and productivity from CMCS (see Sproull and Kiesler 1991a,b) will be inflated with respect to broad and long-term implementation across the spectrum of future CMCS users (King and Kraemer 1981).

8. The role of feedback in communications media

Losada et al. (1990) have studied the impact of collaborative technology and group process feedback on interactive sequences in face-to-face meetings. The researchers utilized the SYMLOG coding scheme to capture the ongoing group dynamics, a system which was developed by Bales and his associates at the Social Relations Laboratory of Harvard University (Bales and Cohen 1979). SYMLOG recognizes three dimensions of interpersonal behaviours: (1) dominant vs. submissive behaviour; (2) friendly vs. unfriendly behaviour; and (3) task-oriented vs. emotionally expressive behaviour. Communications feedback was introduced to groups meeting with the use of collaborative computer technology, and to groups meeting with no computer-supported collaborative environment (pencil-and-paper).

The results showed that there was a significant increase in socio-emotional interactive patterns when group process feedback was introduced in a computer-supported collaborative environment. Overall communication increased, allowing more emotional interaction to supplement the task communications seen in the no-feedback condition. Furthermore, there were
significantly fewer emotional interactions (and no significant change in task communication) in groups without collaborative technology when feedback was given. This study suggests two major impacts on organizational communication. The lack of adequate feedback will lead to a reduced social modus of interaction, and therefore increase the potential for social isolation even with physically available group members who interact primarily through electronic media. In addition, the increase of social communications in groups with both CMCS technology and feedback available does not decrease the overall volume of task-related information exchange. The implications of Losada et al.'s 1990 study support the theory that providing feedback about how an individual or a group interacts socially in a working environment could affect the amount or satisfaction of use of the communication medium.

9. Future research and directions of inquiry

In order for users to obtain maximum benefits with reduced social costs, an effective CMCS technology must fit appropriately into the communications needs of an organization. User benefits include privacy, access, speed, information exchange, and maintenance of emotional contacts and well-being. However, a large fraction of behavioral CMCS research focuses on very restricted communications modalities (McGrath 1984), even through some quantitative comparisons are available between communications styles or media (see, for example, Rice 1984, Rice and Williams 1984, Short et al. 1976). An additional source of complexity arises from the increased power of new computer hardware and software to provide additional information capabilities in ‘groupware’ contexts (see ‘Groupware’ 1991, Michalski 1991). Such additional capabilities may provide additional medium capacity for providing richer and more diverse types of interpersonal communication.

King and Kraemer (1981) draw a parallel between computing technologies and stereo technology in focusing attention on new types of problems or perceived dissatisfaction. The increased power and perceived decrease in costs for a given level of hardware capability allows people to concentrate on previously small or unperceived problems, much as an audiophile’s new stereo system exposes noise and flaws in music recordings undetected in previous listening experiences. Previously acceptable delays in report generation or exchange can be eliminated by using collaborative, electronic media. However, elimination of those production delays and immediate observation of others’ work can emphasize shortcomings in an individual’s work patterns or skills.

The gains in speed and volume of information exchange is not universally accepted or desired in organizations or the public at large (McCarroll 1991). Increased amounts of information and reliance on computer-paced systems are themselves sources of stress for many workers (Briner and Hockey 1988, Carayon-Sainfort and Smith 1991, Lindström 1991, Turner and Karasek 1984). Further, some recent discussions suggest that some information exchange delay or ‘inertia’ is desirable, and eliminating this delay may lead to decrements in system acceptability and worker productivity (Perry 1992a, Taha and Caldwell 1992).

Additional questions about possible communications media need to be answered. It is unclear whether organizations and individuals will accept new computing and media technologies to address communication needs. Possible effects of social, physical, and technological variables to influence isolation in electronic environments are unknown or inadequately researched. Potentially important issues include:

1. perceptions of delay in CMCS transmission;
2. feedback for improved use of CMCS media;
3. ergonomic and social usability of new CMCS applications;
4. speed and critical elements of CMCS medium adoption;
5. control of access and privacy in the operation of the CMCS.

Further research into CMCS processes must address the social costs and benefits of varying levels of information richness and presence involving task and interpersonal activities of the CMCS group members. Research must explore interactions between medium variables and task variables in elaborating the texture of and potential isolation in electronic environments. The concept of optimal contact ranges for situations and individuals, described by Harrison et al. (1988a), can be effectively consolidated with CMCS feedback effectiveness research (Sproull and Kiesler 1991a,b) to develop a dynamic control model of communication medium usage similar to other feedback control models described in engineering systems study (Caldwell 1992, Taha and Caldwell 1992). Specific data will be required to quantify delay, relative isolation, and situation effects in electronic environments, however. Future development in the field will proceed in several directions. Sensitive appreciation of the human experience in CMCS will depend on integrating information exchange, human–computer interaction, and human–environment interaction perspectives. This integration is required to fully comprehend the range of social
interaction benefits and isolation risks associated with newly emerging perceptions of contact and social presence in electronic environments.

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