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SOME ANTECEDENTS AND CONSEQUENCES OF COMPUTER-MEDIATED COMMUNICATIONS USE IN AN ONGOING MANAGEMENT GROUP: A FIELD STUDY

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ABSTRACT

Management is communication intensive and, therefore, managers may derive benefits from computer-based alternatives to the traditional communication modes of face-to-face (FTF), telephone, and written memo. This research examined the use of electronic messaging (EM) by an ongoing management group performing a cooperative task. By means of an in-depth multi-method case study of the editorial group of a daily newspaper, it examined the fit between the interactivity of the chosen communication mode (FTF versus EM) and the mode of discourse for which it was used (alternation versus interaction/discussion).

Two propositions were derived from this exploratory study. The first proposes that FTF, being highly interactive, is appropriate for building a shared interpretive context among group members, while CMC, being less interactive, is more appropriate for communicating *within* an established context. To the extent that the appropriate communication modes are chosen, communication will be more effective. The second proposes that groups exhibiting effective communication will use FTF primarily for interactive discourse and EM for discourse consisting primarily of alternating adjacency pairs.

1. INTRODUCTION

Management is communication intensive; managers establish and maintain complex communication networks for performing their work (Barnard 1938; Kotter 1982; McKenney, Zack, and Doherty 1990; Mintzberg 1973). While managers appear to prefer face-to-face (FTF) communication (Luthan and Larsen 1986; Mintzberg 1973; Kurke and Aldrich 1983; McCaskey 1982), computer-mediated communication technology (CMC) also may play a useful role in this context.

This research examined the use of electronic messaging (EM) versus traditional modes of communication (i.e., FTF, telephone, and written memo) in an *ongoing* management group performing a cooperative task. Ongoing means that the group had an established culture and set of routines and held an expectation of continuing to work together for the foreseeable future. By means of an in-depth multi-method field study, the research explored when and why these managers selected and used a particular communication mode, and how their choices related to communication effectiveness.

Research examining computer-mediated communication modes (cf., reviews by Culnan and Markus 1987; Kerr and Hiltz 1982; Rice and Bair 1984; Steinfeld 1986; Williams 1977) suggests that EM can increase the range, capacity, and speed of managerial communication. However, this research suffers from a lack of empirical grounding (Culnan and Markus 1987; Steinfeld 1986).

The literature on group decision support and computer-supported cooperative work (cf, Dennis et al. 1988; Galegher and Kraut 1990; George et al. 1990; Jessup, Connolly, and Galegher 1990; Kraemer and King 1988; Pinsonneault and Kraemer 1989; Seigel et al. 1986; Smith and Vanecek 1990) has reported much experimental research on media differences in collaborative decision making tasks. Little formal empirical work, however, has been done in this area (Dennis et al. 1988; Nunamaker et al. 1989). The research has typically used artificial groups — groups with no shared history, context, or knowledge about each other — performing artificial tasks, and has not allowed for free choice of medium (Culnan and Markus 1987). Thus it may have limited generalizability to the field, where the technology ultimately is used (Culnan and Markus 1987), and especially to ongoing groups of managers having free choice of various communication modes. Only by systematically observing the antecedents and consequences of managers' unrestricted choices of communication mode can we begin to understand the pragmatic differences in these modes of communication.

A growing body of research has focused explicitly on examining differences between computer-mediated and non-mediated communication channels. The dominant line of research has focused explicitly on media richness, suggesting that the richness of the medium should match the equivocality or richness of the message being sent (Daft and Lengel 1986; Daft and Weick 1984; Daft and Wiginton 1979; Trevino, Lengel, and Daft 1987). This line of research has examined, via survey, the media choices of samples of individual managers in large organizations (Daft, Lengel and Trevino 1987; Daft and Macintosh 1981; Russ, Daft, and Lengel 1990; Trevino et al. 1990). Goodman, Ravlin and Schminke (1987) suggested, however, that only by performing in-depth micro-studies of work groups could we understand the causality — the hows and whys — of the phenomena under consideration. Hackman (1990) stated that developing useful and practical normative models of group behavior required in-depth field work to identify those factors which were easily observed, had a relatively large effect on outcomes, were salient to group members, and were controllable by the group.

Almost no CMC research has observed ongoing work groups in natural settings where history, routine, norms, social relationships, and deeply shared interpretive and behavioral context may play a large role in determining choice of communication mode and procedure. Exploratory research on the role of CMC in management groups in natural settings (McKenney 1986; McKenney, Doherty, and Sviokla 1989; McKenney, Zack, and Doherty 1990; Reder and Schwab 1989, 1990) suggests that shared cognitive and social context may be the most important factors influencing communication behavior and media choice in work groups, and that field-based micro-study is the appropriate method for studying them. For example, McKenney, Zack and Doherty observed that "lean" EM was used effectively to exchange rich messages by employing an elaborate metaphorical code which emerged within the group over time and formed part of each member's shared interpretive context. Additionally, the research on which this current report is based (Zack forthcoming) suggests that the group's shared routines and procedural expectations may be as important as richness in choosing an appropriate medium.

