

REDUCING SOCIAL CONTEXT CUES: ELECTRONIC MAIL IN ORGANIZATIONAL COMMUNICATION*

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This paper examines electronic mail in organizational communication. Based on ideas about how social context cues within a communication setting affect information exchange, it argues that electronic mail does not simply speed up the exchange of information but leads to the exchange of new information as well. In a field study in a Fortune 500 company, we used questionnaire data and actual messages to examine electronic mail communication at all levels of the organization. Based on hypotheses from research on social communication, we explored effects of electronic communication related to self-absorption, status equalization, and uninhibited behavior. Consistent with experimental studies, we found that decreasing social context cues has substantial deregulating effects on communication. And we found that much of the information conveyed through electronic mail was information that would not have been conveyed through another medium.

(ELECTRONIC MAIL; INFORMATION EXCHANGE; SOCIAL CONTEXT)

1. Introduction

The boss is always the last one to know. This aphorism summarizes both what is right and what is wrong about communication in organizations. The unequal distribution of information promotes organizational efficiency by shielding decision makers from unnecessary information (e.g., O'Reilly 1980). But it can also lead to organizational disaster by separating decision makers from information they need to know (Allison 1971; Shlaim 1976; Wohlstetter 1962). Who has what information is a perennially important organizational question.

The purpose of this paper is to investigate how a new communication technology—electronic mail—affects who has what information in organizations. Most analyses of electronic mail view it simply as an information accelerator, a tool that reduces the amount of time it takes for people to get information they otherwise would have received more slowly. For instance managers in Digital Equipment Corporation reported that electronic mail increased the speed of their decision making and saved them about seven hours a week (Crawford 1982, pp. 3–4). Managers at Manufacturers Hanover Trust reported that electronic mail saved them about three hours a week, mostly by eliminating unreturned phone calls and internal correspondence (Nyce and Groppa 1983, p. 65). Speeding up the flow of existing information may be sufficient justification for using electronic mail. But we believe that electronic mail may do more than speed up information exchange. It may also alter the distribution of information in organizations, that is, it may change who has what information. This paper investigates one way that electronic mail may change patterns of information distribution in organizations. It uses research on how social context cues regulate communication to predict how information exchange in electronic mail will differ from information exchange in other media.

§2 describes the basic features of electronic mail. §3 suggests how features of electronic mail are likely to diminish commonly available social context cues and

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predicts how reduced social context cues are likely to affect communication behavior. §§4 and 5 describe the methods and results of an empirical study of electronic mail communication in two divisions of a Fortune 500 company. §6 discusses some of the implications of our findings for organizational management.

2. What is Electronic Mail?

In this section we describe the basic features of electronic mail and its characteristic implementations.

An electronic mail system (EMS) uses computer text-processing and communication tools to provide a high speed information exchange service. Anyone with a computer account can create and send information to anyone who has a mailbox on that computer or on any other computer to which it is connected through a computer network. The networked computers might be physically proximate and connected via a local area network, or they might be in different states, countries, or continents, and connected via long distance telecommunications.¹ Depending upon software sophistication, the mailed information can be a message, a document, a computer program, statistical data, or even a collection of organized messages—a computer discussion—forwarded from some other mailbox. At the recipient's convenience, he can read the information, edit it, save it, delete it, move it to another computer file, forward it to other people, combine it with other computer mail, and/or reply to the sender.

The fundamental process of electronic mail, moving text from one computer mailbox to another, has three general characteristics. First, it is *asynchronous* or nonsimultaneous. That is, like memos or postal mail but unlike conversations, senders and receivers do not attend to the same communication simultaneously.² Second, it is *fast*. Unlike paper-based communication, electronic mail can be transmitted in seconds or minutes down a hall or across a continent. Replies can flow back just as rapidly. Third, it is *text-based*. Unlike facsimile or telephone, electronic mail has no picture or sound components. Messages can be conveyed only through text.

The general process of moving text from one mailbox to another can be implemented in a variety of ways. Currently the most common are mail, bulletin boards, and conferences. Some organizations use all three of these implementations, but the most common is mail. Mail systems transmit information to individually-addressed people, whereas bulletin boards and conferences transmit information to a named electronic location that is accessible to more than one person (e.g., "Science Fiction Lovers," "Macintosh Users"). Bulletin boards and conferences differ in that bulletin boards

¹ Electronic mail services can be operated by an organization for its members or by a third party for extra-organizational traffic. Current commercially-available third party systems include The Source, Compuserve, and MCI Mail. The first large-scale computer communications network—the ARPANET—was begun in 1966 by the Department of Defense. It was designed to allow computer scientists at many locations to use special computing resources operating at only one location. Remote computers could log in to the special machine by using the communications network. It soon became evident that most of the traffic over the ARPANET was not machine to machine, but rather was researcher to researcher, using EMS (Licklider and Veza 1978, p. 1331). Indeed the ARPANET helped form entire communities composed of researchers at various locations around the country who exchange papers, ideas, computer programs, gossip, restaurant reviews, and all forms of messages. Today the ARPANET has hundreds of thousands of users at over 1300 locations. Corporations have also begun using EMS for internal communications. The Manufacturers Hanover Trust network has over 3000 users (Nyce and Groppa 1983); the Digital Equipment Corporation network has over 6000 (Crawford 1982). Other corporations using EMS include AT&T, Bank of America, Hewlett-Packard, IBM, Westinghouse, Xerox, 3M, and Peat Marwick and Mitchell.

² There are electronic communication programs for simultaneous communication. They are worthy of study in their own right but are not included in the domain of this paper which focuses on asynchronous communication.

display messages chronologically as they are received; conferences group messages by topic and display grouped messages together (see Rice 1980, for a review of conferencing).

Within any general implementation, equipment, software, and organizational policy choices can create very different systems. The kind of i/o device is an important equipment choice. In some systems, people use hard copy terminals, like teletype terminals, for typing out sent and received information on paper. But most systems today are based on video terminals, which display on a screen the information that people are typing or reading. An important software choice for mail implementations is presence or absence of a group mail facility. Some systems make it possible to send information only to individual recipients; others make it possible to send to groups of people via a distribution list mechanism. With this mechanism a sender sends one message to a group name, then the computer automatically sends a copy of the message to everyone belonging to the group. Most mail systems today have a group mail feature. Another important software choice is the extent to which people can edit and transmit "messages" of any length and style. Flexible message format makes it possible to exchange documents, computer programs, personal notes, and official announcements within the same medium. An important policy choice is how many people share a terminal. If many people share a single terminal, then the time-to-receipt of a sent message can become much longer than the real transmission time. At the extreme, if an entire building has only one terminal then people might have to make appointments to read their mail, or all mail might have to be printed and physically placed in peoples' office mailboxes once a day. Electronic mail systems are used most heavily by people who have a terminal on their desk. And, as the cost of computing continues to drop, the resulting trend is for more people to have good access to EMS.³

The organization we studied uses a sophisticated mail system, including video terminals, group distribution lists, and easy access. Henceforth our discussion assumes this type of system.

