buffered from one another. Whereas this process can certainly benefit small task groups, it also can support large geographically dispersed groups and group activities that would have been impossible and unimaginable without electronic group communication.

First-Level Efficiency Effects

Accelerating Information Flow: Snail Mail and Telephone Tag

Computer-based communication is extremely fast in comparison with interoffice mail, courier services, or postal mail. A message can be sent down the hall or halfway around the world in seconds or minutes. This rapid transmission speed leads people who use electronic communication to dub the hard-copy alternatives "snail mail." When speed of delivery is important, electronic mail offers clear efficiency gains over hard-copy communication.

Because electronic mail is asynchronous, it also can offer efficiency gains over telephone communication. Some estimates suggest that up to 70 percent of initial telephone call attempts fail to reach the intended party (Philip and Young 1987). But with electronic mail, both parties to a communication do not have to be available simultaneously for it to occur. An electronic message can be sent at the convenience of the sender and read at the convenience of the recipient. This asynchrony reduces the time and frustration of telephone tag. Many telephone conversations do not require a lot of interaction; the substance of the call can often be conveyed in a one-way message. Although most organizations have procedures for taking telephone messages, many featuring the ubiquitous pink slip, they do not eliminate telephone tag. Callers may be reluctant to leave a message with a secretary or receptionist because its contents are too complicated or time-consuming, or they may be unwilling to reveal private information to an intermediary. Leaving an electronic message is an attractive alternative.

The accounting office in a large organization that we have studied demonstrates how electronic mail can efficiently substitute for the telephone. Although standard procedures govern the routine processing of accounts payable information, unusual situations occur frequently. Purchase orders may be missing authorization signatures; shipping orders may have incorrect items; invoices may have inaccurate amounts. The accounts payable supervisor must reconcile all anomalies before authorizing payments to vendors or suppliers. In the office we studied, the supervisor used the telephone to solve many of these problems prior to the introduction of

electronic mail, but "it would usually take me several tries to get the person I needed on the phone. Then he wouldn't have the information at his desk and would have to call me back. Sometimes he'd make a mistake when copying down what I needed. It was a mess and it took a long time." Now the supervisor sends electronic mail when she needs information to reconcile discrepancies or resolve anomalies in the accounts payable process. (See box 2.1 for examples of such messages. Names in all messages are pseudonyms.) Most of her messages are answered within 24 hours, and, as a result, she has been able to reduce the late payments from her office.

Some hope that electronic data interchange (EDI) will eliminate the kinds of errors and discrepancies noted in the accounting office. It will not. When orders and shipments are placed and verified electronically and invoices are generated and verified by the same process, both the cycle time and the error rate may indeed decline. But there will always be exceptions, anomalies, and discrepancies that must be resolved by human intervention.

Box 2.1. Accounts payable messages

```
From: A. Reed
Subject: Problems
To: R. Upshaw
Bob,
I need a receiving for po#1014 for Scan Co.
I need a receiving for Color Co for po#1020.
I need a copy of the consulting contract for M.R. Connors for
po968 that has VP's signature on it.
Thanks,
Ann

From: A. Reed
Subject: Signiture Authorization
To: R. Love
Rick,
Mark needs to get signiturre authorization from Nils Schumann
for his budget center #'s 729, 728 and 749.  this can be all on
one memo with his signature and Mark's.
The only other budget center that Mary had authority for was
725 so we need a memo with your signature and Ken Wilson's and
then Mark's.
All other budget center managers said that they wanted to
approve there own freight bills or that they never had anything
to do with freight.
The sooner we get this into effect the better I think.
Ann
```

Companies appreciate the savings that result from reducing telephone tag and snail mail delays and attend to evidence that purports to quantify these savings. For instance, five people in different locations might have the task of preparing a contract bid. Preparing a draft and sending it to the other four locations for comment takes an elapsed time of one day using an overnight courier service and costs $50 to transmit (at $12.50 per copy). Returning comments from each site takes another day and an additional $50. If five drafts are cycled in this fashion, the total elapsed time is nine days, and the total transmission cost is $450. The elapsed time can usually be cut at least in half by using electronic transmission—either fax or electronic mail. The marginal cost of each transmission is also much lower than that of the courier service.[1] The accuracy of numbers such as these is less important for policymakers than people's belief in them. For instance, Manufacturer's Hanover Trust estimated that employees saved an average of 36 minutes a day by using computer-based communication. This translates into an annual net opportunity value of about $7 million (Nyce and Groppa 1983). Digital Equipment Corporation estimated the marginal cost savings to its managers using electronic mail to be $28 million (Crawford 1982).

