REFERENCES

Relational Aspects of Computer-mediated Communication: Experimental Observations over Time

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M any fear that electronic communication may be less rich in social cues and, therefore, dehumanize organizations. Walther's analysis and controlled study show that electronic communication can promote some surprising, positive relational communication between people. His approach to experimenting with relational communication and his method for coding the results will be most interesting to the reader.

Gerardine DeSanctis

Abstract

Previous research on the interpersonal effects of computer-mediated communication (CMC) reveals inconsistencies. In some cases CMC has been found to be impersonal, task-oriented, and hostile. Other reports show warm personal relations, and still others show gradual adjustments in interpersonal relations over time. The past research results are also difficult to compare, as their research methods reveal inconsistent approaches. These inconsistencies include the treatment of time limits on group development, the neglect of nonverbal behavior in face-to-face, comparison groups, and other measurement issues. Each of these factors may obscure our understanding of the way CMC partners get to know and come to relate to each other through CMC. The present study attempts to address some of these concerns. This study explored the effects of computer conferencing on the interpersonal messages with which people define their relationships, known as relational communication. Observers rated the relational communication from transcripts of CMC conversations or from videotapes of face-to-face three-person groups who had worked in several sessions. Analyses showed that CMC groups achieved more positive levels on several dimensions of interpersonal communication than did face-to-face groups. On other dimensions, no differences between conditions were found. In no case did CMC groups express less intimacy or more task-orientation than face-to-face groups. Implications are drawn suggesting that under certain conditions, CMC may promote positive relational effects in ways that previous theories have not considered, and in some ways superior to more traditional media.
(*Computer Conferencing*; *Interpersonal Communication*; *Groups*; *Temporal Effects*)

For several years researchers have asked managers and subordinates to make a variety of judgements about their work relationships, involving issues such as control, supportiveness, satisfaction, and effectiveness, among others. Obviously, social interaction plays a significant role in these relational judgments....

Fairhurst, Rogers and Sarr 1987, p. 395

Overview

What do people use communication to do in organizations? They communicate to accomplish professional tasks, certainly. As they do so, they also communicate to manage their interpersonal identities, their roles, as well as the character of their relationships with others (Clark and Delia 1979, Graham et al. 1980) in a process known as relational communication.

What do people use various communication media to do in organizations? Answers to this question are somewhat less clear, as research has suggested that computer-mediated communication—electronic mail and computer conferencing—may have undesirable effects in some types of interactions. Some investigations of computer-mediated communication (CMC) suggest that such systems, due to their limited bandwidth, impede or alter aspects of communication in such a way that CMC is inferior to face-to-face (FtF) interpersonal communication. Several studies which

surveyed users (or potential users) concluded that the relational tone associated with CMC makes it less suitable for purposes where "rich" communication is needed (e.g., Hollingshead et al. 1993; Rice 1984, 1993; Rice and Case 1983; Steinfield 1986; Trevino et al. 1987; cf. Foulger 1990). As a result, while some project that the computer-mediated groups may foster enhanced connectedness and greater productivity (e.g., Finholt and Sproull 1990, Sproull and Kiesler 1991b), they simultaneously warn managers and employees about adverse effects. While advising us to be selective in our choice of media to fulfill certain communication goals, some would leave CMC for only unambiguous or unemotional information exchanges, a bit player in the large cast of communication characters.

While a relatively under-social view has emerged in most theorizing and laboratory research on CMC, other studies have shown contradictory results. Field research, in particular, has shown warm collegial relations and growing friendships (e.g., Johansen et al. 1978, Van Gelder 1985). Elsewhere, various ratios of task-orientation to socioemotional orientation within CMC have been attributed to other conditions, exogenous to CMC alone (see Hiemstra 1982, Rice and Love 1987, Steinfield 1986). Theories centered only on the bandwidth of the medium do not account for such findings.

The field is left with a rather contradictory view of CMC effects. In general, observed Lea and Spears (1991, p. 157).

> ... there is a potential conflict between the characterization of CMC as a potentially fast and efficient means of communication on the one hand, and citing the relative inefficiency of the system as a cause of frustration and uninhibited behavior on the other... These two themes—the enhanced exchange and processing of information, and uninhibited and impulsive behavior—sit rather uneasily together.

This report identifies a number of theoretical and methodological issues which may help clarify the inconsistent picture of CMC's relational effects. Accompanying a review of major theories and research in this domain, the potentially problematic effects of time, data-gathering procedures, and observer perspective in CMC research are presented. This research then reports an experimental analysis of FtF and CMC conversations, conducted in such a manner as to overcome some of the methodological problems identified earlier: using groups in a series of meetings, videotaped recordings of control groups, and outside coders as the source of data. Results are presented and discussed, followed by an assessment of support for existing theo-

ries. Unanticipated effects are also discussed, which may have been influenced in turn by secondary time, video, and coding factors. Questions for future research and management implications are suggested. To help establish some context for this research, though, a brief review of relational communication in organizations may be helpful.

Relational Communication in Organizations

Relational communication consists of the messages and message dimensions people use to define or redefine relationships (Millar and Rogers 1976, Parks 1977), how they regard their relationships, and how they regard themselves and their partners within their relationships (Burgoon and Saine 1978). Samples of organizational behavior research which may be described as relational in nature include explorations of superior-subordinate trust (O'Reilly and Anderson 1980), supervisors' communication of openness, warmth, and acceptance (Jablin 1979, 1980, 1982), attentiveness and concern (Baird and Bradley 1979), and supportive versus defensive feedback (Gibb et al. 1955). Variations in relational communication are associated with differences in the cognitive, affective, and behavioral satisfaction participants glean from professional transactions (Burgoon et al. 1987), and communication satisfaction is a potent predictor of job satisfaction (Pincus 1986), continued CMC use (Kerr and Hiltz 1982, Rockart and DeLong 1988), and future interaction in general (Hecht 1978). Relational communication in organizations is clearly an area with significant implications, and it is important to understand whether and how relational communication might be affected by a technology that continues to grow in popularity and use.

CMC's diffusion has prompted theorizing and research on how CMC differs from other communication formats. While the impetus for much original theoretical work in the area was to explain differences in decision-making communication by CMC and FtF groups, the root propositions of the theories focus on how users relate differently as a consequence of media characteristics. In general, and through a variety of perspectives, it has been suggested that CMC produces significantly different relational communication due to the number and types of cues available to participants.

CMC Theories

Social presence theory (Short et al. 1976) was originally devised to describe teleconferencing, and it has frequently been applied to CMC phenomena. The theory

defines *social presence* as the feeling one has that other persons are involved in a communication exchange. The degree of social presence in an interaction is posited to be determined by the communication medium: the fewer the channels or codes available within a medium, the less attention is paid by the user to the presence of other social participants. Since CMC typically transmits no nonverbal visual or auditory codes such as facial expression, posture, dress, or vocalics, CMC is said to be extremely low in social presence in comparison to FtF and other telecommunication media. As social presence declines, messages presumably become more impersonal (see Culnan and Markus 1987, Hiltz et al. 1986, Rice 1984, Steinfield 1986).