3. Social Context and Information Exchange

However sophisticated the communication system, information in organizations does not flow in a vacuum. Senders and receivers are situated within a social context that regulates or influences communication contact (who exchanges information with whom) and communication content (what information is communicated). Three kinds of variables contribute significantly to the social context: geographic, organizational, and situational variables. In this section we discuss variables in each category that influence communication.

3.1. *What Social Context Variables Are Important?*

Geographic location, defined as a person's physical position in time and space, constrains the opportunity to communicate using some media, but not others. In order for people to communicate face to face, they must be in the same geographic location. Communication by telephone can occur across all geographic distances but large time zone differences constrain routine telephone contact. Hard copy communication (e.g., postal mail and interoffice memos) is constrained neither by geographic distance nor by time zones, but it is slow. Distance sometimes affects communication content as well as contact, independent of any other variables (Barnlund and Harland 1963; Baum and Valins 1977).

³ All is not rosy. There are potential serious problems with electronic mail including cost, privacy, security, and authentication of messages. These topics deserve attention in their own right; we cannot do them justice in this paper.

Organizational position is defined as a person's location in an organizational department, hierarchy, and job category. Like geographic distance, organizational distance also predicts communication contact and content independent of any other variables (O'Reilly and Roberts 1974; Tushman and Romanelli 1983). Information is more often exchanged within than across organizational units, chains of command, and job categories.

Situational variables describe features of the immediate communication situation, such as the relationships among senders and receivers, the topic of the communication, and the norms or social conventions appropriate to the situation. For instance, when senders and receivers have the same sex, race, and age, they contribute information more equally and their information is more equally valued than when they are dissimilar on these variables (Cohen and Roper 1972; Kanter 1977; Watson 1982).⁴ The emotional compatibility and trust between senders and receivers also affects the content of what is communicated (O'Reilly and Roberts 1974). So does the topic of a communication. For example, people prefer not to communicate bad news (Rosen and Tesser 1970). Norms in the communication setting also influence what is communicated to whom. Some norms are relatively stable across organizations: for instance, be polite to your boss, don't reveal personal information to people you don't know well, lead the discussion if you are the highest status person in the room. Other norms vary across organizations, as recent case studies of organizational culture suggest (e.g., Kidder 1981; Wright 1979); for example, who should come to meetings, how candid should discussion be.

3.2. *How Does Social Context Affect Information Exchange?*

Social context influences information exchange through perception, cognitive interpretation, and communication behavior. (Figure 1 summarizes the process.) First, senders and receivers must perceive the social context of the communication. Social context barriers, such as status differences, will not constrain communication if senders and receivers are unaware of them. It is not sufficient for people simply to hold different positions; they must be aware of the fact that they do. Even the effects of geographic location are conditioned partially by perception because location covaries with situational variables, especially norms. Thus, although a person may have the technical capability to communicate with a business associate at any hour of the day or night via telephone, knowing that the associate is at home and it is evening or a weekend often deters communication. Communicators perceive the social context of a communication through both static and dynamic cues. Static cues emanate from people's appearance and artifacts such as a clock, a private office, a big desk, and a personal secretary. Dynamic cues emanate from peoples' nonverbal behavior which changes over the course of an interaction—for instance, nodding approval and frowning with displeasure.

Once people perceive social context cues, these cues can create or elicit cognitive interpretations and concomitant emotional states. People adjust the target, the tone and verbal content of their communications in response to their definition and interpretation of the situation. Typically, when social context cues are strong, behavior tends to be relatively other-focused, differentiated, and controlled. When social context cues are weak, people's feelings of anonymity tend to produce relatively self-centered and unregulated behavior. That is, people become relatively unconcerned with making

⁴ Most work investigating these variables has been conducted in face-to-face settings; some might wonder if they are irrelevant in hard copy communication. But some studies have demonstrated that the same written material is evaluated more highly when people think it is written by men than when they think it is written by women (Feldman-Summers and Kiesler 1974).