In considering the benefits that derive from electronic mail's speed and asynchrony, people usually think first about situations in which the alternatives are hard-copy mail or a telephone call, and there is one sender and one receiver who know one another. In these cases electronic mail looks like an information accelerator—firing routine information from one person to another more rapidly and conveniently than could be done by other means. Through this information accelerator, people can work more efficiently than they could do otherwise.

(2) Regularizing Information Flow

Through accelerating information flow, electronic communication may increase efficiency. It also may do so through regularizing information flow. Here, electronic mail's broadcast capability becomes important, along with its speed and asynchrony. Because it is as easy to send a message to a group of any size as it is to one person, previously ad hoc communication can become routinized. All organizations have procedures for disseminating information to groups such as departments (often a memo placed in everyone's mailbox) or to people who work in the same building (often a memo taped on the main entrance and exit doors of the building). The costs of these procedures preclude their being used indiscriminately.

When they are not used, people may learn of potentially useful information only if they happen to overhear it or in some other informal way. Broadcast electronic mail makes it easy to regularize some of these ad hoc communications.

We were interviewing a mid-level manager in his office one day when one of us looked out the window and noticed that a car was on fire in one of the parking lots. The manager first called the fire department, which dispatched a fire truck. Then he turned to his computer and sent an electronic mail message, using a distribution list, to everyone who worked in the building. The message described the fire and said that drivers whose cars were parked in that lot should move them. Obviously hard-copy memos in mailboxes or on doors would have been no use in this situation. The building had no public address system. It did have a fire alarm system, but ringing the alarm, and thereby evacuating the building, was not the appropriate message. Of course, not everyone was reading electronic mail at the moment the fire message arrived, but enough were so that the message was effectively transmitted to everyone in the building. Although the burning car was damaged, employees moved other cars out of the way before they were in any danger. The point here is not that a car or two escaped damage but that broadcast electronic mail made it relatively easy to regularize communication to a group of people, ensuring that no one was inadvertently left out. The efficiency implications of regularizing communication may be more obvious in the next example.

Like many other large organizations, Digital Equipment Corporation runs an extensive training and education program. Classes that are filled during preregistration often get taught with empty seats because of last-minute cancellations. Some of these seats can be filled from waiting lists and instructors' calling around. The training group at Digital now uses electronic mail to broadcast the announcement of last-minute availability of courses. This regularizes the dissemination of this information to everyone who might be able to benefit from it. As a result, more employees receive training for any given course, a direct efficiency gain from the broadcast capabilities of electronic mail.[2]

The previous analyses are based on improving current work demands and routines through reducing transaction time and regularizing communication—important improvements that may provide the initial cost justification for electronic mail. But in the long run, more interesting benefits may emerge because the technology lets people and groups interact in ways that were not possible before.

2.2 Second-Level Social Effects

(1) Group Mail and Coordination Costs

The fundamental unit of work in the modern organization is the group, not the individual. Work is organized in departments, subunits, committees, task forces, and panels. All groups incur coordination costs, defined as the time and money necessary to organize and sustain group activity. For instance, meetings must be scheduled, information must be shared, and individual contributions must be meshed.

When groups meet face-to-face, they incur a coordination cost called process loss, the difference between the potential contribution of all group members if each contributed maximally and their actual contribution. For instance, brainstorming groups tend to produce fewer ideas, even fewer good ideas, than the total ideas produced by the individual members of these groups when they work alone (Diehl and Stroebe 1987). One reason for this loss is that in brainstorming groups, people spend time listening to others and telling others their ideas. In an n person group, there are potentially $(n^2 - n)/2$ possible two-way conversations that can occur. There are potentially 2^n teams (of size two and greater) that can form. If everyone talked simultaneously, everyone could have a turn but no one would hear anything. And so conventionally in a face-to-face meeting, only one person talks at a time. When meeting time is limited (and it always is), some good ideas are never heard. Process loss also increases when group time is taken up by one-to-one exchanges—for instance, in repeating information to a late arrival. Because group memory is usually faulty, process loss also occurs when people repeat what was said earlier in the meeting or disagree over what was settled earlier.