Sproull and Kiesler's (1986) Lack of Social Context Cues hypothesis also delineates FtF and CMC differences as a result of the social information available in CMC. Social context cues include aspects of physical environment and nonverbal behaviors that define the nature of the social situation and actors' roles and relative status (Dubrovsky et al. 1991, Siegel et al. 1986, Sproull and Kiesler 1986). When these cues are absent communication is said to become more excited and uninhibited. This may lead to increased "flaming," swearing, and hostile, intense language (Sproull and Kiesler 1986); name-calling and insults (Weisband 1992); impolite statements (Kiesler et al. 1985); greater self-absorption versus other-orientation, messages reflecting status equalization, and more equal amounts of verbiage contributed by each member of a group (Kiesler et al. 1984, Siegel et al. 1986, Sproull and Kiesler 1986; cf. Lea et al. 1992).

Media richness theory (Daft and Lengel 1984, 1986; Daft et al. 1987; Trevino et al. 1987, 1990) also focuses on the bandwidth or number of cue systems available within different media. Face-to-face is "richest," due to the availability of immediate feedback and the number of channels utilized. CMC is a "leaner" channel, since no nonverbal cues are present. Media richness theory suggested that managers use "rich media" to communicate highly equivocal information, and "lean" media (e.g., memoranda and CMC) for less equivocal exchanges. The original theory was prescriptive, and some early research bore out the effectiveness of adopting such rational choices. Subsequent work has shown that *actual* media choices tend to be made based on one's perception of the utility of a medium, and further, that these perceptions are socially constructed (Fulk et al. 1987, 1990). Markus (1994) has shown that these perceptions and uses do not necessarily correspond to those suggested in the original theoretical formulation. Past the point of media selection, however, this approach is less clear about the nature of communication on-line.

Social presence theory, the lack of social context cues hypothesis, and media richness all point to similar causes and effects regarding the relational nature of CMC. Indeed, the former two theories have been called the "cues-filtered-out" approaches by Culnan and Markus (1987), since they assume that changes in bandwidth and the types of cue systems alone "will result in predictable changes in intrapersonal and interpersonal variables" (p. 423). Because this perspective asserts that the structure of the medium alters the nature and interpretation of messages, it implies that such effects are inherent and constant whenever people communicate using computers. A strict interpretation of such a perspective disallows any effects of extrinsic factors such as relationships or context, and any dynamics within or across conversations such as development or change across time (Walther 1992).

Early CMC experimental research on group and interpersonal interaction generally supported the cues-filtered-out perspective. For example, CMC partners were found to be less likely than FtF partners to express agreement or concurrence in groups, and CMC was more task-oriented (see, e.g., Hiltz 1975, Hiltz et al. 1978, 1986; Hiltz and Turoff 1978). Based on evidence of negative and/or inflammatory emotional expression in computer conferencing, users have been described as self-absorbed and less likely to form impressions of other actors as distinct individuals (Kiesler et al. 1985, Sproull and Kiesler 1986). A review of results from laboratory experiments on group conferencing led Hiemstra (1982) to suggest, "the research so far points to a general conclusion: As bandwidth narrows from face-to-face interaction to computer terminal interaction, the communication is likely to be experienced as less friendly, emotional, and personal, and more serious, businesslike, depersonalized, and task oriented" (p. 883). Rice (1984) also concluded that the task-oriented nature of CMC was well accepted, and this characterization has continued in much of the experimental literature since then (e.g., Hiltz et al. 1986, Connolly et al. 1990). These conclusions are often reversed in field studies (e.g., Beals 1991) or longitudinal research (e.g., Hollingshead et al. 1993).

Effects of Time. In efforts to explain inconsistent interpersonal effects, one troublesome aspect has to do with the effect of time on groups' and individuals' performance with the new media. McGrath (1991) and colleagues (Hollingshead et al. 1993, McGrath et al.

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1993) point out that most group research in general has ignored important elements about groups' use of and responses to temporal factors. Williams et al. (1988) have called for longitudinal research in CMC particularly, recommending that "researchers studying new media use theories, designs, and methods that take change over time into account in order to improve the meaningfulness of their results and to capture the social dynamics of the new media " (p. 65; see also Hesse et al. 1988). Unfortunately, few CMC laboratory or field studies examining interpersonal outcomes have taken the effects of time into primary consideration.

Although time effects have been explored in CMC conflict management, satisfaction, and interaction patterns (e.g., Baroudi et al. 1986, Hiltz and Turoff 1978, Johansen et al. 1978, Rice and Case 1983, Rice and Love 1987, Zigurs et al. 1990), their effects on relational tone have not been examined explicitly until very recently. Early studies typically involved short-term laboratory experiments, often with a FtF control group, *or* long-term field studies with no particular control. Without the comparisons offered by control groups (as in the lab studies) and a longitudinal frame (as in field studies), generalizing about CMC over time is almost impossible. While Hollingshead et al. (1993) recently conducted a longitudinal experiment using CMC and FtF groups, task resolution was given greater attention than relational dynamics.

The importance of time is magnified when we consider that time may actually be a confound in early CMC experiments, for the following reasons: (1) For the sake of experimental control, most CMC experiments provided equal and limited time periods among FtF and CMC groups (2) CMC users' typing requirement reduces the number of messages they are able to transmit in the same period as FtF communicators (Hiltz et al. 1986, Siegel et al. 1986, Weisband 1992, see also Rice 1980). Additionally, CMC's restriction to the single linguistic channel means that less total infor-- mation—especially social information—travels in a given time than when multiple channels are used. (3) Relational communication in groups may develop across time and messages. Several studies in small group development have described groups' first exchanges as heavily task-oriented, while it is generally their final encounters which show greater cooperation and solidarity (see for review Fisher 1974; see also Bales & Strodtbeck 1951, McGrath 1984, Tuckman 1965). Thus, experiments with brief and equal intervals for CMC and FtF conditions may constrain "slower-speaking" CMC users' opportunities to develop inter-

personal relations relative to their FtF counterparts. Thus, if computer-mediated groups work more slowly than FtF groups, the finding that CMC is more task-oriented may be due to cutting off experiments before other, more socioemotional phases and messages occur (Walther 1992).

The case for CMC exchanging social information more slowly is also suggested by other results. The literature shows that CMC groups often do not finish the same tasks in the same limited time as FtF groups (e.g., Hiltz et al. 1986) or do not do as well as FtF groups (Hollingshead et al. 1993). However, when groups are allowed to continue and finish their tasks, CMC groups take about four times as long to exchange the same number of messages as FtF groups (Dubrovsky et al. 1991, Weisband 1992). Likewise, when CMC groups work over long periods, the quality of their decisions is better (Hollingshead et al. 1993). It may be inferred from this that CMC operates at a slower *rate*, and time-limited interactions abbreviate the relational development possible via the electronic medium.