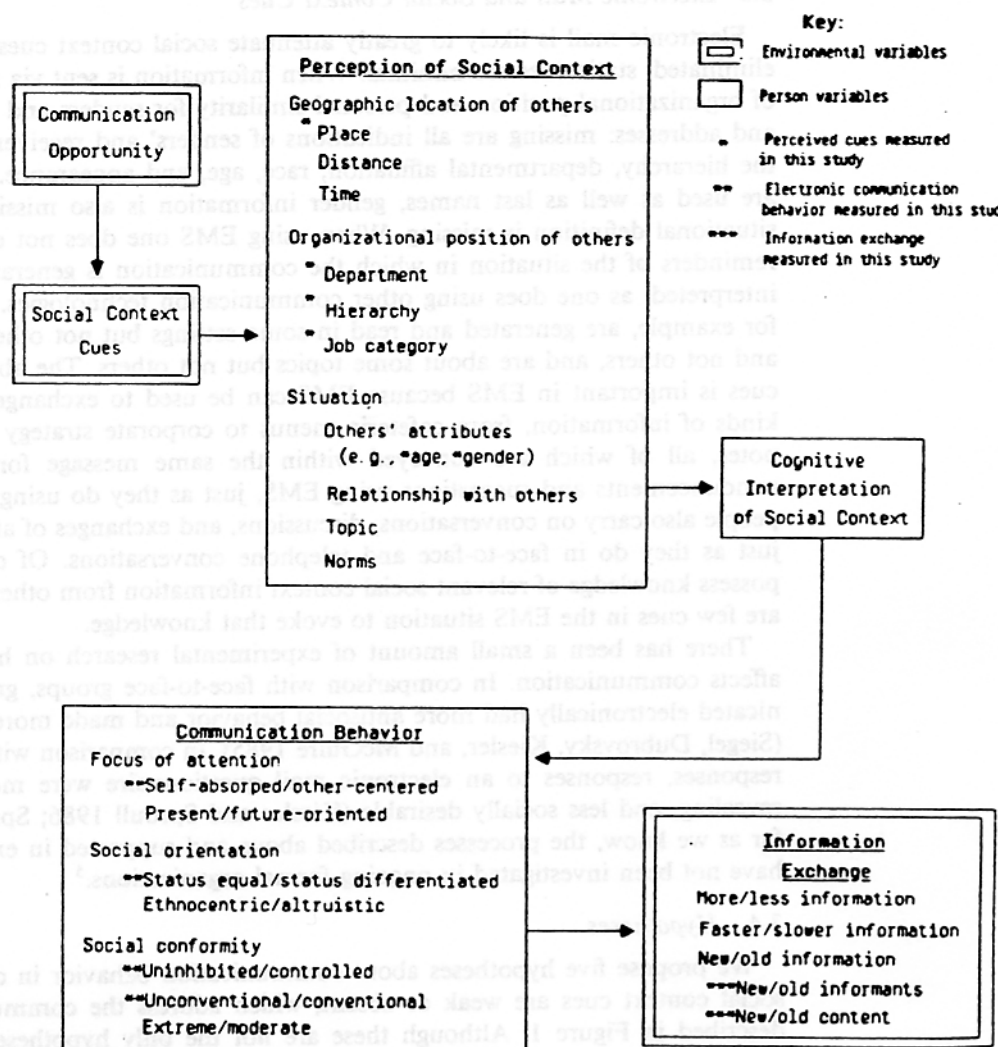


FIGURE 1. Theoretical Framework for How Social Context Information Affects Information Exchange.

a good appearance (Cottrell, Wack, Sekerak, and Rittle 1968). Their behavior becomes more extreme, more impulsive, and less socially differentiated (Diener, Fraser, Beamon, and Kelem 1976; Singer, Brush, and Lublin 1965).

All communications media attenuate to at least some degree the social context cues available in face-to-face conversation. The telephone reduces dynamic and static cues by eliminating visual information about communicators. Letters and memos reduce static cues by imposing standardized format conventions; they eliminate dynamic cues altogether. The relatively low level of social context cues in letters and memoranda can produce communication that is less well-regulated than face-to-face communication. In practice, we do not experience frequent unregulated paper communication because the social context cues attached to paper itself signal norms that paper communication not be used as a substitute for conversation and discussion (Siegel 1985). But in experimental comparisons, paper questionnaires elicited more antisocial opinions and more personal revelations than face-to-face interviews did (Sudman and Bradburn 1974). Written notes elicited more swings of opinion in groups than face-to-face discussions did (Festinger 1950, p. 176).

3.3 *Electronic Mail and Social Context Cues*

Electronic mail is likely to greatly attenuate social context cues. Dynamic cues are eliminated; static cues are minimal. When information is sent via EMS, the only signs of organizational position and personal similarity for senders and receivers are names and addresses: missing are all indications of senders' and receivers' job title, level of the hierarchy, departmental affiliation, race, age, and appearance. Unless first names are used as well as last names, gender information is also missing. Furthermore, a situational definition is missing. When using EMS one does not expect or encounter reminders of the situation in which the communication is generated or received and interpreted, as one does using other communication technologies. Corporate memos, for example, are generated and read in some settings but not others, by some people and not others, and are about some topics but not others. The absence of situational cues is important in EMS because EMS can be used to exchange so many different kinds of information, from cafeteria menus to corporate strategy documents to love notes, all of which are conveyed within the same message format. People make announcements and suggestions using EMS, just as they do using paper memos, but people also carry on conversations, discussions, and exchanges of affection using EMS, just as they do in face-to-face and telephone conversations. Of course, people may possess knowledge of relevant social context information from other sources. But there are few cues in the EMS situation to evoke that knowledge.

There has been a small amount of experimental research on how electronic mail affects communication. In comparison with face-to-face groups, groups that communicated electronically had more antisocial behavior and made more extreme decisions (Siegel, Dubrovsky, Kiesler, and McGuire 1985). In comparison with paper and pencil responses, responses to an electronic mail questionnaire were more extreme, more revealing, and less socially desirable (Kiesler and Sproull 1986; Sproull 1986). But as far as we know, the processes described above and supported in experimental studies have not been investigated in ongoing formal organizations.⁵

3.4. *Hypotheses*

We propose five hypotheses about communication behavior in organizations when social context cues are weak or absent, which address the communication behavior described in Figure 1. Although these are not the only hypotheses about electronic mail to investigate, we believe they exemplify ways in which EMS can alter who has what information in organizations.

1. Social context cues are relatively weak in electronic mail
 - 1a. Messages from unknown senders will not reveal cues about their geographic location, organizational department, hierarchical position, job category, age, or sex.
2. EMS behavior is relatively self-absorbed
 - 2a. People focus more on themselves than on others in the social frame (salutation and closing) of EMS communications
 - 2b. People overestimate their own contribution to EMS communications
 - 2c. People underestimate the messages they receive as a consequence of group membership.
3. EMS behavior is relatively undifferentiated by status
 - 3a. Messages from superiors look the same as messages from subordinates
 - 3b. Messages to managers look the same as messages to nonmanagers

⁵ Computer conferences have been the focus of research. But these studies have looked at extraorganizational conferences, whose participants have come from many different organizations (e.g., Rice 1982; Rice and Barnett 1986).

- 3c. People will more prefer to use EMS to send messages to superiors than they will to subordinates.
- 4. EMS behavior is relatively uninhibited and nonconforming
 - 4a. People behave irresponsibly more often in EMS than they do in face-to-face conversations
 - 4b. People violate the norm against sending bad news more with EMS than with other media
 - 4c. People violate the norm against nonwork communication during the workday more with electronic mail than with other media
 - 4d. People violate the norm against work communication at home more with electronic mail than with other media.
- 5. EMS provides new information, not just a faster way to receive old information
 - 5a. EMS provides new information from new respondents
 - 5b. EMS provides new information from old respondents.

4. Research Design

4.1. Overview

This research investigates EMS behavior in an ongoing formal organization. Ideally such research would be conducted in organizations that have used electronic mail for some time, so that any identified effects would not be attributable merely to initial reactions to a new technology. It would investigate use by people of different statuses, since status information is an important component of social context in communication situations. And it would compare communication behavior across media, since many of the hypothesized effects are relative to other media. The research reported here does examine behavior in an organization that has used electronic mail for a long time. It examines behavior for people of different statuses. It examines the contents of actual electronic messages, but relies on self-reports to compare electronic communication behavior with that using other media. Comparing actual communications from other media would be preferable but was not feasible.

In §3 we postulated a three-element process for how social context affects communication behavior: perception of social context cues, cognitive interpretation, and communication behaviors. We actually investigated the first and third of these elements, but not the second because cognitive states are extremely difficult to measure retrospectively. To investigate the first element, perception of social context cues, we measured respondents' knowledge of a set of social context cues about others: geographic location, organizational department, hierarchical position, job, age, and gender. (See Figure 1.) For a sample of messages, we asked senders if they were aware of this information about their receivers and we asked receivers if they were aware of this information about their senders. We investigated the third element by analyzing messages for self-absorbed behavior, status differentiation, and norm violations.