As several of our examples have illustrated, electronic mail can be used to communicate to groups of people as well as to one person. An electronic distribution list can be used to send a message to many people as easily as to one person. A list of people's names and computer addresses is given a name—such as "Sales Group" or "Science Fiction Lovers." A sender mails one message to the group name; then the computer automatically mails a copy of the message to every person whose name and address are on the distribution list. The sender does not have to specify—or even to know—the names and addresses of group members in order for them to receive the message. Thus electronic mail makes it possible to have fast, asynchronous group communication, as well as one-to-one communication.

Electronic group mail can decrease group coordination costs just as electronic one-to-one mail decreases one-to-one coordination costs. The scheduling constraints of getting everyone into the same room at the same time vanish. Because electronic mail is asynchronous, everyone can "talk" at his or her convenience; everyone can "listen" at his or her convenience. Because electronic mail is fast, asynchronous messages can approximate real-time interaction. Because electronic mail can archive the complete text of every message, the same group memory is available to every member.

The software development teams described at the beginning of the book demonstrate how groups can use electronic communication for coordination. Each team had seven to ten college seniors completing an intensive management information systems curriculum. Each team's objective was to produce a working software system for a real business client under a four-month deadline. Each team was hierarchically organized with a manager, comanager, and workers and functionally differentiated with different subgroups (sometimes with overlapping membership) responsible for programming, documentation, and training. Although team members were in the same organization, they did not share office space, nor were they working exclusively on this task; each had other responsibilities as well. Each team held regularly scheduled meetings over the course of the project, and communicated by telephone, memo, and informal conversation. Each team also had the opportunity to communicate by electronic mail. Members could send individual messages to one another or to the entire group. Within the groups' electronic mail, we found four kinds of messages related to coordination. (See box 2.2 for examples of such messages.)

- **Scheduling** All managers who used electronic mail sent group mail announcing or reiterating the time and place of an upcoming meeting. Some managers used electronic mail to solicit information about when people were available. Teams that did not use electronic mail took up face-to-face meeting time trying to schedule the next meeting. When the time or place of a meeting had to be changed, managers using electronic mail could get the word to everyone by sending one message. Managers who did not use electronic mail had to make telephone calls, leave messages stuck on doors, and generally expend much more effort to get people to meetings.

- **Task assignments** Managers used mail to announce and reiterate task assignments for both individuals and subgroups. Some of these messages

organized people for the next meeting, telling them what they should have accomplished by the time of the meeting and what they should bring to it. These messages could increase the productivity of face-to-face meetings by increasing the probability that team members had done their homework before the meeting.

Reporting accomplishments Team members used electronic mail to report task accomplishments. This mail allowed people to keep up-to-date with others' progress and problems in between meetings, and it meant that not as much time had to be spent in the face-to-face meetings reciting everything that had occurred since the previous meeting.

General awareness Team members, and especially managers, kept the group generally informed by producing summary messages and by forwarding to the entire group messages of general interest that had been received by one team member.

Did these electronic coordination activities have any payoff? We discovered a very high correlation between use of electronic mail and group productivity—the quality of the software product as judged by the teams' clients. Furthermore, this increased productivity was achieved without an increase in the total amount of communication. The teams that used electronic mail met less often and spent less time on the telephone and writing memos. We cannot definitively rule out two competing explanations for our findings. One is that computer ability in the group was

---

Box 2.2. Group mail for coordination

Announcing a Meeting

```
Date:  Thu 28 Aug 86 10:45:52-EDT
From:  Horatio Nelson <HN03@TB.CC.CMU.EDU>[manager]
Subject:  Meeting Update
To:  Group:
I have arranged a meeting with Robert [client] from 12:30 to 1:00
today.  Anyone who can is free to attend.  A summary of the
meeting and details about next week will follow later today.

Horatio
```

Task Assignment

Date: Thu 25 Sep 86 18:35:51 EDT
From: Oliver Perry <OP12@TD.CC.CMU.EDU> [manager]
Subject: update
To: PROJECT: :