The research studied the editorial group of a medium sized daily newspaper (Figure 1). The group contained fourteen senior and middle-level newsroom managers responsible for producing the "hard" news section of the newspaper. Stories were written, transmitted, edited, and the process managed using EM[1] together with FTF. While managers had both telephone and written memo readily available, memos played no observed role in the day-to-day production of the paper and were reserved solely for infrequent, formal administrative communication among the three top executives. Telephone accounted for less than 3% of the observed communication events, primarily for communicating to others outside the newsroom and where no alternative existed (e.g., to talk to a reporter at home). Thus the study focused on EM versus FTF. The group conducted daily scheduled meetings to coordinate efforts and to negotiate newspaper content and story placement, and communicated on an ad hoc basis throughout the twenty-four hour publishing cycle using both EM and FTF. The organization was considered by the industry to be innovative and to produce a high quality newspaper.

The findings reported here represent the early results of a broader, multi-site study (Zack, forthcoming) exploring the role of CMC in ongoing management groups. That study produced a process model identifying a set of factors influencing the choice of communication mode, and another set of factors, in combination with choice of mode, influencing communication effectiveness. This paper describes one aspect of that model, namely, the relationship between channel interactivity and communication effectiveness.

2. BACKGROUND

2.1 Media Richness

Managers typically have several communication modes[2] to choose from. Choosing a mode with the appropriate information processing characteristics relates positively to managerial effectiveness (Daft, Lengel and Trevino 1987). The work of Daft and associates (Daft, Lengel and Trevino 1987; Daft and Lengel 1986; Daft and Macintosh 1981; Daft and Weick 1984; Daft and Wiginton 1979) suggests that communication about ambiguous or equivocal events, often arising when shared interpretive context among communicators is lacking (Gerrig 1986), requires rich media. Daft, Lengel and Trevino defined rich media as those providing 1) multiple channels having the capacity to transmit high-variety languages, 2) personalization, and 3) capacity for immediate feedback. This definition combines three factors: "bandwidth," social presence, and interactivity. Rich channels have high levels of each. FTF would be very rich, while EM would be less so. Each of the three factors, however, can vary independent of the others (Figure 2).

In ongoing groups, interactivity tends to be the dominant characteristic for choosing an appropriate communication mode. Routine abounds and interpretive context tends to

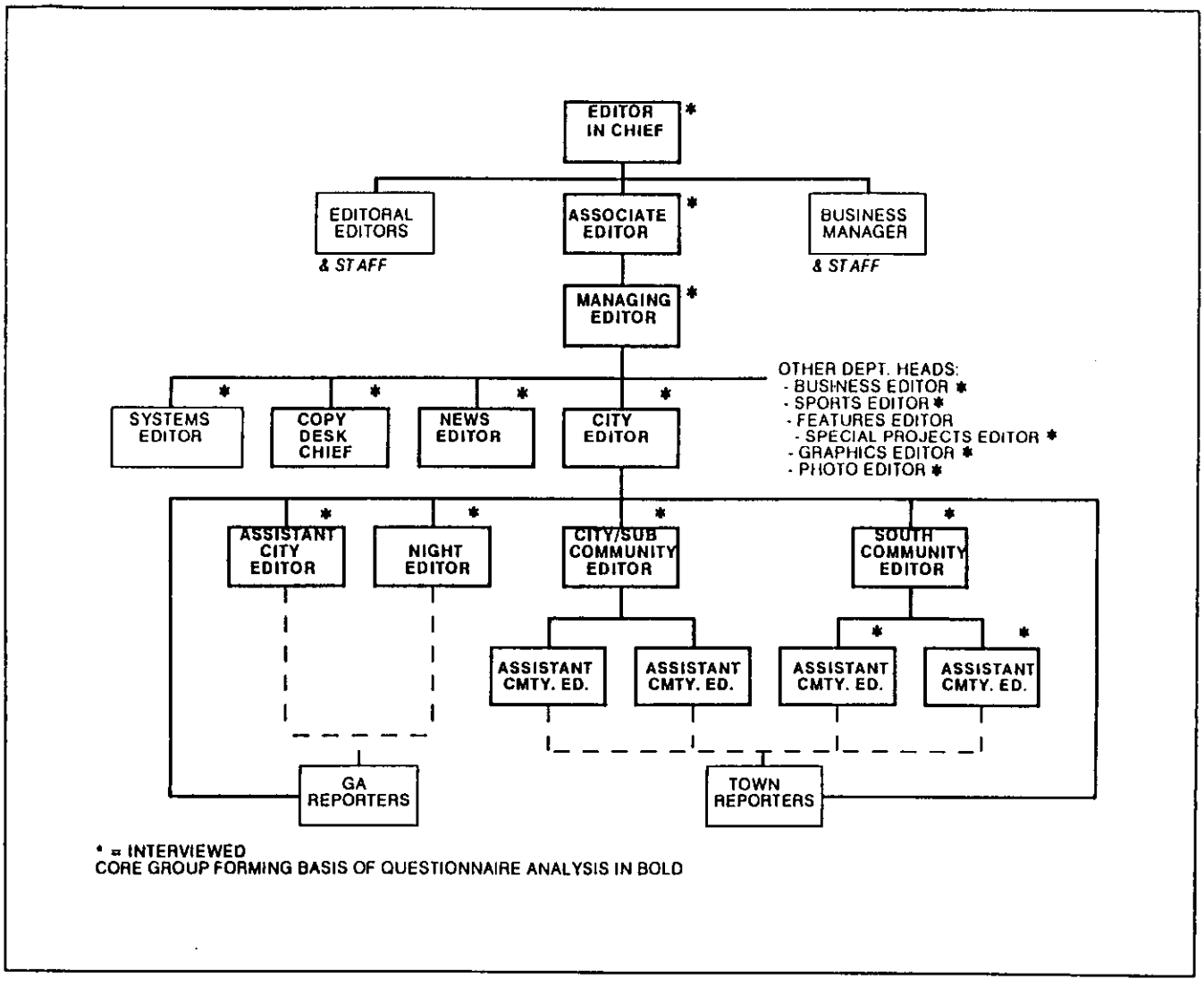

Figure 1

be highly shared. Even electronically transmitted text — considered a "lean" medium (Daft and Lengel 1986) — can carry symbols and words conveying rich meaning (McKenney, Zack and Doherty 1990). Social presence is felt to some degree by knowing who sent the message. Thus interactivity represents a key source of variance between communication modes in these groups.