4.2. Sample

We collected data from EMS users in units of two divisions of a Fortune 500 office equipment firm employing over 100,000 people, with assets of over \$7.5 billion, and 1982 sales of over \$8 billion. The two divisions—R&D and Business Products—were the corporation's most extensive users of electronic mail. At the time of data collection in the late spring of 1983, the research unit employed 312 people organized into an administrative unit and 7 research laboratories. The product development unit employed 291 people.

The mail system used by this corporation supported over 3700 users and handled over 8000 messages each day, many of which were sent to multiple (sometimes

hundreds of) people. The system provided good tools for editing mail, storing it, and forwarding it to others. It also provided good and extensively-used software for sending mail to groups of people via distribution lists. All the people in the units we studied used video terminals for input and output and most of them processed their own mail directly.

All EMS users ($n = 513$) were stratified on employment level (technical/clerical, professional, managerial) and gender, resulting in six strata. Each stratum containing at least 5% of the entire unit's population was sampled. Female managers, who represent less than 5% of each unit's population, were not sampled. A 10-person sample was drawn from each stratum in the research unit. In the product development unit 10-person samples were drawn when possible; census samples were drawn from strata with fewer than ten members. Out of the original 98-person sample, 11 were no longer employed by the company or were out of the country, 2 did not use EMS, and 4 declined to participate. Replacements were drawn for all nonparticipants, except in the case of census strata, resulting in a final sample of 96 people.

4.3. *Data Collection and Instruments*

Data were collected during an eight-week period in the spring of 1983 by interview, questionnaire, and content coding of actual mail. Every participant saved a hard copy of every message sent or received for the three days prior to a scheduled interview. During the interview the respondent was asked ten open-ended questions about each of 15 or fewer messages from the previous workday (henceforth, the focal messages). If the respondent had 15 or fewer messages, the questions were asked for each message. If the respondent had more than 15 messages, a random sample of 15 was used. Then the respondent filled out a separate 13-item partner characteristics sheet for each focal message partner while the interviewer recorded attributes of each focal message on a coding sheet. The respondent also filled out an 80-item fixed-response questionnaire about general EMS attitudes and behaviors. In summary, the data set contains self-reports about attributes of specific messages (from interview questions about the nature of each focal message and characteristics questions about each focal message partner), data on actual attributes of specific messages (recorded or coded directly from the focal messages themselves), and self-reports about general electronic mail behavior and attitudes (from the questionnaire).

4.4. *Measures and Analyses*

The general analysis strategy was to use actual message attributes to examine internal characteristics of electronic mail behavior and to use questionnaire data to examine perceived differences in behavior across different communications media. Respondent data were weighted by the appropriate stratum proportion; message data were weighted by the total number of messages per respondent, then by the appropriate stratum proportion (Cochran 1963; pp. 87-153). Questionnaire responses and message characteristics were compared using correlated *t*-tests or repeated measures analysis of variance.

4.4.1. *Message Attributes.* Eight attributes characterized the messages: length, opening, closing, positive affect, negative affect, politeness, energy, and topic. Length was coded as the number of lines in the message text. Opening was coded as the number of words in the salutation; closing was the number of words in the closing. Positive affect was coded as the number of words or simple phrases expressing positive sentiment (such as "wonderful," "I love it"). Negative affect was coded as the number of words or simple phrases expressing negative sentiment (such as "terrible," "this is garbage"). Politeness was coded as the number of words or simple phrases expressing courtesy or etiquette (such as "please," "I would be grateful if . . ."). Energy was

coded as the number of instances of typographic extremes, marked by exclamation points and words typed in all capital letters. The topic of each message was coded as either work or nonwork.⁶ Coding of these attributes was performed by two independent coders resulting in an overall agreement rate of 97%, ranging from a low of 83% for positive affect to a high of 100% for length. We constructed an index of message uninhibition (UMI) by adding together the number of instances of negative affect, energy, and overly long messages (ones at least two standard deviations greater than the mean length) and subtracting the number of positive affect and politeness instances. The UMI ranges from 0 to 29 with a mean of 8.1 (s.d. = 2.2).

4.4.2. *Partner Attributes.* Seven attributes characterized the message partner for each focal message: geographic location, departmental location, hierarchical position, job category, age, gender, and how well the partner is known by the respondent (0 = not at all, 5 = very well). Each of these items was provided by the respondent for each message partner and was translated directly into numerical form for analysis. We constructed an index of perception of social context cues (SCI) for each message by adding together each of the first six attributes for which the respondent had information. The SCI index ranges from 0 to 6, with a mean of 3.7 (s.d. = 2.1).

4.4.3. *Absorption Effects.* We used multiple measures to increase the reliability of measurement. This is particularly important in this case because our operationalizations are based on artifacts (messages) and self-report (questionnaires), hence are indirect measures of absorption. We used three indicators of absorption: the length of message salutations and closings, the difference between questionnaire estimates of total message volume and the actual message volume (computed from the average of the three days' worth of saved messages), and the difference between questionnaire estimates of group message volume and the actual group message volume. Because reminders of the presence of other people are relatively weak in EMS, people should focus relatively strongly on themselves and on what they want to say and less strongly on their audience. One indicator of this is that people dispense with direct acknowledgements of the other person, that is, salutations. Another indicator of this is that people are more likely to use a closing (i.e., the author's name) than a salutation (other's name). The total number of words in both salutations and closings is an indicator of the total attention paid by the sender to the social relationship. The number of words in the closing compared to the number in the salutation is an indicator of the relative focus on the self. The length of message openings and closings were compared using correlated *t*-tests. Another indicator of self-absorption is peoples' estimates of their behavior compared with their actual behavior; estimates larger than actual indicate relative self-absorption. Questionnaire estimates of message volume were compared with the actual volume using *t*-tests for the difference in proportions. Questionnaire estimates of group messages were compared with the actual number of group messages similarly. (In this case, estimates lower than actual indicate relative self-absorption.)

