

# **Two-Level Perspective on Electronic Mail in Organizations**

**Lee Sproull and Sara Kiesler**  
*Boston University*

Organizational computing tools are often developed and managed with an eye toward increasing efficiency. Yet today's most widespread organizational computing tool, electronic mail, has an impact that goes well beyond efficiency effects. This article summarizes a two-level perspective on organizational computing and reviews research results demonstrating strong organizational effects of electronic mail. From these results, we draw some lessons for the next generation of organizational computing.

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  of computing

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## **1. INTRODUCTION**

When we talk to people interested in organizational computing, we ask how extensively they use various organizational computing tools in their own work. We ask about computer-supported meeting rooms, on-line conferences, collaborative writing tools, group project tools, and electronic mail. Inevitably, the only tool used by more than a few people is electronic mail. And it is often used by almost everyone. Electronic mail is currently the only organizational computing tool in widespread use by many kinds of people in many kinds of organizations. Yet many managers and developers underestimate the potential importance of electronic mail as a source of lessons about organizational computing. They may recognize its utility for mundane purposes such as reducing telephone tag, but they are unaware of the profound effects it can have on the dynamics and organization of work.

Histories of earlier technologies such as the telephone and automobile suggest that a two-level perspective on technology can help illuminate the organizational implications of new technology [5, 2]. This article summarizes a two-level perspective on organizational computing [30] and reviews research results demonstrating strong organizational effects from electronic mail. It con-

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Correspondence and requests for reprints should be sent to Lee Sproull, School of Management, Boston University, Boston, MA 02215.

cludes with some lessons that we can learn from our collective experience with electronic mail for the next generation of organizational computing.

## 2. TWO-LEVEL PERSPECTIVE ON TECHNOLOGY

Ranked among the most important human technologies are those that have increased the durability, intelligibility, and portability of information, technologies such as the printing press, the typewriter, and the telephone. Communication technologies such as these have effects at two levels. The first level of effects is efficiency gains or productivity gains achieved through reducing the cost of work that was previously more expensive. The printing press, for instance, was first conceived as a way to copy manuscripts more rapidly than human scribes could. The telephone was envisioned as a more efficient telegraph. Conventional cost-displacement analysis or value-added analysis often underlies the calculation of first-level efficiency gains from technology.

Such analyses fail to recognize that the most important effects of a new technology may be, not to let people do old things more efficiently, but rather to do new things that simply were not possible or feasible with the old technology [5, 2]. Communication technologies have generally given people greater freedom of expression and more choice in the information they give and receive. Entirely new ways of working, including new social roles and work structures, are second-level effects of communication technology. The printing press, for example, made possible mass literacy. The telephone made possible national stock and commodity markets [1]. Second-level effects come about when a new technology connects people with new information and new people [16]. New information changes what people pay attention to—how they spend their time and what they think is important. New social contacts change whom people get to know and how they feel about them.

The history of the ARPANET, progenitor of today's electronic mail systems, illustrates this two-level perspective. Originally, the ARPANET was conceived as a way to share scarce computing resources by allowing computer scientists at one location to have access to computers at other locations via a network connection [29]. Although ARPANET did indeed make this first-level efficiency effect possible, much to the surprise of its developers, the most popular use of the network was electronic mail [18]. With electronic mail, a computer scientist at one location could send a free-text message on any topic over the network to a computer scientist at a different location. Via electronic mail on ARPANET, large numbers of computer scientists around the country exchanged ideas rapidly and casually on topics ranging from system design to programming bugs to movie reviews. Graduate students "moved around" electronically to work with professors and other students who could offer interesting problems and skills regardless of where these colleagues were located physically, a kind of free-floating apprenticeship. Scientists could choose their colleagues based on shared interests rather than on proximity [17]. A large electronic community was formed, filled with friends who did not know each other and collaborators who

had never met in person. We are now beginning to see similar electronic communities developing in organizations that make extensive use of electronic communication.

The ARPANET example illustrates that technology can have both first-level efficiency effects and second-level social system effects. Most inventors and early adopters of technology think primarily about efficiency effects, or first-level effects, of that technology. Second-level system effects are likely to be more important for organizations in the long run, however. They often emerge relatively slowly as people renegotiate changed patterns of attention and social contact. They are not "caused" by technology operating autonomously on a passive organization. Rather they are "constructed" as technology interacts with, shapes, and is shaped by the social and policy environment. First-level efficiency effects have been documented for electronic mail in organizations (see, for example, Refs. 3, 22, and 28). Because the technology is fast and asynchronous, it is a relatively efficient communication medium. More interestingly, in some organizations, electronic mail has been associated with changes in interpersonal dynamics and ways of organizing—second-level effects. The next section summarizes evidence at both levels.