2.2 Interaction and Interactivity

The noted sociologist Erving Goffman placed interaction at the forefront of communication research (e.g., Goffman 1967). Building on this perspective, Rogers (1986) developed an interactive model of the communication process (Figure 3). He defined communication as

> a process in which participants create and share information with one another in order to reach a mutual understanding. Such information sharing over time leads the individuals to converge or diverge from each other in their mutual understanding of a certain topic (p. 199).

The essential components of interactive communication are

1) joint activity between at least two participants,
2) a high degree of mutual involvement in the process,
3) the simultaneous exchange of information, and
4) the potentially spontaneous, unpredictable, and emergent progression of remarks (Goffman 1967; Lippman 1987; Rogers 1986; Sigman 1987).

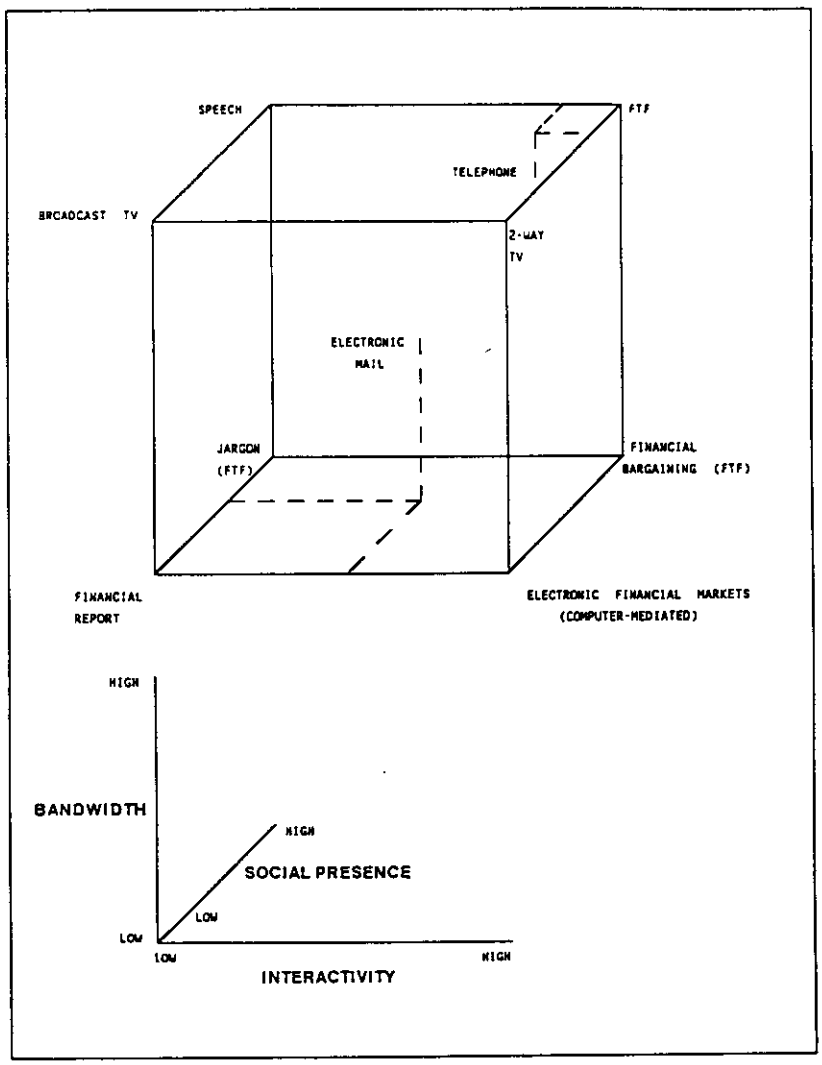

Figure 2

The essence of interactivity is interruptibility (Lippman 1987). Highly interactive exchange allows the communication process to be interrupted by the participants at a small grain of interaction (Lippman 1987). Interacting FTF speakers can interrupt each other at any point in their exchange. They can see how others are responding to their messages before they are even finished, and alter them in midstream to elicit a different response (Nohria and Eccles 1990). In contrast, EM limits interruption or response to the grain of an entire message.