In lieu of the meeting this week, here's what needs to be going on at this point:
1) everyone—make sure that you have interviewed your UW people by Wednesday.Technically,by then we have to meet and pull together out of the interviews what everyone would like from the system, and what we can feasibly do.if you ABSOLUTELY can't do it be then, then by Thursday or Friday, NO LATER. When you interview them,(or call to set up the interview, introduce yourself and the system, explain what Claudia has already suggested,and what Timothy wants, and ask them what information not already wanted by Timothy or Claudia would be helpful to them in their decision making process, specifically what kids of statistics—if they can be that specific.) Claudia's wishes are explained in clause 7 of the contract and Timothy wants info for DataMate. Make sure you write down carefully what they want, since you'll be the only one there, and most likely we won't have the chance to meet with them again. If you need help, or can't make your interview see if someone else would be willing to go in your place.

2) everyone—i assume you got the message from Olson—hardware is being delivered tomorrw (Friday) to SDS. ANYONE who can be there to supervise the setting up PLEASE GO!!! (I have to be at SteelCo. tomorrow, so I can't do it.) It's at 1 in PH 208. You should go back and reference Olson's message for the details.

3) Kai, Lynn, Max [group members]—you should continue to work on the data dictionary for Datamate. No rush at this point but there's a lot that has to be done, I know.

4) Anne [member], Nancy [assistant manager]—finish setting up appointments with the chairmen and exec. directors. Let me and Dylan [member] know if you need people to go to interviews. Anne, the Gantt
chart is a last priority, but if you have time.....

5) I have a copy of the R:Base programming manual that Kai found for us. Anyone who wants to start looking at it let me know. I've read a couple chapters, and it doesn't look too bad.

6) Next meeting is our regular meeting on Wednesday, tho i'll be in touch. Call me—if you have questions or problems.
Oliver Perry

Task Accomplishment

```
Date: Thu 4 Sep 86 15:19:35-EDT
From:J. Johns <JJ76@TD.CC.CMU.EDU> [manager]
Subject:  End of week reports
To: Our-group:
Though I basically know what everyone has done all week it is
probably a good idea to get in the habit of sending weekly
reports.  So.... if you would, please try and send them to me
by tomorrow morning.  Thanks.
John (jj76@td)


Date:  Sun. 21 Sep 86 23:38:18 edt
From:  W. Nimitz@andrew.cmu.edu (William Nimitz)[member]
To:  jj76@andrew.cmu.edu (John P. Jones)[manager]
Subject:  End of Week Report 9-14-86
CC:  nimitz@andrew.cmu.edu (William Nimitz)
John-
A synopsis of the weeks effort:
Worked on producing slides for the probdef presentation.
Worked with Dreux on the presentation outline and text.
Well thats realy about it.  Idon't realy know what else to add.
William


Date:  Tue. 16 Sep 86 10:46:03 edt
From: caroline@andrew.cmu.edu (Caroline Shea)[member]
To:  jj76@andrew.cmu.edu (John P. Jones)[manager]
Subject:  Re:  some tasks for me
John,
     A weekly meeting time might be difficult for me since my
schedule is based on when other people want to meet.  (like
bosses and stuff).  How about if we set Monday afternoons at
1:30 aside?  I haven't had a meeting scheduled for that time
slot in a few weeks.
```

responsible for both the volume of electronic mail and the quality of group performance, with no direct link between mail and performance. There were no differences across teams in the computer ability variables we measured, but more sensitive measures might have revealed such differences. A second alternative explanation is that managerial savvy might have been responsible for both volume of electronic mail and quality of group performance. The teams were made up of relatively novice software developers. Their supervisors emphasized that groups should communicate extensively and use electronic mail. Savvy managers might have decided to use electronic mail extensively because their supervisors wanted

them to and also to have been better at organizing their teams, with no necessary relationship between the two. If this were the case, the savvy managers would also have to have explicitly decided to reduce their teams' volume of noncomputer communication and to use electronic mail for coordination messages, with no expectation of affecting group performance. There probably is a relationship between managerial savvy and group electronic mail, but we suspect it is a direct one; that is, savvy managers understand how to exploit the technology to benefit the group directly.