### 3. OVERVIEW OF RESEARCH ON THE EFFECTS OF ELECTRONIC MAIL

#### 3.1. First-Level Efficiency Effects

Electronic mail is fast. When speed of delivery is important, electronic mail offers clear efficiency gains over hard copy communication. Because electronic communication is asynchronous, it can also offer efficiency gains over telephone communication in which up to 70% of initial attempts fail to reach the intended party [26]. Organizations appreciate the savings that result from reducing hard copy and telephone delays, and attend to evidence that purports to quantify these savings. For instance, Manufacturer's Hanover Trust estimated in 1983 that employees saved an average of 36 minutes a day by using electronic communication, which translated into an annual net opportunity value of about \$7 million [25]. Digital Equipment Corporation estimated in 1982 the marginal cost savings to its managers using electronic mail to be \$28 million [4]. Some of the efficiency gains that in the early '80s were attributable to electronic mail may today be produced by fax.

Electronic communication may increase efficiency through accelerating the flow of information. It may also do so through regularizing the flow of information. All organizations have procedures for disseminating information to groups, such as departments of people who work in the same building. The costs of these procedures preclude their being used indiscriminately. When they are not used, people may learn of potentially useful information only through ad hoc means. Broadcast electronic mail makes it easy to regularize some of these ad hoc communications. For example, Digital Equipment Corporation uses

electronic mail to broadcast the announcement of last-minute spaces in its employee training and education classes. Classes that are "filled" on paper often get taught with empty seats because of last-minute cancellations. Broadcast electronic mail disseminates information about these vacancies to everyone who might be able to benefit from them. As a result, more employees receive training for any given course, a direct efficiency gain from the broadcast capabilities of electronic mail [22].

Electronic group mail, through the use of distribution lists, bulletin boards, or conferences, can decrease group coordination costs just as electronic one-to-one mail decreases one-to-one costs. The scheduling constraints of getting everyone into the same room at the same time vanish. Everyone can "talk" at his or her convenience; everyone can "listen" at his or her convenience. Everyone can be kept up to date, reducing the need to redo tasks just because people have been working in ignorance of one another. An archive of messages can preserve the same group memory for every member.

Seven software development teams that we studied demonstrate how groups can use electronic communication for coordination [10]. These groups of college seniors had to produce a working software system for a real business client under a 4-month deadline. Each team of 7–10 people held regularly scheduled meetings over the course of the project. Teams also communicated via telephone, memo, informal conversation, and electronic mail. We discovered a very high correlation between use of computer mail and group performance—the quality of the software project as judged by the teams' clients. Furthermore, this increased productivity was achieved without an increase in the total amount of communication. The groups that used electronic mail more spent less time on face-to-face meetings, telephone calls, and writing memos. Similar results have been found in other studies of groups using electronic communication for coordination [31, 8].

### 3.2. Second-Level Organizational Effects

First-level effects occur through accelerating the flow of information, regularizing communication procedures, and enabling smoother coordination of group tasks. Such improvements are important and may provide the initial cost justification for electronic mail. However, in the long run, more interesting benefits emerge because the technology allows people and groups to interact in ways that simply were not possible previously. In adding the memory and processing power of computers to communication technology, electronic communication does much more than speed up information flow. It loosens constraints of space, time, numbers of people, social or organizational boundaries, and information ownership on communication. It makes data available that were not previously accessible and enables people to escape or change previous social arrangements. These qualitative changes, involving both new patterns of attention and new social contacts, can be seen in the dynamics of how people relate to one another electronically and in changing organizational structures (see, for example, Refs. 12, 14, and 27).

*Changing Interpersonal Dynamics.* Interpersonal dynamics, or how people relate to one another, are relatively more open and egalitarian in electronic communication than in other communication settings, such as the face-to-face meeting, telephone call, or letter. Electronic communication is relatively impoverished in social cues and reminders of shared experience. People "talk" with other people but they do so alone. Reminders of other people and conventions for communication are weak. Thus messages are likely to display relatively little social awareness. The advantage is that social posturing and sycophancy are reduced. The disadvantage is that so too are politeness and concern for others.

Reduced audience awareness increases self-disclosure. Among university students randomly assigned to fill out a paper-and-pencil survey, only 3% admitted using illegal drugs at least once a week, but among the students assigned to fill out the survey via electronic mail, a significantly greater 14% made the same admission [30]. In another study, a significantly higher proportion of respondents presented socially desirable responses to questions presented in a paper-and-pencil survey than to the same questions presented via electronic mail [15].