Interactive communication can be characterized by patterns of turn-taking and use of adjacency pairs (Levinson 1983). Speakers typically take turns in making remarks, and managing turns is an important part of conversation. Interactivity implies that turn-taking is flexible, rather than structured and deterministic. Adjacency pairs are ordered sequences of two utterances that are adjacent, produced by different speakers, and classified so that a particular first part requires a particular second part. For example, an offer requires an acceptance or rejection; a question requires an answer (or other "legitimate" response). Interactive conversation deviates from strict adjacency in terms of the order or sequencing of remarks and the predictability of response. With interactive conversation, remarks typically are made out of sequence or embedded within other sequences. Additionally, it may be quite difficult to predict which of a range of responses will be forthcoming. For example, a question may elicit a challenge to the basic premise of the question. The increased structural complexity of communication patterns caused by divergent responses such as this requires the ability to *repair*, that is, to respond in a mutual, instantaneous and flexible manner to steer the conversation back to convergence. Repair is a major resource in maintaining and restoring inter-

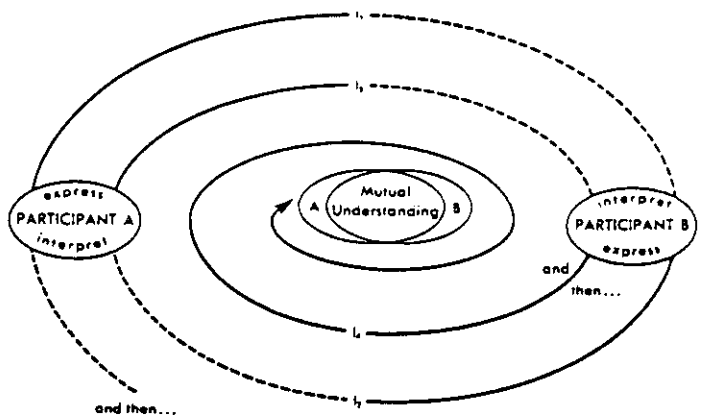

Figure 6-2. A Convergence Model of Communication

Communication, a process in which participants create and share information with one another in order to reach a mutual understanding, is a cyclical process that involves giving meaning to information that is exchanged between two or more individuals as they move toward convergence. *Convergence* is the tendency for two or more individuals to move toward one point, or for one individual to move toward another, and to unite in a common interest or focus.

Source: Rogers (1986)

Figure 3

subjectivity or mutual understanding (Shegloff 1987). FTF provides mechanisms to transcend turn-taking and adjacency-pair expectations, and to repair interaction as needed.

FTF interaction, then, provides a standard by which communication interactivity can be measured. FTF is highly interruptible at a small grain. It provides continuous and instantaneous feedback about the interaction, providing the ability to respond to unanticipated or unpredictable remarks, engage in repair, and resolve divergence. These characteristics are vital to dynamic and adaptive evolution of discourse, required to generate new concepts and meanings, enact interpretations, reach consensus, give explanation, and resolve conflict.

EM provides a clear contrast to FTF. EM is not interruptible. Rather it supports alternating turns at the grain of an entire message. In contrast to FTF, EM tends to enforce strict turn-taking. Lacking the capability for interrupting at a fine grain, communicating simultaneously, or engaging in instantaneous feedback, it is inappropriate in circumstances where repair might be required. EM is appropriate for strict adjacency pairs where the remarks are predictable in sequence and content and adhere to a low number of alternating exchanges.

2.3 Coherence and Context

Rogers's (1986) model, and pragmatics in general (Gerrig 1986; Levinson 1983), places shared interpretive context in a primary role. Effective communication requires participants to share enough background knowledge or interpretive context to render their messages mutually meaningful.

Meaningful communication requires the exchange to be congruent with 1) the pre-established agenda for the interaction, 2) previous interaction episodes, and 3) the ongoing networks and institutions of which the interaction is a part (Sigman 1987). Coherence comes from "above," by staying within the general theme of the conversation, and from "below," by producing appropriate and sequentially related adjacent turns during the interaction (Sigman 1987).

A distinction can be made between context-building and context-using communication (McKenney, Zack and Doherty 1990). When the communication process diverges from mutual understanding, shared context may have to be created — a special form of repair. FTF, because of its interactivity, supports complex, iterative exchanges appropriate for context-building and sharing. EM, in contrast, is an alternating channel appropriate for

simple exchanges *within* a strongly shared and developed interpretive context previously set by culture, habit, social structure, or prior FTF conversation (McKenney, Zack and Doherty 1990).

3. RESEARCH FRAMEWORK

This discussion suggests that the extent of shared interpretive context determines an appropriate form of discourse (alternation or interaction) and communication mode (FTF or EM) (Figure 4), and that effective groups should exhibit the appropriate fit between communication mode and form of discourse (Figure 5). As an exploratory study, the objective was to amass data addressing these themes, leading to the formulation of research propositions for future study.

4. RESEARCH METHOD AND DESIGN

Real-world context was essential to the research, thus a field study was required. Goodman, Ravlin and Schminke suggested that useful research on organizational effectiveness required in-depth "micro-studies." This notion, together with the exploratory nature of the research, suggested a case-study approach. That is, data were collected from several sources and by several methods about and within a particular site and analyzed to identify convergent findings about that site. Rogers (1986) proposed the information exchange relationship (or interaction event [Sigman 1987]), rather than the individual, as the appropriate unit of analysis for CMC research. The interaction event was used as an embedded unit of analysis (Yin 1984) within the case site.

Eighteen interviews of forty-five to ninety minutes each were conducted with most of the management group and several non-group managers. I attended several news meetings and observed the publishing process (usually shadowing a central actor) for thirty hours, distributed throughout the twenty-four hour publishing cycle.[3] All electronic mail messages sent during each observation were obtained directly from the editorial computer system. After conducting all interviews and observations, a questionnaire was created, tested, and administered;[4] and completed questionnaires were received from the entire core group of fourteen editors.