4.4.4. *Status Equalization Effects.* We compared message presentation for messages from partners subordinate to the respondent with those from partners superior to the respondent. In this analysis, we analyzed sent messages separately from received messages to preserve the directionality of hierarchy. (If we had looked at all messages together we would not have known if "partner's hierarchical status" characterized a sender or a receiver.) We also analyzed questionnaire responses to hypothetical tasks

⁶ The topic is coded work if it has anything at all to do with the corporation, its employees, or their activities. This is an extremely liberal interpretation of "work." It includes, for example, messages announcing the week's menu in the company cafeteria and scores from the company softball games as well as laboratory reports, personnel announcements, and technical arguments. Examples of nonwork messages are movie reviews, requests for babysitters, and advice on where to find a second mortgage.

entailing communication up or down the hierarchy. People were asked to indicate what medium (face-to-face, EMS, telephone, or hardcopy mail) they would use to carry out four such tasks: asking your boss (secretary) to solve a problem, and negotiating with your boss (secretary) for more resources for a task you are working on. We assumed face-to-face is the norm for all four tasks. Responses were analyzed using repeated measures analysis of variance with medium and direction of communication as within-subjects variables.

4.4.5. *Uninhibited Behavior.* Because reminders of the presence of other people and of social norms are relatively weak in EMS, communication behavior should be relatively uninhibited. We used three indicators of uninhibited behavior from the questionnaire. People were asked how many times they saw flaming⁷ in their electronic mail and in their conversations. Responses were compared using correlated *t*-tests. People were asked about six tasks related to communicating good or bad news: telling your secretary she had gotten a large (no) raise, providing an enthusiastic (half-hearted) recommendation for a colleague; providing compliments (criticisms) about a colleague's work. We assumed that face-to-face was the preferred medium and that communicating bad news was less normative than communicating good news. Responses were analyzed using repeated measures analysis of variance with medium and nature of news as within-subjects variables. A third indicator of uninhibited behavior compared questionnaire responses on the frequency of using EMS and telephone for nonwork messages at the office and for work messages at home. We assumed that nonwork messages at the office were less normative and work messages at home were less normative.

5. Findings

Table 1 describes the sample. The mean age of respondents is 36.5. On average, respondents have a college education, have worked for the PHC for 4.8 years, and have used EMS for 4.6 years. Twenty-five percent of them are in business or support positions. There are no differences between the two divisions on any of these characteristics. Men, in comparison with women, are better educated, have been in the organization longer, and are more likely to be in scientific and technical positions. Managers are older and have been in the organization longer; nonexempts have less education and are more likely to be in business and support positions.

5.1. *The Electronic Community*

Table 2 affirms that PHC does represent a well-established electronic community. On average PHC's policies and procedures made it very easy to use EMS; people found the program itself easy to use; they and their work colleagues had good access to EMS terminals; they used EMS quite extensively. People sent and received an average of 26 messages a day. Table 2 also displays differences in electronic community characteristics by group (division, sex, and hierarchy). There were no gender or hierarchy differences in EMS accessibility or volume of messages, suggesting that EMS had widely permeated the entire organization. The two organizations differed in EMS accessibility, although in both cases accessibility was relatively high. The biggest difference was that the product development organization had more message traffic than did the R&D organization—an average of 31 messages a day per person in the product development organization compared with 20 messages a day per person in the R&D organization.

⁷ "Flaming," a term coined by the hacker community, means "to speak rabidly or incessantly on an uninteresting topic or with a patently ridiculous attitude" (Steele et al. 1983).

TABLE 1
Sample Characteristics

Sample Characteristics				
Entire Sample (<i>n</i> = 96)				
	Mean Response			
Characteristic				
Age	36.5			
Education (2 = some college, 3 = college degree, 4 = graduate work, 5 = professional degree, 6 = Ph.D.)	3.5			
Job Category (1 = scientific/technical, 2 = business/support)	1.25			
Years in organization	4.8			
Years using EMS	4.6			
Sample Differences By Organization				
	Research (<i>n</i> = 50)	Prod. Dev. (<i>n</i> = 46)	<i>p</i> -value of <i>t</i> -statistic	
Characteristic				
Age	37.3	35.7	n.s.	
Education	3.6	3.4	n.s.	
Job Category	1.2	1.3	n.s.	
Years in organization	5.4	4.2	n.s.	
Years using EMS	4.4	4.8	n.s.	
Sample Differences By Gender				
	Male (<i>n</i> = 58)	Female (<i>n</i> = 38)	<i>p</i> -value of <i>t</i> -statistic	
Characteristic				
Age	37.8	34.6	n.s.	
Education	4.0	2.8	<0.01	
Job Category	1.1	1.5	<0.01	
Years in organization	5.6	3.6	<0.01	
Years using EMS	4.9	4.1	n.s.	
Sample Differences By Hierarchy				
	Mgrs. (<i>n</i> = 21)	Profs. (<i>n</i> = 40)	Non-exempt (<i>n</i> = 35)	<i>p</i> -value of <i>F</i> -ratio
Characteristic				
Age	43	34	35	<0.01
Education	5.0	4.1	1.9	<0.01
Job Category	1.2	1.1	1.4	<0.01
Years in organization	6.9	4.3	4.1	<0.01
Years using EMS	5.6	5.2	3.3	<0.01

Table 3 describes characteristics of message presentation and message partner attributes. Messages ranged in length from 0 lines to 1200 lines; in number of opening words from 0 to 9; in number of closing words from 0 to 5. They ranged in number of instances of positive affect from 0 to 15; in number of instances of negative affect from 0 to 12; in number of instances of politeness from 0 to 9; in number of instances of energy from 0 to 14. 60% of the messages were about work topics. The average age of message partners was 34.3; for message partners whose gender was known by the

TABLE 2
Organizational Characteristics

Overall Characteristics (n = 96)				
	Mean Response			
EMS Accessibility				
Organizational ease of use (1 = very easy, 5 = very hard)	1.2			
Program ease of use (1 = very easy, 5 = very hard)	1.4			
Office Access (% with terminal in own office)	85%			
Colleague's access (% of work partners with terminal in own office)	87%			
Messages				
Total daily	25.6			
Sent	2.0			
Received	23.6			
Differences By Organization				
	Research (n = 50)	Prod. Dev. (n = 46)	p-value of t-statistic	
EMS Accessibility				
Org. ease of use	1.4	1.0	<0.01	
Program ease of use	1.6	1.2	<0.01	
Office access	72%	99%	<0.01	
Colleagues' access	77%	97%	<0.01	
Messages				
Total Daily	19.8	31.4	<0.01	
Sent	1.5	2.4	<0.01	
Received	18.3	29.0	<0.01	
Differences By Gender				
	Male (n = 58)	Female (n = 38)	p-value of t-statistic	
EMS Accessibility				
Org. ease of use	1.2	1.2	n.s.	
Program ease of use	1.4	1.2	n.s.	
Office access	86%	82%	n.s.	
Colleagues' access	89%	83%	n.s.	
Messages				
Total Daily	26.6	22.5	n.s.	
Sent	2.0	2.0	n.s.	
Received	24.6	20.5	n.s.	
Differences By Hierarchy				
	Mgrs. (n = 21)	Profs. (n = 40)	Non-exempt (n = 35)	p-value of F-ratio
EMS Accessibility				
Org. ease of use	1.0	1.2	1.3	n.s.
Program ease of use	1.4	1.4	1.3	n.s.
Office access	95%	82%	93%	n.s.
Colleagues' access	85%	87%	89%	n.s.
Messages				
Total Daily	23.0	27.2	19.6	n.s.
Sent	2.4	2.0	1.6	n.s.
Received	20.6	25.2	18.0	n.s.