Effects of Data-Gathering. Another major concern confronting previous CMC/FtF comparisons has to do with the exclusion of nonverbal behavior in the data-gathering on FtF groups. Past cross-media studies have employed FtF audiotape or transcripts in order to compare the verbal content between the media. They do not capture movement, posture, gaze, touch, and spatial behaviors; transcripts further leave out all vocalic behaviors. In methodological studies, data coded from these sources are dissimilar to participants' own assessments (Burgoon and Newton 1991), and they differ significantly from the social interpretations made by coders observing videotapes of the same conversations (Street et al. 1988). When nonverbal behaviors of FtF participants are ignored, we cannot discount the possibility that a great deal of whatever socioemotional cues which FtF groups emit are systematically excluded from analysis.

The implications of such methodological choices are quite serious. If all nonverbal behavior was consistent with verbal remarks, then nothing would be lost. But nonverbal communication is often disparate from, even contradictory to, verbal messages (Ekman and Friesen 1969). The implications of this suggestion can be seen through example: Hiltz et al. (1986) found that the number of agreement statements was greater in FtF and disagreements were greater in CMC. While this may be because the electronic medium makes people less agreeable, it is entirely plausible that FtF partners

expressed their disagreements with head shakes, postural lean, and other silent maneuvers. With nonverbal behavior excluded from coding we cannot know, and conclusions about the differences between the social behaviors of FtF and CMC groups may be flawed.

Social Information Processing Theory

Several "threads" of independent research have also suggested greater variation in the relational aspects of CMC than the cues-filtered-out positions would dictate. First, some have documented various linguistic and typographic manipulations which may reveal social and relational information in CMC (e.g., Allen 1988, Asteroff 1987, Holmes 1991, Lea and Spears 1992, Sherblom 1988). Second, some have speculated that relational tone might change as a function of time in CMC (Johansen et al. 1988, Kerr and Hiltz 1982, Rice and Love 1987).

Social information processing (SIP) theory (Walther 1992) integrates these "threads." Social information processing refers to the way by which communicators process social identity and relational cues (i.e., social information) using different media. The theory attempts to explain and predict participants' interpersonal accommodation via CMC and FtF channels. The critical difference between FtF and CMC from this perspective is a question of rate, not capability. The limited bandwidth of CMC offers less total information per exchange than does FtF exchange, and relational development in CMC is further retarded when typing and/or asynchronous exchanges slow message transmission even further. The progression of relational development should therefore be slower in CMC and FtF. However, the theory posits, "given sufficient time and message exchanges for interpersonal impression formation and relational development to accrue, and all other things being equal, relational (communication) in later periods of CMC and face-to-face communication will be the same" (Walther 1992, p. 69). This differs from a suggestion that CMC users simply become accustomed to and overcome the reduced-cue medium (e.g., Hollingshead et al. 1993, McGrath et al. 1993). While the end result may be similar, SIP theory suggests that information accumulates via exchanges over a consistently narrow but potentially social bandwidth.

The term "social information processing" has appeared in the CMC and organizational literature more than once. Fulk et al. (1987; see Salancik and Pfeffer 1977, 1978) used it to describe a model of media choice in which socially-constructed subjective assessments of media determine channel selection (which they have

since re-named the "social influence model"; Fulk et al. 1990). Walther's (1992) theory uses "social information processing" to describe how persons process social information and communicate their relationships based on that information. This use of the term is consistent with the psychological literature on impression-formation and related social cognition (e.g., Lord, 1985; Taylor and Crocker 1981, Wyer, 1980, Wyer and Srull 1980), and Shetzer's (1993) investigation of employee participation processes.

Initial tests of this SIP perspective produced mixed but generally supportive results. An experiment was conducted examining CMC and FtF groups over time (Walther and Burgoon 1992). In that research, groups assigned to CMC or FtF which met several times over two months showed some predicted changes toward greater affiliation and convergence in relational communication between the two conditions. However, that effort employed data from participants' self-administered measures. As a result, methodological issues involving participants' perspective and questionnaire administration arise which make comparisons to other results difficult.

The perspective issue revolves around the notion that actors' versus observers' experiences may not be the same. Most previous experiments in CMC used observer-generated data for relational tone analyses; the Walter and Burgoon research did not. When conversational participants judge their partners, a "mutual contingency" exists (Jones and Gerard 1967): The actor not only observes, but is also affected by, the target. A passive observer would not be so affected, and much conversational action is more salient to observers than to an actor (Jones and Nisbett 1971). Actors' and observers' judgments may differ.

A second issue concerns the method of questionnaire administration. In Walther and Burgoon (1992) subjects completed three administrations of the same scale items. While this method allows for the detection of temporal change, repeated administrations of the same instrument present some danger of reactivity. Evidence generated by outside coders would dispel this threat and enhance the findings.

In order to address the conceptual and methodological concerns outlined above, an analysis was conducted by coders from Walther and Burgoon's FtF videotapes and CMC transcripts of experimental groups with repeated interactions.

Relational Change in CMC and FtF

A comprehensive set of themes for relational communication was developed by Burgoon and Hale (1984),

and subsequent measurements confirm that communicators deploy and recognize variations in these dimensions (e.g., Burgoon et al. 1984, Burgoon and Hale 1987, Burgoon and Newton 1991, Burgoon et al. 1989). These dimensions include *intimacy*—which is comprised of the subdimensions *immediacy/affection*, *receptivity/trust*, and *similarity/depth*—and *composure/relaxation*, *formality*, *dominance/inequality*, and *task-social orientation* (Burgoon and Hale 1987). Their rating scheme allows for judgments from nonverbal as well as verbal messages.

With these dimensions in mind, the following section offers contrasting predictions for relational communication by groups in FtF and CMC conditions, based on cues-filtered-out and SIP perspectives. Both views suggest the same between-conditions effect in initial conversations. The critical divergence will be whether these effects are maintained over time: The cues-filtered-out perspective suggests stable differences reflecting more positive outcomes for FtF groups. In analysis of variance terms, a main effect for communication condition would be hypothesized (e.g., Kiesler et al. 1985). As SIP predicts that levels will converge over time (in most cases), its first specification is that of a disordinal medium-by-time interaction, and the pattern of the interaction must be such that convergences occur later rather than earlier in the groups' development. In order to examine this prediction, trends must be analyzed.

Several works in the literature speak to the evolution of how groups approach their tasks over time. Unfortunately, these works are inconsistent and have been challenged in recent research. The Walther and Burgoon (1992) test of SIP drew most of its hypotheses from the literature on interpersonal relationship development, and incorporated some of the more persistent patterns from phasic group theories as well. In order to provide a more orderly comparison among theoretical approaches, those hypotheses and their rationale are replicated here, as follows.

Immediacy/Affection. The first dimension incorporates items relating to immediacy, affection, inclusion and involvement (Burgoon and Hale 1984). A strict cues-filtered-out approach suggests that this dimension would seem unlikely to become very positive without nonverbal cues in CMC. One might predict a strong effect for communication condition such that FtF groups are more immediate/affectionate than CMC groups.