5. DATA ANALYSIS

5.1 Theme 1: Shared Context, Communication Mode, and Communication Effectiveness

Shared Context and Communication Mode. Observation and interview data suggested that the greater the shared interpretive context among communicators, the less ambiguous the exchange and the less interactive a channel required to support it. FTF conversations provided the rich, interactive channels used to enact a consensus about newsworthiness, importance, angle, etc. for upcoming stories. This enactment continued within the daily news meeting. As the cycle progressed and editors began to talk about and read particular stories, shared context grew. As the process moved from editing to layout, a greater volume of terse, simple messages were sent via EM, reflecting the large amount of tacitly shared background knowledge and implied meaning built earlier in the cycle.

The editors tended to match the interactivity of their communication mode to the extent to which they shared interpretive context. They generally used FTF for building shared context and EM when communicating within a shared context. One editor described an example of his communication with the copy desk.

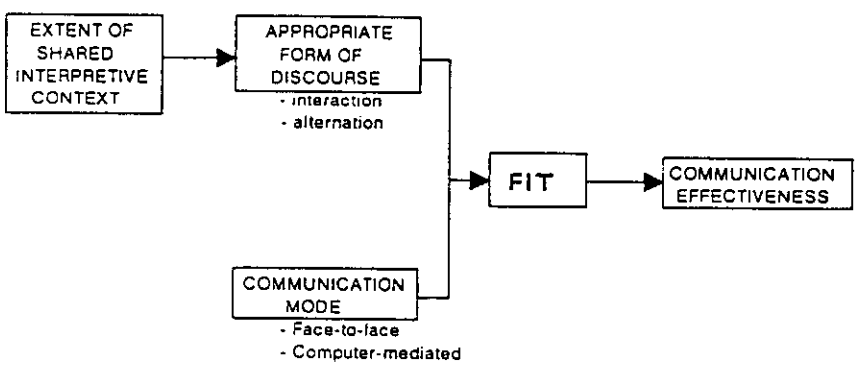

Figure 4

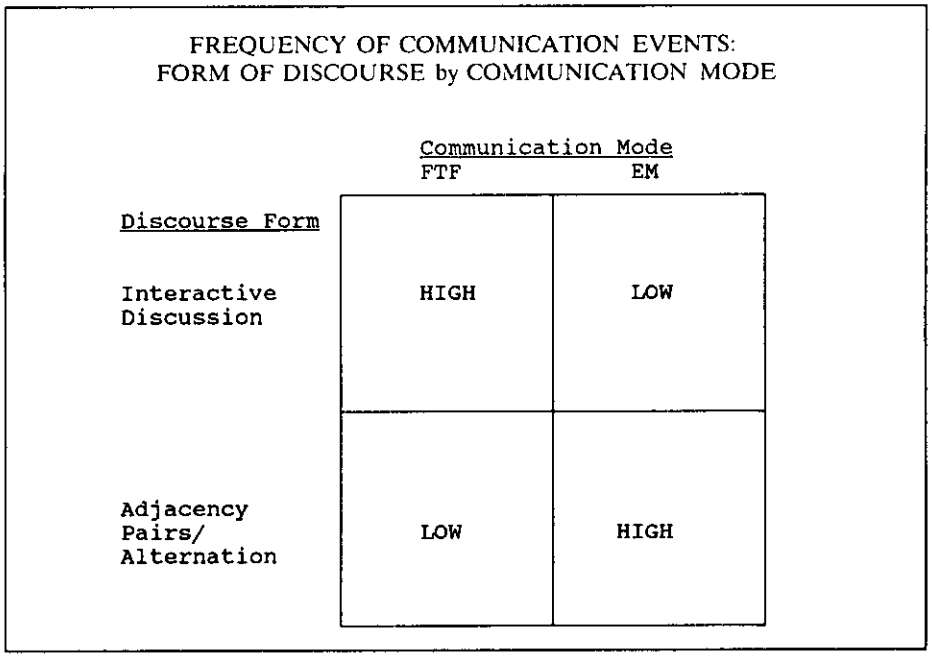

Figure 5

> If you are dealing with the regular person on the desk [i.e., the person who usually edits his section], you can send an electronic message describing each page: a list of the slugs, whether or not the page will use a town logo, which story goes on top. Otherwise, communicating this to the copy desk will be mostly face-to-face.

Reporters and editors typically used FTF to negotiate and establish a shared interpretive context about stories to be written, followed by EM for simple logistics and status-oriented exchange of facts. Figure 6 illustrates an example where context was built early in the exchange via FTF, while subsequent communication within that context occurred over electronic mail. When clarification was needed, the mode switched back to FTF.

Questionnaire responses (Table 1) supported the observation that editors used appropriate communication modes.

Several editors stated that electronic messages were rarely ambiguous, indicating that the group tended to share an adequate interpretive context for communicating electronically. Observed communication, regardless of mode, generally was unambiguous and convergent. Questionnaire responses supported this finding (Table 2).

Table 1

Editors were asked to indicate extent of agreement with statements that:

	Ave.(SD)*
1) FTF should be used to create a common understanding about something before exchanging electronic messages	1.43 (.65)
2) editors use appropriate methods for sending messages	2.13 (.94)

* (1=strongly agree, 5=strongly disagree)

EM was also used effectively to communicate within the context of other electronic text. Editors often appended terse messages to prior electronic messages. For example, the copy desk often electronically sent to editors paragraphs with "Is this ok?" appended. Notes and questions embedded within a story could be terse, as the story text itself provided the context for the message, usually sufficient for sending simple electronic messages, many requiring no response.