Note. The data for each sampling stratum are weighted to reflect its proportion of the organization as a whole.

TABLE 3
Organizational Message Characteristics

All Messages (<i>n</i> = 1248)	
	Mean Characteristic
Message presentation	
Length (in lines)	12.6
Opening (number of words)	0.31
Closing (number of words)	0.94
Positive affect (number of instances)	0.52
Negative affect (number of instances)	0.15
Politeness (number of instances)	0.46
Energy (number of instances)	0.48
Topic (0 = nonwork; 1 = work)	0.60
Partner attributes	
Age	34.3
Job title (1 = scientific or technical; 2 = business or support)	1.2
Sex (0 = male; 1 = female)	0.29
Hierarchy (1 = subordinate; 2 = peer; 3 = superior; 4 = not in chain of command)	3.2
Know partner (1 = not at all to; 5 = very well)	2.1

Messages Differences By Organization

	Research (<i>n</i> = 627)	Prod. Dev. (<i>n</i> = 621)	<i>p</i> -value of <i>t</i> -statistic
Message presentation			
Length	12.5	12.7	n.s.
Opening	0.35	0.28	n.s.
Closing	0.85	1.01	<0.01
Positive affect	0.46	0.58	n.s.
Negative affect	0.14	0.15	n.s.
Politeness	0.50	0.42	n.s.
Energy	0.57	0.38	<0.01
Topic (% work)	54%	66%	<0.01
Partner Attributes			
Age	35.2	33.6	n.s.
Job title	1.3	1.2	n.s.
Sex	0.35	0.24	<0.01
Hierarchy	3.0	3.4	<0.01
Know partner	2.0	2.2	<0.01

Message Differences By Gender

	Male (<i>n</i> = 955)	Female (<i>n</i> = 293)	<i>p</i> -value of <i>t</i> -statistic
Message presentation			
Length	13.3	10.3	<0.01
Opening	0.33	0.27	n.s.
Closing	0.91	1.02	n.s.
Positive affect	0.49	0.60	n.s.
Negative affect	0.15	0.14	n.s.
Politeness	0.45	0.48	n.s.
Energy	0.49	0.42	n.s.
Topic (% work)	60%	60%	n.s.

TABLE 3 (Continued)

	Male (<i>n</i> = 955)	Female (<i>n</i> = 293)	<i>p</i> -value of <i>t</i> -statistic	
Partner attributes				
Age	34.0	35.7	n.s.	
Job title	1.2	1.3	<0.01	
Sex	0.29	0.28	n.s.	
Hierarchy	3.2	3.4	<0.01	
Know partner	2.2	2.1	n.s.	
Message Differences By Hierarchy				
	Mgrs. (<i>n</i> = 114)	Profs. (<i>n</i> = 963)	Non-exempt (<i>n</i> = 171)	<i>p</i> -value of <i>F</i> -ratio
Message presentation				
Length	18.5	11.9	12.4	<0.01
Opening	0.65	0.27	0.34	<0.01
Closing	0.89	0.95	0.88	n.s.
Positive affect	0.38	0.53	0.55	n.s.
Negative affect	0.32	0.11	0.22	<0.01
Politeness	0.42	0.45	0.54	n.s.
Energy	0.31	0.49	0.47	n.s.
Topic (% work)	84%	58%	55%	<0.01
Partner attributes				
Age	37.1	33.8	35.2	<0.01
Job title	1.29	1.17	1.49	<0.01
Sex	0.37	0.26	0.37	<0.01
Hierarchy	2.8	3.2	3.4	<0.01
Know partner	2.6	2.1	2.1	<0.01

Note. The data for each sampling stratum are weighted to reflect its proportion of the organization as a whole.

respondent, 71% of them were male. For received messages, 11% of the partners were subordinates, 17% were peers, 9% were superiors, and 63% were outside the chain of command. 52% of the received messages were from partners not known by the respondent. Eighty-six percent of the received messages were sent to more than one person, almost always via a distribution list.

5.2. Reduced Social Context Information

The SCI is our measure of social context information. When partners are known, awareness of social context information can come from many sources. When partners are unknown, the message itself is one of the very few available sources of such information. The mean SCI for messages whose partners were known was 5.2; the mean SCI for messages whose partners were unknown was 2.0 ($t = 40.11$, $p < 0.01$). The major mechanism for communicating with unknown partners is via group messages; 97% of all messages whose partner was unknown were group messages.

5.3. Absorption

The mean number of words in salutations was 0.31; the mean number of words in closings was 0.94 ($t = 13.9$, $p < 0.01$). People estimated they send an average of 3.9 messages a day; they actually sent an average of 2.0 per day ($t = 20.4$, $p < 0.01$). They also overestimated the number they received (mean = 27.6) in comparison with the

actual number they received (mean = 25.6) ($t = 6.83$, $p < 0.01$). But they *more* overestimated their sent messages than their received ones. The ratio of estimated messages sent to actual messages sent was 2:1; the ratio of estimated messages received to actual messages received was 1.1:1 ($t = 13.83$, $p < 0.01$). Another aspect of absorption is underestimating group membership. People underestimated the proportion of group messages (i.e., messages from distribution lists) they received in comparison with the actual proportion they received from distribution lists. People estimated that 79% of their received messages were group messages; 86% of their received messages were actually group messages ($t = 1.47$, n.s.).