The SIP view incorporates more dynamic immediacy notions. Immediacy may be conveyed verbally as well as nonverbally (Wiener and Mehrabian 1968), and re-

search indicates that communicators make up for immediacy losses in one channel through increases in another other over a sequence of exchanges (Argyle and Cook 1976). With the capability for partners to exchange immediacy through language, CMC partners may eventually match FtF partners' immediacy levels. Partners in FtF settings may build immediacy/affection quickly, using nonverbal and verbal information, to a plateau. In CMC, however, where immediacy/affection cues are less abundant, participants will require more exchanges to obtain similarly developed levels; their development will occur more gradually.

The first SIP hypothesis is offered as follows:

H1. *There is an interaction of time and medium on immediacy/affection such that (a) immediacy/affection is greater in initial FtF conversations than in initial CMC conversations, and (b) immediacy/affection increases and converges in FtF and CMC after many message exchanges in both conditions.*

This hypothesis suggests that the trend for immediacy/affection may produce a linear and quadratic trend in FtF while immediacy increases linearly in CMC.

Similarity/Depth. Similarity/depth includes the communication of attitude likeness, interest in a deeper relationship, and how familiar and nonsuperficial the relationship is. In social penetration theory (Altman and Taylor 1973), depth includes the degree of knowledge partners have of each other. In the cues-filtered-out literature, the idea of reduced social presence suggests that similarity/depth should remain lower in CMC than in FtF conversations; DeSanctis and Gallupe (1987) speculated that computer-mediation reduces interpersonal attraction and group cohesiveness by increasing the psychological distance between discussants.

Similarity/depth may increase through self-disclosure (see Burgoon and Hale 1984). As such it is more likely to increase as conversations continue. Since disclosure is a verbal behavior, there is less reason to suspect that the absence of nonverbal cues in CMC should retard depth development. For this reason, Walther and Burgoon's (1992) SIP hypothesis specified only a time effect rather than a time-by-medium interaction, such that the progression of similarity/depth should be similar between the two media conditions. This represents somewhat of a departure from the divergence/convergence patterns deduced for other dimensions from SIP theory; it did not explicitly consider whether slower rates of exchange in CMC may still be a factor. Thus the original hypothesis is re-

peated, and an additional research question may probe for differences between media after initial conversations by groups.

H2. *Depth increases monotonically in both CMC and FtF as the number of exchanges increases (i.e., initial levels are not expected to differ, and both conditions reflect a similar positive linear trend).*

RQ1. *Is similarity/depth lower in CMC than FtF in initial exchanges?*

Composure/Relaxation. Composure/relaxation reflects the degree to which communicators express calm versus tension and arousal (Burgoon and Hale 1987, Burgoon et al. 1989). Kiesler et al. (1985) hypothesized that CMC partners would experience greater arousal than FtF communicators, and that this difference would persist over time. However, communication generally becomes more relaxed as relationships develop (Knapp 1984) and arousal reactions to the near presence of others dissipates as communicators grow accustomed to each other (see Le Poire 1991). Communicators who may at first be anxious about meeting new partners should relax as their uncertainty is reduced over time.

The SIP perspective suggests this latter pattern. While less nonverbally-transmitted information may contribute to less uncertainty reduction and composure in CMC than FtF in *initial* conversations, accumulated information should lead CMC communicators to achieve similar relaxation as FtF partners, eventually. Indeed, the results of Kiesler et al.'s (1985) investigation showed that communicators' physiological arousal (pulse and palmar sweat) declined significantly across three measurement points in both CMC and FtF conditions; the time effect was greater than the communication condition difference.

H3. *There is an interaction of time and medium on composure/relaxation such that (a) composure/relaxation is greater in initial FtF conversations than in initial CMC conversations, and (b) composure/relaxation increases and converges in FtF and CMC after many message exchanges in both conditions; i.e., initial levels are higher in FtF than CMC, both become more composed/relaxed, and final levels converge.*

Formality. Looking at the effects of medium alone, there are mixed expectations for the level of CMC formality. The written aspect of CMC may lead to increased formality, since written messages are generally not as "rich" as the "natural language" used in oral conversations (see Daft and Lengel 1984, 1986).

Alternatively, the lack of turn-taking in computerized group meetings may lead to greater informality (Siegel et al. 1986). The cues-filtered-out perspective is not clear on this dimension. A research question is posited,

RQ2. *Is CMC more formal or less formal than FtF in initial conversations?*

Taking a developmental approach, initial conversations are typically somewhat formal (Berger and Calabrese 1975), and relationships generally become more informal as they develop (Knapp 1984). In the case of groups who interact only in the context of task resolution, however, informality should not be expected to become extreme, and a plateau level of informality should be achieved in time. While the medium may have some initial effect on message formality (although unspecified in terms of direction), users are likely to imbue their messages with informality cues as they proceed. For the following SIP hypothesis, the direction of difference between the conditions in their first conversations is not specified. However, CMC and FtF messages are expected to become less formal and similar after time.

H4. *There is an interaction of time and medium on formality such that (a) formality is different in initial CMC conversations than in initial FtF conversations, and (b) formality decreases and converges in FtF and CMC after many message exchanges in both conditions; i.e., initial levels are significantly different in CMC than FtF, both become less formal, and final levels converge.*

Dominance/Inequality. Dominance is associated with efforts to control, command, and persuade others. Equality connotes cooperation and mutual respect. Previous CMC experiments show greater equality in CMC where equality has been defined as participation level. The interpersonal tone of the participation may be quite different. CMC has been reported to induce greater hostility and flaming (but see Lea et al., 1992). Thus the cues-filtered-out prediction for dominance is uncertain. CMC may foster more dominating messages than those among FtF groups, or greater equality. A research question addresses this issue.

RQ3. *Is CMC more dominant or less dominant than FtF conversations in initial conversations?*

Either difference may occur across time, as the cues-filtered-out view suggests, or just at first according to SIP. Developmentally speaking, dominance should decline in groups over time, although the trend may be

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curvilinear or linear. In initial interactions generally, messages are nonthreatening, short, and balanced (Berger and Calabrese 1975). Although most groups attempt a direct path from inception to completion without conflict, interpersonal conflict is nevertheless common. As groups develop, members size up each others' task expertise and resources and they assert dominance (Caplow 1959, Putnam 1986). Thus, from initial to intermediate conversations, dominance messages may increase. As groups head toward closure, however, greater cohesiveness and solidarity is expected (see Bales and Strodtbeck 1951, Gersick 1989); dominance should decline. Over time, CMC participants should exhibit patterns similar to FtF communicators, i.e., first increased, then decreased dominance. A nondirectional difference between media is predicted for initial conversations, while convergence is expected as groups progress.

H5. *There is an interaction of time and medium on dominance/inequality such that (a) dominance/inequality is different in initial CMC conversations than in initial FtF conversations, and (b) dominance/inequality increases and decreases in FtF and CMC in relationship with message accumulation, such that final conversations are lower in dominance/inequality than median conversations, and both conditions reach a similarly lower level; i.e., initial levels are different in CMC than FtF, median levels are higher than initial levels, and final levels are lower.*

Receptivity/Trust. This dimension pertains to the expression of rapport, openness, and the desire to be trusted (Burgoon and Newton 1991). Media effects have been said to reduce trust in one early experiment reported by social presence theorists Short et al. (1976). In that research, trust—as evidenced by cooperative versus competitive strategies in Prisoner's Dilemma simulations—was lower in electronic and written media than among FtF (non-mediated) partners.