TEMPORALLY ORDERED INTERACTIONS

TIME	Community Editor / Copy Editor / Reporter	MESSAGE CONTENT
11:40 p.m.		Editor and reporter discuss status of a story containing a numerical chart comparing current town budget to prior year. They discuss content and format of chart.
Midnight		Community editor describes chart to the copy editor responsible for laying out his edition's community pages, and they discuss its layout.
12:01 a.m.		Editor asks reporter to send him the chart before sending it to the copy desk. "*Could I have chart first, please*"
12:34 a.m.		Reporter tells editor she has sent him the chart and describes a problem she is having making sense of the numbers.
12:40 a.m.		Editor replies: "*Come see me*"
12:42 a.m.		Reporter comes over and describes her problem, and they discuss it. They negotiate whether to run a modified version or to hold the story until they can get clarification. They decide to hold the story.
12:45 a.m.		They describe the problem to the copy editor and tell her the story is being held.

Dotted lines represent electronic messaging.
Sol id lines represent face-to-face
Arrows indicate direction of message. No arrow indicates interactive exchange.

Figure 6

Table 2

Editors were asked to indicate the extent to which they were confident that a message would be understood when sent by

	Ave (sd)*
1) FTF	1.57 (.51)
2) CMC	2.14 (.86)

* (1=to a great extent, 5=not at all)

Where an appropriate mode was not used, editors usually recovered quickly. For example, I observed one editor returning several electronic messages with the appended note "What does this mean?" leading to FTF conversations to clarify the messages.

Communication Effectiveness. Given that editors usually chose communication modes appropriate to the extent of shared interpretive context, observed communication should have been effective. Although miscommunication occasionally occurred, the editors believed that communication was generally effective (Table 3). Communication breakdowns occurred several times per week, but this was not considered excessive (Table 4).

Table 3

	By Item ave (sd)*	Overall ave (sd)
Communication characteristics		2.35 (.93)
Communication is accurate	2.85 (.76)	
Messages are meaningful and understandable	1.85 (.82)	
Overall effectiveness		2.29 (.73)
Communication patterns are effective	2.21 (.80)	
Communication detracts from quality of work**	2.36 (.74)	

* (1 = strongly agree, 5 = strongly disagree)
** Reverse scored

Questionnaire responses (Table 5) indicated that most miscommunication occurred when communicating across shifts (43%). The second highest area of miscommunication occurred when communicating across levels or desks (average = 31%: (36% [lower level] + 29% [higher level] + 29% [another desk])/3 = 36%), while the least amount of miscommunication occurred when communicating within a department (7%).

Table 4

	Ave (SD)
How frequently do communication breakdowns which affect the content or quality of the news section occur? (1 = almost never, 2 = once/month, 3 = once/week, 4 = once/day, 5 = more than once/day)	3.54 (1.20)
We (don't) often experience communication breakdowns. (reverse coded; 1 = strongly agree; 5 = strongly disagree)	2.64 (0.63)

This pattern provided additional evidence to support the proposed relationship between shared context, choice of communication mode, and communication effectiveness. Cross-shift communication relied on EM to a great extent because of temporal separation, therefore the flexibility to match the interactivity of the exchange to the communication mode was limited, resulting in less effective communication over all. According to the editors, the highest frequency of miscommunication occurred when communicating with another department on another shift — a situation usually requiring building and sharing context, but one where FTF was not convenient.

Table 5

Locus of Miscommunication	% responding (*)
communicating with another shift	43%
communicating with someone at a lower level of authority	36%(**)
communicating with someone at a higher level of authority	29%
communicating with someone at another desk of department	29%
communicating with someone on my own shift	21%
communicating within my desk or department	7%

(*) Does not sum to 100% as respondents indicated all that applied.
(**) possibly biased upward as several respondents were senior managers.

Context was shared to a greater extent with people in one's own department than with those in other news departments, and the incidence of miscommunication varied accordingly.

A similar situation held between different levels of management. Senior managers held a more long-term set of goals and performance criteria for the paper, while middle and lower level managers were more concerned with producing the next day's paper, often under severe time and resource constraints. Additionally, managers at similar levels tended to be physically collocated and to engage in more FTF interaction, strengthening shared context and enabling clarifying discussion to take place more easily than across levels.

Overall, the editorial group engaged in an effective communication process, and most editors believed that their communication led to a high-quality paper — or at least did not detract from that quality. Communication was more effective when FTF was used to build or share context where deficient, and when EM was used to communicate within an existing shared context. The editors usually chose an appropriate mode of communication vis-a-vis shared interpretive context.

These findings suggest the following three-part proposition:

P1a: *Where extent of shared interpretive context is low, interactive discourse is needed, and FTF is the appropriate communication mode.*

P1b: *Where interpretive context is highly developed and shared, discourse can take the form of adjacency pairs and strict turn-taking (i.e., alternation), therefore EM is an appropriate communication mode.*

P1c: *To the extent that appropriate communication modes are used, communication will be more effective.*

5.2 Theme 2: Fit Between Interactivity and Communication Mode

Given that the group was considered highly effective, form of discourse and choice of communication mode should have shown a high degree of fit. Editors' comments as well as data from structured observation and the questionnaire suggested that effective groups use FTF primarily for interactive discourse and EM primarily for alternating adjacency pairs. According to the managing editor,

> I use messaging when I'm looking for simple responses. If the message involves more than one person or if it is a complex situation involving more than a one-time action or task, I'll use face-to-face.