Exhibit 1 displays one example of absorption effects. This message was sent in

EXHIBIT 1

Self-Absorbed Message

Date:	28 April 1983 2:38 pm EDT (Thursday)
From:	
Subject:	Re: VDTs—A NEW SOCIAL DISEASE
In-reply-to:	Menr's message of 17 April 1983 6:53 pm EDT (Wednesday)
To:	ALLNYC ALLCHI ALLPGH
cc:	ALLSEW ALLPHL ALLNEW WOMEN.LA WOMEN.PGH

Reply-to:

As a user of glasses only for reading (you know, the old age bit, where your could see 500 miles away, but can't read 2 inches in front of you, and your arms aren't made of elastic, therefore won't stretch far enough): I recently decided to purchase bifocals (thinking they would be better than my reading glasses) and I definitely say they are only good for reading material that you could position at the level you want. I am not of the same opinion as you in that it can be a problem only if you make it a problem. Even if you sit back and look through top part of the lens, I find then that I'm better off without my glasses. You have to remember there are different degrees of distances farsighted people can see. My bifocals are not only entirely useless for the screen AND keyboard, but in trying to position my neck, face, head, shoulders, in order to work at the keyboard properly, I have worsened some very severe problems in my neck.

I found that my very first reading glasses (with the smallest prescription possible) were the best for working with the screen. The reason I say "were" is because I broke the frame the other day.

I sure hope someone comes up with a solution to all this. Until all this started coming over the electronic mail, I was silently suffering to myself, thinking I was the only one in such a dilemma.

response to an earlier general information message on health effects of video display terminals. Note its chatty tone and how it reveals personal information about the sender (her physical ailments, how she broke her glasses). This message was sent to more than 3000 people.

5.4. Status Equalization

Messages from subordinates were no different from messages from superiors on the UMI or the other variables of message presentation. Messages from managers were more likely to be about work but there were no differences in the UMI or other variables of message presentation.

Table 4 reports the results of asking people how they would do a series of hypothetical tasks. We deliberately chose important tasks, ones in which a preference for face-to-face communication should dominate, in order to provide a strong test for any change in medium preference across tasks. People said they preferred EMS more when sending messages up the hierarchy than when sending them down, as shown by the last four tasks in Table 4. People more preferred EMS for communicating with their boss than with their secretary about project resources (the F -ratio for the interaction of medium and hierarchy was 3.71 (d.f. = 3,285), $p < 0.05$). People more preferred EMS for communicating with their boss than with their secretary when solving an administrative problem, although the difference in preference was not significant (the F -ratio for the interaction of medium and hierarchy was 1.41 (d.f. = 3,285), $p = \text{n.s.}$). There are two plausible reasons why people might prefer EMS for upward over downward communication. One is access equalization; that is, bosses may not be as accessible face-to-face as they are via EMS while secretaries are equally accessible in both media. The other is status equalization; that is, subordinates may prefer to have few reminders of status differences when talking with bosses but many when talking with secretaries. Our data do not allow us to distinguish between these explanations.

TABLE 4
*Preferred Medium Depending upon Task and Kind of Information
or Hierarchical Direction of Communication*
(Mean preference on a 10-point scale)

Task, Kind of Information, and Hierarchical Direction	Medium of Communication			
	FACE	EMS	PHONE	PAPER
Salary news				
Raise	9.4	0.3	0.2	0.1
No raise	8.6	0.9	0.3	0.2
Recommendation				
Enthusiastic	5.3	2.2	1.7	0.9
Half-hearted	4.4	2.8	1.9	0.9
Evaluate colleague				
Compliment	5.8	3.0	1.0	0.2
Criticize	7.1	2.1	0.7	0.1
Solve Problem				
To Secy	6.0	2.8	1.0	0.05
To Boss	6.0	3.3	0.7	0.03
Negotiate				
To Secy	7.5	1.5	0.7	0.25
To Boss	7.3	2.3	0.3	0.06

5.5. *Uninhibited Behavior*

People reported seeing flaming in their EMS messages a mean of 33 times a month; they reported seeing flaming in their face-to-face conversations a mean of 4 times a month ($t = 2.9$, $p < 0.01$). Exhibit 2 displays one example of an uninhibited message sent by a professional in the product development organization. Note the profanity, negative affect, and typographic energy (capitalizations and exclamation points). This message was sent to more than 100 people.

EXHIBIT 2 *Uninhibited Message*

Date: 26 Apr 83 19:53:38 EDT (Tuesday)
From:
Subject: That which is TRULY MONSTROUS
To: [Product] Interest .pa

It's great to worry about fine points, but I think we should concentrate on getting rid of those aspects of [product] which are TRULY MONSTROUS to the native user (such as yours truly). I had to ask about three people to figure out how to get the @#\$\$*ing insertion point beyond a graphics frame. the answer, it appears, is some *incredibly arcane* nonsense about show structure, select after anchor, and repaginate. WHY CAN'T I JUST POINT THE BLOODY MOUSE BELOW A GRAPHICS FRAME AND GET AN INSERTION POINT?

A second kind of uninhibited behavior is increased willingness to communicate bad news or negative information. People said they more preferred EMS to deliver bad salary news than good salary news (F -ratio for the interaction of medium and kind of information was 8.89 (d.f. = 3,285), $p < 0.01$). People said they more preferred EMS to deliver a half-hearted recommendation than an enthusiastic one (F -ratio for the interaction of medium and kind of information was 6.34 (d.f. = 3,285), $p < 0.01$). But they said they preferred EMS less to criticize a colleague's work than to compliment it (F -ratio for the interaction of medium and kind of information was 15.75 (d.f. = 3,285), $p < 0.01$).

A third kind of uninhibited behavior is flouting social conventions. One such convention marks the boundary between work and play, which we expect would be attenuated by electronic mail. Forty percent of all message traffic was totally unrelated to work, e.g., movie reviews, notices about astronomy club meetings, recipes, advice about where to obtain a second mortgage.⁸ People reported that they used EMS at the office a mean of 38 times during the week for nonwork communication; they used the telephone at the office a mean of 6 times during the week for nonwork communication ($t = 5.74$, $p < 0.01$). Those with terminals at home reported that they used EMS at home at least once a week to send or receive messages about work matters. This was the same frequency with which they used their home telephone for work ($t = 0.25$, $p = n.s.$).

⁸ We do not know of good comparative data from other media for organizations generally, so it is difficult to know whether 40% is a small or large number. Some comparative data are available for managers however. In one study of managerial time allocation, managers spent about 6% of their time in nonwork activities (Sproull 1984, p. 19). In the managers' subsample in this project, about 16% of their messages were unrelated to work.

5.6. *New Information*

Sixty-two percent of the messages constituted "new" information; that is, information respondents reported they would have gotten (or sent) no other way if there were no electronic mail. Table 5 reveals that new information flowed in two ways. One was via access to unknown people. This was how the majority of new information arrived and much of it was nonwork related. The other way was via known people. Note that new work-related information was as likely to come from known partners (170 messages) as it was from unknown partners (177 messages). Examples of new information from the sample included an announcement of a house for sale (nonwork), a request for a baby sitter (nonwork), a report about a conference (work), a solicitation for ideas about a new product (work), and suggestions for new ways to use a particular piece of software (work).