In the nonelectronic world, groups use face-to-face meetings to link members with one another and time outside meetings to buffer members from one another. During meetings members become mutually aware of others' attitudes, problems, and accomplishments. They are reminded that their individual work must be meshed with that of other people. During time not spent in meetings, each member can work on his or her individual contribution to the group product. While individual members are working alone and buffered from the rest of the group, they can lose track of group objectives and turn to other responsibilities that have nothing to do with the group project. Or while working on their piece of the group project, they can become so absorbed in their own contribution to the project that they lavish too much attention on each component in striving for perfection (at the expense of meeting deadlines) or pursue tangents that are intrinsically interesting but irrelevant to the project needs.

Electronic group communication lets busy people who aren't in the same place share information rapidly and effectively. In effect it allows group members to be simultaneously linked to and buffered from one another. They are buffered from one another because they can attend to information from the group at their own convenience, and they are linked to the group because group mail reminds them and informs them of other parts of the project, including issues that will affect their own work. When they send group mail, they inform other group members of their own work and simultaneously remind themselves that they are working on a group project.

Although electronic group mail reduces the amount of meeting time needed for coordination activities, it doesn't eliminate the need for face-to-face meetings. Face-to-face meetings are particularly important in getting a group started, in negotiating issues, and in problem solving.[3] But with electronic group mail, there can be less total time devoted to meetings and

a higher proportion of meeting time devoted to functions for which face-to-face communication is best suited.

(2) **Distributed Groups**

The software development teams were small, located in the same place, and concentrating on a shared task. Groups met face-to-face at least once a week. A different kind of group found in all large organizations is the dispersed project group. Its members are drawn from different locations and often from different divisions or sectors. Its function is often to coordinate or set policy for shared or similar activities occurring quasi-independently across the organization. It may hold meetings somewhere between once a month and once a year. The coordination costs of such groups are enormous. Hewlett-Packard engineers describe the typical frustrations of such groups: "Our Council meets once a month . . . half of us have to fly in . . . for a few hours . . . we need to start over each time . . . We can't get anything done!" (Fanning and Raphael 1986). Electronic group mail can allow such groups to sustain and even build productive momentum between meetings by simultaneously linking and buffering their members.

Beneficial Finance communicates with its board of directors between board meetings using electronic mail. Just before one Labor Day weekend, the company received a serious and attractive offer, valid until the following Tuesday, to buy its Western Auto subsidiary. Through electronic mail, the company's top management and its board were able to explore the implications of the offer and craft some counterprovisions over the weekend. The board met the next Tuesday and approved the divestiture. Without electronic mail, according to Finn Caspersen, the company's president, Beneficial Finance would have tried to inform all the relevant parties of the offer by fax or an overnight delivery service, but there would have been no opportunity for board members and management to react to the original proposal or make counterproposals prior to the Tuesday meeting. The divestiture would probably have been approved but with people less informed and terms less favorable.[4]

Electronic group mail can improve the operation of existing groups, even distributed ones, as the software development teams and Beneficial Finance examples illustrate. More significant, it can support groups and group activities that would be impossible and unimaginable without electronic group communication. When sending a message to an electronic distribu-

tion list, it doesn't matter if there are five, fifty, five hundred, or five thousand people in the group. The sender still sends only one message. Furthermore, the geographic location of any group member is irrelevant to his or her participation in the electronic communication. Thus the technology of electronic mail can simultaneously link and buffer extremely large geographically distributed groups.

One of the developers of Common LISP, a popular computer language for artificial intelligence, described one such group and its operations. Over sixty people from universities, government, and industry collaborated for three years to produce Common LISP:

> The development of Common LISP would probably not have been possible without the electronic messaging system provided by the ARPANET. Design decisions were made on several hundred distinct points, for the most part by consensus, and by simple majority vote when necessary. Except for two one-day face-to-face meetings, all of the language design and discussion was done through the ARPANET message system, which permitted effortless dissemination of messages to dozens of people, and several interchanges per day. The message system also provided automatic archiving of the entire discussion, which has proved invaluable in the preparation of this reference manual. Over the course of thirty months, approximately 3000 messages were sent (an average of three per day), ranging in length from one line to twenty pages. Assuming 5000 characters per printed page of text, the entire discussion totaled about 1100 pages. It would have been substantially more difficult to have conducted this discussion by any other means and would have required much more time. (Steele 1984)