Several editors felt that FTF allowed for a quicker convergence or agreement than did EM in potentially ambiguous situations.

> The message I send could have a number of possible responses, and each response could have another set of responses. The thing could get out of hand using electronic communication. With face-to-face we can rapidly narrow the range of responses. [Managing Editor]

> Messaging can be confusing compared to a quick conversation when the message is not clear. [Associate Editor]

> This is a business where you are trying to think quickly and resolve ambiguity quickly — to figure it out quickly and then spend more time working the corners of a story. The key is to have a quick face-to-face exchange of ideas and to tap into each other's knowledge quickly. [Business Editor]

The editors chose the appropriate channel most of the time. Most of the editors indicated they used FTF whenever they anticipated requiring more than a simple one-way message or a message-response pair; for example, if they expected many comments or questions. Simple messages tended to be factual or those for which there was a rich, shared context, and those could be sent electronically; for example, questions about story length and status. Where more interactivity was required, FTF would be used; for example, the news editor negotiating the length or placement of a story with the copy desk. When many back-and-forth messages were required, the exchange would be slower with EM than FTF, and convergence might not occur. Or if it did occur, it might take an exceedingly large number of messages. With FTF, the parties would quickly converge to a consensus on meaning, decision, or action.

Occasionally, editors started an electronic exchange and terminated it when the iterations grew beyond a small number and it became obvious that they would reach closure only via FTF. Editors continued with EM exchanges as long as they felt they were making adequate progress towards closure.

Senior editors also used FTF to obtain a diversity of opinion, for example, on the interpretation of a story or the planned content of the paper. The inherent interactivity of FTF tended to encourage divergence, exchange of opinion, and discussion, avoiding premature closure. EM, on the other hand, would usually preclude discussion. The business editor provided an example.

> FTF gets reporters thinking about their own questions about the story. I could [electronically] send them a list of my own four questions and they could answer them, but this might not address *their* questions. And if we could get together to discuss the questions, we might find that two of my four were resolved and that two of the reporter's questions were more important. And we may come up with two more during our

discussion. Then we could all decide how to answer those questions and plan our attack.

The editor-in-chief chose a communication mode in a similar manner. When he wanted information to be taken as a directive with no discussion anticipated or requested, he would use EM. For example, he often sent electronic messages to the news editor directing him to change page one. However, when the editor-in-chief wanted discussion, reaction, or opinion, he would either use FTF or follow his electronic message with a visit to the newsroom floor for a FTF conversation.

Shouting was a unique form of "face-to-face" interaction and in some ways resembled electronic messaging. Editors often shouted to one another when within earshot. It was appropriate for quick, simple, one-way exchanges because it was too intrusive, public, and susceptible to noise and interference to use for longer back-and-forth exchanges. However, it provided the benefits of a broadcast medium by keeping all editors in earshot simultaneously informed and co-oriented. Shouting often occurred between editors and the copy desk, but almost never between editors and reporters. The former often communicated about simple, factual logistics issues (e.g., shouting a story length), while communication between reporter and editor usually involved a lot of interactive discussion (e.g., negotiating a story angle).

Questionnaire responses (Table 6) indicated strong agreement (and with almost complete consensus) that FTF should be used when lots of back and forth exchange was required. However they were neutral to somewhat in disagreement that EM should be used *only* when communicating about well-defined issues requiring simple responses. Thus, FTF was clearly the preferred choice for interactivity; however, this did not preclude the use of EM for more than simple exchanges (although only one occurrence of this was observed). This is probably best explained by the high degree of shared context that existed among the group, enabling EM to be used for more complex exchanges when FTF was not an option (e.g., for cross-shift communication).

A structured analysis of observed communication events strongly supported these findings. There were 404 separate communication events recorded during twelve hours of observation.[5] A communication event was considered to be any number of communication exchanges about a topic that had an observable beginning and ending (i.e., reached closure). An event might range from a simple, unidirectional announcement of a fact to a long discussion with many back-and-forth exchanges and fine-grained interruptions. The number of exchanges for each communication event was recorded when discrete and alternating. Where the exchange did not follow a pattern of alternation, the event was considered to be an interactive "discussion."

Table 6

Editors were asked to indicate extent of agreement with statements that:	Ave (SD)*
1) FTF should be used when requiring lots of back and forth exchange	1.01 (0.27)
2) CMC should be used only when communicating about well-defined issues requiring simple responses	3.21 (1.12)

* (1 = to a great extent, 5 = not at all)

Events were classified by whether they were interactive discussions or simple one-way or alternating exchanges, and also by communication channel (EM, shouting, or FTF). EM comprised electronic mail, messages placed within stories, and information exchanged via text files stored in public queues.

The data were cross-tabulated and are presented in Table 7. Each cell contains the frequency of communication events, the expected frequency under assumptions of independence, the percent of events by communication mode and by type of exchange, and the overall percent of events accounted for by the cell.