6. Discussion

In a field study of organizational electronic mail, we found evidence that electronic mail reduced social context cues, provided information that was relatively self-absorbed, undifferentiated by status, uninhibited, and provided new information. Specifically, we found:

- Relatively weak social context cues in EMS
- People focused more on themselves than on others in message salutations and closings
 - People overestimated their own contribution to EMS communications
 - People underestimated their group messages
 - Messages from superiors and managers looked no different from messages from subordinates and nonmanagers
- People more preferred to use EMS to send messages to superiors than to subordinates
 - People behaved irresponsibly more often on EMS than they did in face-to-face conversations
 - People preferred EMS for sending bad news
 - People used EMS for nonwork communication during the workday
 - 60% of the messages contained new information.

Three alternative explanations for these findings—technical unreliability, user inexperience, and lack of widespread access to the technology—can be considered. Some might argue that the technology is unreliable because it is new. Unreliability would lead to uncertainty and frustration, hence disinhibition and, perhaps, self-absorption. But the mail system in this research had been running continuously and reliably for ten years at the time of data collection. Some might argue that people have not yet learned how to use the technology "properly," even though it is reliable. Inexperience

TABLE 5
*Relationship among Nature of Information, Topic of Message,
and Knowledge of Partner*

Topic of Message	Partner			
	Unknown		Known	
	Old Info	New Info	Old Info	New Info
Work	65	177	340	170
Nonwork	18	339	54	85

on the part of users would lead to uncertainty and inappropriate behavior. But respondents reported they had been using EMS extensively for as long as they had been in the organization. Some might argue that, although the technology is reliable and people are experienced, EMS communication is insignificant or trivial because only a very few people have access to it and none of those people are important. Insignificance would lead to uninhibited behavior and deviance. However, in this case the mail system was used by over 3700 people in the corporation. And in the divisions studied in this research, people at all hierarchical levels used EMS extensively. In sum although we cannot rule these explanations out, it is unlikely that unreliable technology, inexperienced users, or lack of access produced the results of this study.

Further research should address two shortcomings in this study. The first is that the research was conducted within only one organization; therefore any claims to generalizability are problematic. The hypothesized processes have been observed in laboratory studies; however further field studies should be conducted in more than one organization. The second is that, because all mediated communication reduces social context information, further research should compare actual face-to-face conversations, telephone conversations, letters, and memoranda with electronic mail.

Each of the effects hypothesized and observed in this research can have important consequences for organizations. People's overestimating their personal contribution to and involvement in EMS communications is one of the self-absorption effects. Overestimation may have interesting implications for decision making. If people receive an EMS message announcing a decision or new policy, they may feel more committed to it than if it had come via a paper announcement. This might occur simply because people would feel a generalized sense of having contributed. On the other hand it may be more difficult for people to reach a decision using EMS than using face-to-face meetings or paper memoranda. If participants overestimate the value of their EMS contributions as much as they overestimate their frequency, people should be very reluctant to give up their initial positions conveyed via EMS to reach a consensus or compromise. But once consensus is reached, participants might value the decision more highly than one made using other media because they would overestimate the extent to which the decision reflected their own effort in reaching that decision.

A consequence of status equalization is that managers may have access to information that formerly would have been difficult if not impossible for them to get. During the period of research described in this paper, a product developer sent a message to distribution lists that reach thousands of people asking for suggestions about how to add a particular new product feature. Within two weeks, he had received over 150 messages in reply, cutting across geographical, departmental, divisional, and hierarchical boundaries, almost all from people the product developer did not know. Some of these messages even told the developer bluntly why it was a bad idea to add this feature. Status equalization may make people less unwilling to send bad news up the chain of command.

Uninhibited behavior may lead to more new ideas flowing through electronic mail, just as brainstorming techniques are supposed to release inhibitions so that ideas can flow in face-to-face groups. The extensive literature on communication and innovation (e.g., Allen and Cohen 1973; Ebadi and Utterback 1984) documents how structural and social variables can impede or channel technical information. Uninhibited behavior signals a decrease in the importance of these barriers to information flow. A topic for future research is how electronic mail networks affect the relative importance of structural and social variables in governing technical communication. For example, if everyone is easily accessible via electronic mail, what happens to the role of gatekeepers?

Another question is whether more information exchange is useful. Uninhibited

behavior may lead to more "junk mail" as well as to more creative ideas. Proponents of new information technology often assert that it will remove "barriers" (geographic, temporal, departmental, and others) to communication. The assumption is that if these barriers are removed, large amounts of pent up task-relevant information will surge through the organization. In our study people did receive many work-related messages they said they would not have received other than through EMS. But they also received a great deal of new nonwork communication as well. The real value of this could be increased sociability and organizational attachment. People like to be sociable at work. A technology that makes it easy to be sociable—be it a water fountain, coffee pot, telephone, or EMS—will be used for sociability.⁹ EMS has the potential to be a good technology for sociability. It reduces social reminders of norms against "goofing off". Furthermore, because it is asynchronous, it is a relatively efficient medium for sociability. Recipients are amused or enlightened on their own schedule, not that of the initiator. And recipients do not have to reciprocate; they can simply read their entertaining message and get back to work. Thus, even busy workers who otherwise would not take the time, or wallflowers who would not have the social skills, can participate in affable communication. One topic for future research is the relationship between EMS sociability and feelings of affiliation and commitment to the organization. Another is the relationship between sociability and work effectiveness.

All of these consequences bear on changing the distribution of information in organizations—who knows what. EMS can both add new recipients to information already being circulated within an organization and add genuinely new or previously uncirculated information. These are managerial issues, not technical ones. The technology of electronic mail simply moves text from one computer mailbox to another. Organizational policy will determine who has access to those mailboxes, how easy the access is, who can create distribution lists, who can join them, who can send mail to whom, and how closely, if at all, messages are monitored. In the case of the organization studied in this research, access was easy and widespread, anyone could create distribution lists, and the management was not heavy-handed in policing the system. The costs were in computer resources necessary to support a very heavily-used mail system and in people's sometimes receiving inappropriate messages. The benefits were in expanding and changing the distribution of information within the organization. The results of our research suggest that much of the power of EMS may stem from changing the nature of information and informants, not just the quantity and speed of information.¹⁰

⁹ Two of the most frequently-run computer programs at Carnegie-Mellon University are JOKE and COOKIE. The first prints a joke on the user's screen; the second prints a fortune-cookie fortune. JOKE is run an average of 150 times a day; COOKIE is run an average of 2300 times a day (Blackwell 1986).

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