Increased self-disclosure may be associated with increased honesty. Researchers in Scotland discovered that people reporting their consumption of alcohol reported significantly higher consumption if answering electronically than if answering in a face-to-face interview [32]. Not only does this replicate the pattern of how people report illegal drug use, but in this case actual sales figures for alcohol were available (unlike the case for illegal drugs). The electronic responses much more closely matched actual sales figures than did the face-to-face responses.

It may seem curious that people would answer threatening questions more honestly on a computer than in other media. Nearly everyone knows a computer can store everything a person says. Yet, people interacting remotely on a computer are isolated from social cues and feel safe from social surveillance and criticism. This feeling of privacy makes people feel less inhibited with others. It also makes it easy for people to disagree with, confront, or take exception to others' opinions.

Because a person composing an electronic message has no tangible reminders of his or her audience, the writer can easily forget the norms appropriate for communicating with that audience. Furthermore, the writer has no nontext resources available to help convey his or her ideas. Resorting to ever stronger language is a common result. Computer buffs call this behavior "flaming." It is a direct consequence of the low level of social information in electronic communication.

In addition to relatively open communication, electronic communication is also relatively egalitarian. In face-to-face meetings, only one person can talk at a time. The asynchrony of electronic discussion makes turn taking unnecessary. Thus, for any given duration of time, more people can "talk" in an electronic meeting than in a comparable face-to-face one. Furthermore, because status cues are weaker in electronic messages than in other forms of communication, high-status people do not dominate electronic discussion as much as they do

face-to-face discussion [17]. For instance, when groups of executives met face-to-face, the men in the groups were five times more likely than the women to make the first decision proposal. When those same groups met via computer, the women made the first proposal as often as the men did [21]. When pairs of students—one graduate student and one undergraduate—met face-to-face to decide on the topic of a joint project, the pairs were much more likely to choose the topic preferred by the graduate student than the topic preferred by the undergraduate student. When equivalent pairs of students discussed and decided electronically, the pairs were just as likely to choose the topic initially preferred by the undergraduate [13].

*Changing Organization of Work.* Electronic task groups can have larger, more complex, and more fluid structures than their face-to-face counterparts. In a field experiment conducted by the Rand Corporation [8], electronic communication allowed retired people to participate more actively in a task force than their retired counterparts in a task force that did not use electronic communication. Both groups created subcommittees, but the task force with electronic communication created more of them. The task force without electronic communication assigned each member to only one subcommittee; the task force with electronic communication had people on more than one subcommittee. Furthermore, these subcommittees were organized more complexly in an overlapping matrix structure. New subcommittees were added during the course of the task force's work. Electronic communication helped the structure of the one task force to grow and change as its task evolved.

The above-described software development teams also used electronic communication to create useful subgroup structures. Via one-to-one mail, project managers and chief programmers created two-person crisis-management groups that kept on top of the ever-changing project requirements and personnel shifts. Via all-group distribution lists, project managers and chief programmers kept all other team members informed of changes. In this fashion, electronic communication technology helped the teams create small, focused communication groups without excluding anyone.

An organization's employees represent a vast reservoir of information and experience that can potentially be brought to bear on any particular problem or opportunity. The difficulty is accessing it. When sending a message to an electronic distribution list, it does not matter if there are 5 or 5,000 people in the group. The sender still sends only one message. Furthermore, the geographic location of group members is irrelevant to their participation. When electronic group mail reaches large numbers of employees, they can be treated as an information buffer, a way to organize current information in a readily accessible form.

The "Does anybody know . . .?" broadcast message is common on electronic mail systems. (For instance, "I have a customer who wants to do X. Does anybody know if we have any customer who ever did X? If so, what was their experience?") Because more than one person can (and usually does) reply with "the answer," the person who asked the question sees alternative ways of

thinking about the problem and alternative solutions to it. Answers not only give the asker information about the question, but they also provide information about a new set of electronically accessible colleagues. The process also makes possible two additional types of learning. Often the answers to does-anybody-know questions, as well as the questions themselves, are broadcast to the entire network. In this way, everyone on the system, not just the question asker, can observe the responses. Furthermore, files of such exchanges can be stored as plain text archives, thereby allowing future learners access to the information.