As relationships progress, however, trust may increase. Even in social traps like the Prisoners' Dilemma, behavior reflects more mutual trust when players are allowed to communicate with each other freely (see Marwell and Ames 1979). Given that trusting behaviors seemed to be affected by communication medium in limited duration interactions, but that trust/receptivity may increase as relationships and communication exchanges progress,

H6. *There is an interaction of time and medium on receptivity/trust such that (a) receptivity/trust is greater in initial FtF and in CMC conversations, and (b) recep-*

tivity/trust is similarly greater after many message exchanges in either medium; i.e., initial levels are higher in FtF than CMC, while final levels converge.

Task-Social Orientation. This continuous dimension measures the extent to which messages range from work-related to personal. Theoretical and empirical claims about task versus social orientation in CMC have been a major element in the CMC literature, with cues-filtered-out research claiming that CMC is more task-oriented than is FtF discussion.

While greater task orientation may appear in initial CMC interactions, interpersonal solidarity is an outcome of task accomplishment (Beebe and Masterson 1986), and participants in both CMC and FtF discussions should become more socially-oriented over time. As in the case of informality, where groups continue to work on decision-making tasks, they should not become exceptionally social, but reach a balanced state of task and social orientation. The SIP perspective hypothesis, then, is as follows:

H7. *There is an interaction of time and medium on task orientation such that (a) task orientation is greater in initial CMC than in FtF conversations, and (b) that task orientation becomes similarly lower after many message exchanges in either medium; i.e., initial levels are more task-oriented in CMC than in FtF, while final levels converge.*

Method
Stimulus Materials
Groups using CMC and FtF meetings provided recorded discussions for analysis by outside raters. For these groups, 96 participants were randomly assigned into one of 32 three-member groups, 16 groups each in CMC and FtF conditions. Participants were undergraduate students at a large university representing several majors and class levels who participated in this project for course credit. No group members knew each other beforehand. Some general guidelines for research using zero-history partners were followed. First, group members were told that they would meet in their groups together over several sessions. Second, following McGrath (1984), "concocted" or "temporary" alliances must be presented with some real incentive tied to the outcome of their task accomplishment; then aggregates of randomly selected individuals become real partnerships, and their behaviors should be generalizable and realistic. Accordingly, participants were informed that their course grades would be determined in part by the level of participation and the quality of

decisions on several decision tasks they would perform in the conferences/groups. (In actuality, all those who contributed whatsoever to all tasks received full credit.) While the use of student subjects offers questionable generalization to professional users of CMC, since this study is intended as a longitudinal parallel to previous experiments which also employed student subjects, the issue is of less concern in the present case (see also McGrath 1993).

CMC Condition. CMC participants signed up for and attended one of eight training sessions. The asynchronous CMC system used was the COSY COnferencing SYstem (see Rapaport 1991, Smith 1988) hosted on the university's Vax mainframe. Participants could access COSY from several campus terminal locations 24 hours a day or with a personal computer and modem. COSY messages are automatically imprinted with the user's last names, message number, date, time, and length of messages. COSY users can post, read messages sequentially, or re-read messages; users can also link comments to previous postings.

Participants faced three loosely-structured decision-making tasks over the five week course of the conference. The tasks were intended to be involving and relevant to the subjects' interests in order to generate discussion and authentic group behavior (see McGrath 1984). They involved scenarios of faculty hiring strategies, use of writing-assistance software for college papers, and mandatory student ownership of personal computers. Subjects were asked to develop and reach consensus on policy recommendations to university administration for each scenario. A multivariate analysis of variance showed no significant effect of tasks on relational communication variables. The order of the tasks was counterbalanced across groups. Deadlines were given, and participants were reminded that they would be evaluated on their participation and decision quality. Participants were free to read and write messages on COSY whenever they wished during the project; there were no "meetings" during which all members interacted simultaneously.

FtF Setting. FtF groups were instructed to attend a classroom for three discrete meetings on different dates spread over a five week period. Meeting periods were scheduled to allow two hours; the median time groups took was 28 minutes, and no meeting exceeded 70 minutes. The classroom featured a large desk, and three padded chairs. On the desk was a tabletop microphone, three pens, and three copies of the decision task. A videotape camera was placed in the FtF meeting room across from the participants, fully exposed, paralleling the CMC groups' knowledge of the experimenters' consistent perusal of their messages. One of several lab assistants conducted meeting sessions. The tasks were identical to those used in the CMC condition, but the instructions were modified slightly to accommodate the FtF administration.

Using these procedures, the CMC and FtF conversations were recorded, and these recordings became the stimulus materials for the observational coders. The median portions of each group's records at each time were reproduced for observation. For FtF groups, the central ten minutes of each videotaped interaction were copied onto another tape; for CMC transcripts, it took ten minutes to read nine pages, so the central nine pages of each groups' discussion on each task were duplicated. Each transcript section was copied three times. In each copy, one participant's comments were highlighted with a pencil line. In this way a coder could focus primarily on one participant's comments at a time, then the next, then the next, over the course of three readings. Likewise, each videotape coder viewed each tape three times, each time focusing primarily on a different participant in the group. In this way, each coder rated all three members in a group.

The notions that groups may change within a single meeting may raise concern over the decision to code the central ten minutes of each episode. At worst, the current results may be limited to the midpoint interactions of groups. As Gersick (1988) found, groups often change their orientation to task completion midway through their history. Given this, however, the central ten minutes may offer the most representative glimpse of a group; they are most likely to capture the pre- and post-midpoint interactions. At the same time, Gersick (p. 18) reports that groups' interpersonal "pattern of internal interaction" is established very early in its progression and persists almost throughout its duration on a particular task; relationally, the midpoint is probably not unique. In any case, this strategy offers the most efficient way to examine differences between media conditions and episodes over time.

Coders

One hundred and ninety-two coders were used in the analysis. These coders were recruited from a variety of undergraduate courses and given class credit for their participation. Coders were trained briefly by way of oral and written instructions which directed coders to complete their evaluation of one participant before they began observing the next; they were told to pay attention to "the way (subjects) said things" in addition to the content, and to subjects' nonverbal behavior in FtF coding. Two coders observed and assessed each

group/time episode. The order of the participants observed was rotated, as indicated by the order of the subjects' name on the coders' rating sheets.

Messages

A check was conducted to verify that the number of message units exchanged did not vary by communication condition or by task. Eight coders were trained to identify "idea units" (see, e.g., Weisband 1992), defined as the expression of a one whole idea or propositional utterance (similar to a subject-predicate construction, but often including grammatical fragments and run-ons), from the verbiage in FtF videotapes and CMC transcripts. Any single coder rated both videotapes and transcripts. Inter-coder reliability was examined on 10% of the data, and reliability equalled or exceeded alpha 0.98. Analysis of variance revealed no differences in message counts between conditions, times, or due to the condition by time interaction. These tests verified that the subsequent coding of median discussion periods would reflect equal or near-equal intervals of message accumulation.