The most frequently observed combinations, as expected, were EM for one-way or simple, alternating exchanges (34.9%) and FTF for interactive discussion (31.2%). Shouting and FTF were used for simple exchanges in 32.7% of the events, primarily because of the close proximity of the editors, the inconvenience of having to interrupt their work to access the electronic messaging screen, and the routine nature of the communication. The combinations not expected to occur frequently (using EM or shouting to support interactive discussion) represented only 1.2% of the observed communication events. When EM or shouting were used, it was almost always for a simple exchange (EM: 99.3%, shouting: 95%). When FTF was used, it was usually for interactive discussion (69.2%), and 96.2% of all discussion occurred via FTF.

These results suggest a strong observed relationship between communication mode and interactivity for effective communication, as expected, leading to the following proposition:

P2: In a group exhibiting effective communication, FTF will be used primarily for interactive discourse while

EM will be used primarily for alternating adjacency pairs.

6. CONCLUSION

This exploratory study attempted to identify factors which were important, salient, observable, leverageable, and operating within a real-world context (Hackman 1990) so as to provide useful information to managers for improving their performance through the use of EM. In addition to accomplishing that goal, it clearly demonstrated that fruitful research on CMC technology (and related technologies such as groupware and GDSSs) requires a detailed understanding of how people communicate and interact on an ongoing basis and in a real-world context.

EM within the core editorial group provided a means for efficiently and directly exchanging information with others, where the pattern of exchange required no more than a one-way message or a simple adjacency pair. These messages were communicated within a previously established and shared interpretive context and might range from simple facts to moderately rich messages depending on the extent and richness of that shared context. Many of the electronic messages were routine exchanges and therefore took place within a rich, shared, and institutionalized context. Typically, anything requiring more than a simple exchange within a shared context would be FTF.

The editorial group tended to be aware of the different roles of EM and FTF and to choose a communication mode appropriate to their need for interactivity or alternation. The communication process, supported by the appropriate choice of communication mode and sufficiently shared interpretive context, was effective, enabling the group to produce a high quality paper.

These findings show how EM complements, rather than substitutes, for FTF interaction. They suggest that the interactivity of the communication mode should be of central concern to managers. They should be aware of channel interactivity and match it to the extent of interactive exchange required. Where interpretive context does not exist or is not shared, FTF is the appropriate communication mode. EM is effective and efficient *within* a shared context, either pre-existing or build specifically around the communication event. To sustain effective communication, managers must be aware of their communication options and the differences in their characteristics, and accordingly choose the appropriate mode.

Generalizability has been identified as a problem with case-based research (Yin 1984). Yin, however, suggests that each case study be treated as an experiment. Experiments generalize to a theory and not to other experiments. Likewise, each case study generalizes to the theory being built rather than directly to other sites. However, based on the results of similar in-depth studies of management groups performing both within ad hoc cycles (e.g., software development teams [McKenney,

Table 7

	SIMPLE ALTERNATION	INTERACTIVE DISCUSSION
EM	Freq: 141 (Exp: 96.0) % EM = 99.3 % Alternation = 51.6 % Total Events = 34.9	Freq: 1 (Exp: 46.0) % EM = 0.7 % Interaction = 0.8 % Total Events = 0.2
SHOUTING	Freq: 76 (Exp: 54.1) % Shouting = 95 % Alternation = 27.8 % Total Events = 18.8	Freq: 4 (Exp: 25.9) % Shouting = 5 % Interaction = 3.1 % Total Events = 1.0
FTF	Freq: 56 (Exp: 123) % FTF = 30.8 % Alternation = 20.5 % Total Events = 13.9	Freq: 126 (Exp: 59.0) % FTF = 69.2 % Interaction = 96.2 % Total Events = 31.2

Chi-square: 205.190, DF=2, p=.0000
Kruskal's lambda (symmetric error) = .439

Zack,and Doherty 1990]) and performing within cycles varying in duration from days to months (leasing company management team [McKenney 1990]), the findings appear to be robust for groups managing information- and communication-intensive work in a range of circumstances. However, in all cases, computer use formed an integral part of the managers' work. One area for future research would be to study managers for whom computer system use was not as integral a part of their task.

For researchers, the results provide a foundation on which to build more focused and controlled (e.g., social survey or behavioral laboratory) studies of communication context and its relationship to communication mode characteristics and communication effectiveness. This stands in contrast to typical experimental design whereby the effects of context are controlled out of the experiment (or alternately, the experimental setting itself forms the context). Additionally, it suggests that CMC researchers themselves must understand and share the context of the phenomenon before employing more precise research methods.

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8. ENDNOTES

1. EM as used here collectively refers to the following electronic communication facilities provided by the research site's editorial computer system:.

    1. *Electronic mail* (referred to as "messaging" by the subjects).
    2. The *notes* function which allowed the user to annotate a story.
    3. A message could be written as though it were a *story* and saved in a file. This file could then be sent to any other person on the system as though it were a story-in-process.

2. As used here, a particular communication *mode* comprises characteristics of the *medium*, such as richness and social presence, and characteristics of the *channel*, such as speed, capacity, reliability, or interactivity.

3. Details about the data collection methods are available from the author.

4. The questionnaire, used as part of the larger study, was an exploratory instrument given to the entire, although small (N=14), population. It was created following the interviews and observations and reviewed by several editors for clarity prior to administration.

5. A total of 415 communication events occurring over CMC, FTF, and telephone were recorded. Telephone usage accounted for only eleven of the 425 exchanges, mainly for communicating with departments outside the newsroom or reporters at home, and was therefore dropped from the analysis, leaving 404 events.