Organizational members belong to only a very small number of conventional groups—a primary work group, perhaps a committee or two, and perhaps a social group. Using group electronic communication, it is possible for people to belong to many groups and to tailor their memberships to their changing interests. Employees in one Fortune 500 firm we studied received an average of 21 group messages per day from over 700 electronic distribution lists [9]. The majority of the average person's electronic group mail came from strangers—company employees not personally known by the recipient. Thus, electronic group mail represented a way for people to receive information and make connections that otherwise would have been difficult or impossible. About half of the groups were discussion groups, groups that people joined of their own volition devoted to topics about which members had a special interest. The discretionary discussion groups were large and geographically dispersed—averaging 260 members in seven different cities. They sustained real discussions over distance and time among people who did not know one another.

Whereas some corporate mail networks may serve thousands of people worldwide, the behaviors described here come from intraorganizational communication only. Interorganizational communication is taking place today through a variety of networks, although that has not been the focus of our research. Perhaps changes even more striking than the ones we have described will be effected through interorganizational electronic communication that establishes electronic markets and hierarchies [19]. However, if second-level changes occur in interorganizational communication, they will result not from any particular technical design but from changes in attention and social contact patterns.

#### 4. LESSONS FOR THE FUTURE

Electronic mail has come to be used for many purposes by many people in organizations. It is a general-purpose tool that, by virtue of its flexibility, can be useful in many different settings. Particularly important is its ability to handle group communication. Furthermore, because it leads to changes in attention and social contact patterns, it can change the interpersonal dynamics and organization of work.

Anyone offering lessons for the future should do so with trepidation and humility. Remember that the genesis of electronic mail was something of an afterthought. Technologists did not set out to design systems that would change the interpersonal dynamics and organization of work. They wanted better access

to scarce computing resources. The history of technological innovation is full of profound unanticipated second-level consequences [20]. Yet there are some lessons we can learn from the electronic mail experience that may be useful for the next generation of organizational computing.

#### 4.1. General-Purpose Tools

During the worst of the Depression, hard-pressed rural Americans who had both telephones and automobiles chose to give up their telephones rather than their automobiles [11]. Despite the utility and convenience of the telephone, the automobile was a more general-purpose technology. Not only could it transport people and goods from place to place, it could substitute for the telephone as a communication medium. Today the trade-off is not between phones and cars, but between mass transit and cars. Once again the automobile is preferred, because it is more general purpose.

The desirability of general-purpose tools is an important lesson for organizational computing [24]. Although special-purpose tools can address particular tasks elegantly, efficiently, and perhaps even optimally, many people in organizations must perform a wide variety of tasks everyday. They are likely to prefer tools that give them adequate leverage on many tasks over specialized tools that excel at only a few. This observation does not obviate the importance of special-purpose tools. But they should be thought of as addressing niche markets, and their potential benefits should be calculated accordingly.

The best general-purpose tools give people control rather than take it away. In general, people do not like to be told how to behave, by their parents, their bosses, or their technology. Technology that forces people to go to special rooms (computer-supported conference rooms), label their intentions (communication structuring software), or comb their hair (video) begins at a disadvantage. Although it can still be successful, it is unlikely to succeed in competition with technology that achieves similar goals without such structuring. Technology that lets people grow their own structures and establish their own rules of behavior, by contrast, is likely to be more appealing.

#### 4.2. Active Participation

An electronic mail community is not simply nodes on a network. Nor is it applications and programs, no matter how "friendly." People make such a community, and they will do so when they share common interests and find ways of meeting those interests electronically. Their ongoing, active participation in creating, designing, and changing diverse forums useful to them will much improve the chances of that happening. When people form their own electronic discussion groups, for example, they design these groups to suit themselves. In doing so, they become more committed to the success of these groups than when they passively use forums developed by others. They also learn more, gain more confidence, and develop stronger feelings of social responsibility.



Features that let people actively participate in their community characterize strong electronic communities. For instance, such features make it easy to form and participate in electronic groups. They encourage self-regulation of behavior by reminding people that they are members of a community. There is easy access to relevant data bases and software. They offer information services such as digests and access to reports and documents. They help one another through communitywide broadcasts, and in some cases even archive this help for the use of community members in the future. They offer the ability to deliver goods and services as well as information. [Some of the best examples of service delivery are currently found within electronic communities of scientists (see, for example, Refs. 6, 23, and 24)]. Technologists may dream of automating all of these behaviors, but no amount of automated agents will substitute for the ongoing, active participation of community members.

#### 4.3. Conclusion

We have demonstrated a two-level perspective on organizational computing through the case of electronic mail. Our main message is that efficiency analyses and motivations for new technology are insufficient for understanding the most interesting possibilities associated with technological change. For those we need to look to changes in attention and social contact patterns. Furthermore, the case of electronic mail suggests that general-purpose tools that accommodate and foster active participation are most likely to lead to second-level changes.

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