Dependent Measures

Coders completed 64 Likert-type items of the relational communication questionnaire (Burgoon and Hale 1987) after observing each of three subjects in a group. Inter-item reliability was analyzed for each relational communication dimension using Cronbach's alpha, and items were dropped which substantially lowered dimensional reliability scores. Final reliability coefficients were generally high, immediacy/affection = 0.90, similarity/depth = 0.88, composure = 0.83, formality = 0.89, dominance = 0.93, receptivity/trust = 0.82, and task-social orientation = 0.86.

Results

Hypotheses were tested in two stages. First, analysis of variance was employed to detect interaction and main effects among condition and time. A variable was included in the analysis reflecting a between-subjects random factor for *groups*, nested within CMC/FtF condition. Thus the overall design was a 2 (conditions) by 16 (groups nested in condition) by 3 (time) ANOVA with time as a repeated factor. This approach also yielded the appropriate error terms for analyses of the interaction and condition effects (see Rosenthal and Rosnow 1985, Winer 1971). Second, one degree of freedom orthogonal contrast analyses were planned for tests between conditions of the initial (time-one)

Table 1 Means and Standard Deviations for Relational Communication Dimensions by Condition and Time ($n = 48$)

		Time 1	Time 2	Time 3
Immediacy/	CMC	3.51 (0.58)	3.70 (0.54)	3.43 (0.67)
Affection	FtF	3.37 (0.66)	3.34 (0.67)	3.20 (0.62)
Similarity/Depth	CMC	3.18 (0.68)	3.33 (0.52)	3.13 (0.65)
	FtF	2.97 (0.55)	2.99 (0.50)	2.87 (0.46)
Composure/	CMC	3.76 (0.47)	3.89 (0.40)	3.78 (0.48)
Relaxation	FtF	3.74 (0.64)	3.51 (0.60)	3.43 (0.59)
Formality	CMC	2.70 (0.77)	2.49 (0.75)	2.37 (0.65)
	FtF	2.53 (0.69)	2.67 (0.56)	2.57 (0.69)
Dominance	CMC	2.81 (0.92)	2.63 (0.69)	2.71 (0.73)
	FtF	2.57 (1.01)	2.56 (1.00)	2.65 (1.07)
Receptivity/	CMC	3.75 (0.51)	3.83 (0.41)	3.68 (0.54)
Trust	FtF	3.81 (0.43)	3.79 (0.52)	3.67 (0.39)
Task/Social	CMC	3.73 (0.65)	3.90 (0.50)	3.60 (0.66)
Orientation	FtF	3.50 (0.83)	3.17 (0.71)	3.29 (0.97)

discussions. Tests of the hypothesized trends were also planned as polynomial contrast analyses (see Rosenthal and Rosnow 1985).

Immediacy/Affection

H1 predicted a condition by time interaction such that (a) immediacy/affection is greater in initial FtF than in CMC conversations, and (b) immediacy/affection increases to similar levels after many exchanges in both media. The condition by time interaction was non-significant. Instead, main effects were obtained both for communication condition, $F(1, 30) = 11.26$, $p = 0.002$, $\eta^2 = 0.05$; and for time, $F(2, 60) = 6.91$, $p = 0.005$, $\eta^2 = 0.05$. The pattern of means is presented in Table 1.

Surprisingly, the condition effect was in the opposite direction than predicted for the time one discussions (H1a) in that CMC groups were rated *higher* in immediacy/affection than were FtF groups, at time one as well as times two and three. The time effect did not reflect H1b since means for time three were not higher than in time one in either condition. Accordingly, the trend analysis (for H1b) was not conducted.

While SIP Hypothesis 1 was not supported, neither was shown a pattern resembling a cues-filtered-out prediction. In fact, the higher immediacy/affection ratings for CMC over FtF across time is antithetical to that perspective.

Similarity/Depth. Within the SIP framework, similarity/depth was hypothesized to increase linearly in both

conditions over time (H2); no interaction and no time one between-conditions difference were predicted. However, a main effect for conditions emerged, $F(1, 30) = 20.32$, $p < 0.001$, $\eta^2 = 0.10$; CMC groups were rated higher in similarity/depth than were FtF groups across all three times (see Table 1). There was no interaction effect, nor did a main effect for time emerge (as predicted). As the pattern of means showed that similarity/depth was not greater at the time three than at time one within CMC, further trend analyses were not conducted.

RQ1 was posited to test whether similarity/depth is lower in CMC than in FtF communication during initial exchanges. As mentioned, the means were in the opposite direction than assumed in the hypothesis. RQ1 was not affirmed.

No other effects were significant. These patterns do not support the hypotheses about similarity/depth, save for the underlying rationale that communicators can express this dimension through CMC. Once again, CMC groups were unexpectedly more prosocial in their higher similarity/depth ratings than were their FtF counterparts.

Composure / Relaxation

H3 predicted a condition by time interaction, such that (a) composure/relaxation is greater in initial FtF than in CMC conversations, while (b) composure/relaxation levels both increase after time one to similar levels. A condition by time interaction obtained, $F(2, 60) = 3.96$, $p = 0.024$, $\eta^2 = 0.05$, but the interaction was ordinal and patterns of the means progressed differently than expected. Rather than becoming more similar between conditions over time, CMC/FtF scores began as nearly identical and then diverged. While FtF was expected to be higher than CMC in composure/relaxation at time one, CMC appeared more composed/relaxed overall, and a significant main effect for condition obtained, $F(1, 30) = 11.88$, $p = 0.002$, $\eta^2 = 0.10$. CMC showed some increase in composure at time two, and FtF groups declined (see Table 1), so the test for the predicted trends was inapplicable. These data suggest rejection of H3, although it is noteworthy that CMC was once again rated higher on this construct than was FtF.

Formality

RQ2 asked whether CMC is more formal or less formal than FtF in initial conversations. Although the absolute score appeared higher for CMC and FtF at time one, a two-tailed 1 df test of the time-one scores in both conditions revealed no significant difference, $t(30) = 0.06$, $p > 0.05$.

The patterns of the means indicated that after time one, CMC became less formal, while FtF moved toward greater formality. The disordinal condition by time interaction on formality obtained, $F(2, 60) = 3.09$, $p = 0.053$, $\eta^2 = 0.093$. Although no differences were detected when time-one scores were examined alone (H4a), the disordinal interaction suggests that there was a difference in the directions of the conditions over time, and the means indicate a pattern of divergence-to-convergence (although not at time 3). Given the unanticipated fluctuations in FtF formality, the CMC means alone were tested for a linear decrease over time with a 1 df polynomial contrast. This test was significant, $t(6) = 2.44$, $p < 0.01$, $\eta^2 = 0.04$, offering partial support for H4b. According to observers, then, CMC partners become more informal over time, as hypothesized, although FtF may not.

Dominance

RQ3 addressed whether CMC was more or less dominant in initial conversations. The time-one scores were tested with a 1 df contrast analysis, which showed that CMC groups were more dominant than FtF, $t(30) = 2.55$, $p < 0.01$, $\eta^2 = 0.007$.

In regard to H5, there was no interaction effect, nor did the pattern of means suggest that the specific trends had occurred. A main effect for CMC/FtF condition was significant, $F(1, 30) = 5.53$, $p = 0.025$, $\eta^2 = 0.16$, with CMC higher in dominance than FtF.

Upon first inspection these results indicate a cues-filtered-out effect. However, more detailed analyses cast doubt on that interpretation. While H5a—common to both cues-filtered-out and SIP—allowed for the obtained difference between CMC and FtF, H5b suggested that this difference should dissipate over time. Indeed, the means at subsequent points seemed much closer, and this suspicion was tested via further post hoc tests of the scores at each time (left at a more liberal 0.05 alpha since tests were orthogonal). These tests revealed no CMC/FtF differences at times two ($t[30] = 0.648$) or three ($t[30] = 0.694$). While these tests cannot conclusively demonstrate the failure of differences, it seems reasonable that the between conditions effect is accounted for by the time-one CMC/FtF difference. The means at times two and three appear to be very similar between conditions as might be expected in SIP. Overall, the observers' ratings support only one aspect of the hypotheses, that CMC was more dominant in initial interactions than was FtF.

As there was no significant interaction effect, it is indeterminant whether there was or was not some convergence between the conditions in later sessions.

Receptivity/Trust

SIP Hypothesis 6 specified a condition by time interaction such that receptivity/trust (a) is greater in initial FtF than in CMC conversations, while (b) receptivity/trust increases thereafter to an equal level. In both conditions, time three scores did not appear higher than previous scores (see Table 1), obviating the predicted H6b trend.

Regarding H6a, observers' ratings of FtF groups were not significantly higher in receptivity/trust than were CMC groups at time one, $t(30) = 0.73$. Overall, the observers' ratings of receptivity/trust did not support Hypothesis 6. No other main or interaction effects were significant. Communication of receptivity/trust was not differentiated by medium or time.

Task-Social Orientation

H7 predicted a condition by time interaction on task-social orientation such that (a) CMC is more task oriented than FtF at time one, and (b) both conditions become lower in task orientation over time to a similar level.

Contradicting H7a, FtF was not less task-oriented than was CMC at time one. Indeed, FtF was rate *more* task-oriented across all times, resulting in a significant and large main effect for condition, $F(1, 30) = 12.79$, $p = 0.001$, $\eta^2 = 0.299$. This difference was especially pronounced at time two (see Table 1), where FtF groups were most task-oriented and CMC was most socially oriented, producing an ordinal condition by time interaction, $F(2, 60) = 5.99$, $p = 0.004$, $\eta^2 = 0.166$. Planned comparisons for the simultaneous trends were inapplicable. CMC alone was tested for change over time; a 1 df contrast test showed a significant but minor difference such that CMC was more socially-oriented at time three than at time one as predicted, $t(60) = 1.80$, $p < 0.05$, $\eta^2 = 0.02$.

The means of the two conditions seem to have exhibited two essentially opposite patterns, and did not converge as had been expected. In opposition to many previous findings about task-social orientation in CMC, groups in the computer-mediated condition were less task-oriented than the FtF groups, and CMC groups became less task-oriented as they progressed. While the task-social orientation hypotheses were not entirely supported, there is some evidence that a group development, time-based approach to the study of CMC offers markedly different results than one-shot studies.

Discussion

A review of the literature on CMC revealed contradictory theoretical specifications and empirical findings. These issues, and the possibility that methodological problems regarding time and measurement contributed to these contradictions drove the present research. The results suggest alternative views about the role of CMC and time in enhancing relational communication among work groups.

Theoretical Issues

The current results did not lend much support to existing theories about CMC. None of the results clearly suggest the viability of a cues-filtered-out view: FtF was not more intimate and sociable than CMC over time. CMC was more dominant than FtF in initial conversations alone, but the difference dissipated thereafter. This difference clarifies previously conflicted views about CMC. CMC may be more aggressive (at first), similar to findings in the literature regarding uninhibited CMC behavior. However, it also suggests that CMC is more egalitarian in nature, as is echoed in previous research showing equalized participation. A few patterns emerged offering partial support of the antithetical SIP contention that CMC groups experience relational development over time. CMC groups became less formal and less task-oriented over time as predicted by the social penetration aspects of SIP. Another aspect of the hypotheses was that groups using CMC and FtF reach levels of relational communication similar to the other medium over time. In the cases of formality and receptivity, CMC and FtF means overlapped from their initial positions at time two or time three. For example, while CMC groups were rated (nonsignificantly) more formal at time one than were FtF groups, CMC was less formal than was FtF at time two. Where the patterns overlapped it seems that some convergence in the levels of those respective dimensions took place. In other cases, there were differences between CMC and FtF across times, and in each case —surprisingly—CMC was more relationally positive.

Do SIP's interaction predictions fail to describe the respective progressions of CMC and FtF over time? That may indeed be the case. It may be that the medium by time interactions failed because there are simply no substantial joint influences of extended contact and communication conditions. But before we throw out the baby with the bathwater, another look at methodological factors may be in order.

It is possible that the present methods may have been insufficiently sensitive to capture the dynamics

SIP predicts. The observational measurements of relational communication may have come too late. Since coders evaluated the mid-points of groups' interactions at each interval, it is possible that groups had already reached their plateaus by the first measurement point. This notion is consistent with recent work on group development. In Gersick's (1988) research, for instance, groups were found to cast the tone for their long-term demeanor in their first few message exchanges. "Almost immediately," Gersick (p. 18) found, group members laid out their approach to their task, patterns that persisted throughout much of their association. If groups indeed do their "forming" in very few exchanges—as few as five by Gersick's account—then measuring successive midpoints might not capture this development. If this is the case, then SIP effects may still be operative, but the present design may not have been sensitive to it. While the sampling of midpoints offered the best glimpse of the groups over the long haul, groups' initial interactions may yet show some development. This notion deserves further study.

All this is not to say that there were no empirical differences found at all. In several cases CMC groups were more relationally positive than FtF groups. In a sense, the results parallel the empirical chasm offered by lab versus field studies in CMC; although one-shot CMC groups have been less social and more task-oriented relative to FtF, when groups interact over time, warmer relational tone and friendship development is frequently seen. The effect of a longer time period on relational communication seems to have occurred in this longitudinal, laboratory study as well.

Alternative Interpretations
It appears that the time factor may have affected the groups in interesting, albeit unanticipated ways. Observer ratings of CMC and FtF behavior showed that CMC groups expressed more immediacy/affection, similarity/depth, and composure/relaxation: all intimacy-related dimensions of relational communication. CMC groups also showed greater social- rather than task-orientation than did FtF groups. These findings suggest that the effects of greater task orientation and impersonality associated with CMC previous cues-filtered-out experiments do not occur in extended-time, asynchronous CMC interactions. It may also be that SIP underestimates the positive effect of computer-mediation on relational communication. The most striking finding in the current results suggests that when CMC participants are interdependent over time, they adopt more intimate and sociable relational behavior *from the inception of interaction* and throughout.

The higher ratings for CMC invite speculation. Why might CMC participants act more intimate and sociable than their FtF counterparts? Two main reasons seem plausible. One, once again, explores methodological influences. In this case, the effects may have to do with the inclusion, in this research, of FtF nonverbal behavior. The second is more conceptual, and has to do with the nature of the asynchronous CMC and how it might actually facilitate certain interpersonal processes.

The retention of subjects' nonverbal communication in the FtF (control) stimuli may have influenced the coders' judgements in a significant manner. If the subjects expressed negative nonverbal cues these may have lowered FtF ratings relative to CMC. If FtF members make their meetings more impersonal, this may be conveyed in their nonverbal behavior which, as was pointed out earlier, has not been recorded in past studies of CMC/FtF. There is no reason to suspect that FtF participants in the present study were any less verbally positive than those in previous research. But if participants' nonverbal behaviors were less positive than their verbal ones, the effect may have been to transmit mixed messages, and receivers tend to rely on *visual* cues in deciphering the meanings of mixed messages; there is a visual primacy effect (see Burgoon et al. 1989b).

While visual primacy may be just as likely to highlight negative or positive cues, there is an additional effect which may pertain: a negativity effect. In impression formation negative information disproportionately influences our impressions of others (Kellermann 1984, Richey et al. 1982). If FtF subjects displayed negative nonverbal cues, then perhaps this information not only detracted from positive assessments, but actually tipped the scale in the opposite direction.

The second explanation pertains to the ability of asynchronous communication to facilitate more positive exchanges. Participants in asynchronous conferencing used the system at their convenience. They had time to manage interpersonal exchanges without impeding their devotion to task accomplishment. The CMC transcripts revealed that the partners sometimes asked one another what social organizations they belonged to, which nightclubs they liked, and other personal information. On the other hand, FtF communicators tended not to self-disclose or probe in this manner. It appears that the asynchronous aspect of CMC lent itself to the exchange of personal information, which led to the higher intimacy-related impres-

sions in this medium. In FtF interaction, those who discuss such things detract from the meeting task may be seen as deviants, as they forestall other members from completing their obligation and leaving. These notions are consistent with McGrath and his colleagues' formulations regarding the "entrainment" problems that time presents in nonmediated groups (Kelly et al. 1990, McGrath 1991, McGrath and Kelly 1986). Entrainment refers to the synchronization among partners with respect to their interdependent activities within a larger milieu of independence. McGrath identifies several problems of entrainment, two of which may help distinguish between asynchronous CMC and synchronous FtF groups. These include "conflicting temporal interests and requirements," and "scarcity of temporal resources" (McGrath 1991, p. 162). They speak to the fact that FtF meetings require members' co-presence, time away from other important individual activities. Such is far less the case in asynchronous CMC, where the trade-off between time, length of time, and frequency for participation is much more a matter of individual choice. McGrath further states that individuals must respond to these problems by "making temporal commitments," and "regulating the flow of task and interpersonal interaction" (1991, p. 162). The preceding discussion suggests that each of these responses is modified in asynchronous CMC, since temporal commitments become discretionary, and task *versus* interpersonal interaction becomes, in a sense, de-regulated; both task and social exchange may exist without one constraining the time available for the other. While McGrath's other writings about the temporal effects of asynchronous technology on group entrainment include predominantly pessimistic speculations (McGrath 1990), these potentially "liberating" effects appear not to have been considered.

Naturally, a complete assessment of CMC effects may not be available without inclusion of *synchronous* CMC meetings, too. With synchronous CMC, gone are the entrainment-compensations ascribed to the asynchronous mode, above; all parties must attend and perform at the same time. Indeed, a fully crossed design including synchronous CMC as well as asynchronous, noncomputerized communication would be advantageous, and such research is underway by this author. Preliminary findings suggest that synchrony is a potent factor, with spoken FtF and synchronous CMC being relationally similar to each other, yet different than other asynchronous modes. While important exceptions exist, most organizational CMC takes place asynchronously (Archer 1990, Hiltz et al. 1989); the

present study reflects "the reality that face-to-face meetings usually occur in synchronous mode, and dispersed meetings usually occur in asynchronous mode. The realistic nature of this contrast makes it a useful one" (DeSanctis, personal correspondence, June 1993).

Either FtF groups are not as prosocial relative to CMC as previous studies have found them because their nonverbal behaviors indicate negativity, or CMC groups are more prosocial relative to FtF groups in the presence of a longitudinal relationship with technology favorable to interpersonal interaction. In this research, CMC groups demonstrated several of the relational dimensions better than FtF communicators. When such groups anticipate extended interaction and are allowed to continue over time and accumulate numerous messages, this continuity has a significant, positive impact on groups' relational communication in CMC.

Implications for Management

The organizational parallel may be that CMC provides an "electronic water cooler," where employees may both do "job talk" and "shoot the breeze," conveniently, without having to leave their desks, and without risking the impression that they are not "working." These patterns are, in a sense, similar to the findings of Finholt and Sproull (1990), who suggested that studying "electronic groups at work may also help us understand play at work" (p. 61). These researchers suggest that play is a large part of organizational life, generally neglected by research on managerial and productivity-related communication. Thus the CMC system provided convenient, asynchronous time for interaction, allowing participants to reciprocate affection in a way that FtF group interaction ill affords.

Another implication is that CMC may be better suited to longitudinal interaction than short-term meetings, relationally speaking. The impetus for the early research assumed that CMC might yield more critical and effective decisions as it reduced barriers due to floor access, etc., yet relational and consensus "losses" became evident: While CMC discussions may have been more critical than those conducted FtF (see Hiltz et al. 1986, Connolly et al. 1990), they were less likely to reach decisions or be as agreeable as FtF partners. The present research indicates an alternative perspective: The benefits of CMC may best be accrued when participants have longer periods of time in which to communicate. In this research, no group failed to achieve consensus, and although the quality of decisions was not analyzed, the relational factors that did differ favored the use of CMC over FtF. The implica-

tion is that CMC may be a more satisfying medium than previously indicated, when it is used for "task forces" or "teams"—longer-term associations—than for ad hoc meetings.

In contrast to earlier studies, the present work suggests some positive impacts of CMC for relational communication in group interaction. While it should not be assumed that intimacy and sociability are desired end-states in and of themselves (see Parks 1982), these directions echo support for speculation by Finholt and Sproull (1990, p. 61), that electronic groups "...could ultimately increase the quality of work through providing new information resources and increase affiliation with the organization through providing new opportunities for employees to discover things they have in common with other employees." Indeed, CMC may be an especially malleable process, allowing organization members to optimize their task and social interactions. The relational effects in this study of CMC suggest reevaluation of the medium and its potential usefulness in conveying organizational trust, warmth, attentiveness, concern, and other interpersonal dimensions known to affect work relationships and organizational outcomes. Such considerations may yield insights to what organizational roles CMC actually plays in the large cast of communication characters.

Acknowledgements

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