The Common LISP group was constituted for a specific purpose. Although not every member may have personally known every other member, both membership and task were explicitly identified. Thus, it could be considered a kind of dispersed work group in that all members spent at least some of their time working on a common task. The Tandem scenario at the beginning of this chapter illustrates a different kind of totally distributed group. In that case, the group was not specifically formed to solve the customer's problem. But because everyone in the company shared the same computer network and electronic mail system, the product manager could broadcast a request for help to all employees as a standing group. Those who could help solve the problem responded to the broadcast message. The sender did not have to know in advance who those people were. They emerged from the network to make their contribution and then continued with their own work.

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 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.[5] A case from the product development organization of a Fortune 500 company provides another example of how this can occur. Box 2.3 shows a message that a product developer sent to distribution lists that reached thousands of employees. The message described an idea for developing a new product and asked others to contribute their ideas. Within two days, the developer had received twenty-five replies from twenty-two people in five different cities. Within two weeks he had received over one hundred fifty replies, almost all from people he did not know. He did not have to know in advance who those people were, and they did not have to divert a lot of attention from their own work to reply to him.

(3) But It's Not All Rosy

Reducing communication costs is not always and automatically beneficial because faster and easier communication is not always better communication. Because it is so easy to send a message, people may be tempted to speak before they think, and injudicious communication may result. (We discuss this topic in chapter 3.) Moreover, more information is not always better than less information. In the case of the product developer, several thousand people received his message and "only" 150 replied. Presumably the message was irrelevant to most of the people who received it but who didn't reply. Thus the cost of the inquiry was bothering several thousand people with an irrelevant message. We can crudely estimate the "cost" of such a broadcast message. Assume it was sent to three thousand people.

Box 2.3. Electronic message to an entire organization

```
DATE:  12-April-83  10:49:00 PST Tuesday
FROM:  Salamon
SUBJECT:  Spreadsheets
TO:  Everyone
REPLY-TO:  Salamon
Do you have any opinions about spreadsheet programs (Visicalc,
SuperCalc, MultiPlan, Lotus 1-2-3, MBA etc.etc.)?  I'd like to
hear what you consider to be their strengths and weaknesses.
We're planning some spreadsheet-like additions to [our prod-
uct]; what should we include?

Let me know if you want to get the compiled replies or to join the
discussion on SpreadsheetInterest.
```

Assume one-third of them never saw it or scanned the header but didn't read the message. If it takes 5 seconds to actually read the message, then the two thousand who did read the message spent a total of 167 minutes reading it. If the median annual salary for electronic mail reading employees is $50,000, then the direct cost of reading the message was approximately $75, or $.04 per reader. This ignores any benefits foregone that might have accrued by spending the five seconds in any other way. Was the cost worth it? The product developer would certainly say yes. The people who read the irrelevant message would probably say no.

David Constant, who studied question asking and answering in one company's electronic mail system, has collected data that help us extend the cost-benefit analysis. People who respond to messages such as the one from the product developer estimate it takes a mean of 6 minutes to write a reply. Aggregating the mean reply time over 150 replies yields 900 reply minutes. Using the same salary figures as above yields a direct cost of message reply time of $375. (Again, this ignores any benefits foregone from other time uses.) People such as the product developer who had asked questions estimated the mean value of each reply to them to be $10. (These data came from answers to a question phrased as follows: "If you could award from $0 to $25 for how useful this answer was to you, how much would you award it?") Aggregating across 150 replies yields an estimate of direct benefit to be $1,500 and a net benefit (subtracting the cost of replies) of $1,125. These figures are only rough estimates. Their merit lies more in suggesting the order of magnitude of costs and benefits rather than specifying them precisely.

More information is not always more valuable than less information. Surely not every one of the 150 replies contained unique information. There was certainly redundancy. And the product developer had to filter out the redundant messages. Was it worth it? According to Constant's data, the product developer would probably say yes. These data show that question askers did not downgrade their replies just because of getting too many. What was important to them was the actual expertness of the repliers and the repliers' desires to help their fellow employee. So the developer might even say that redundancy was a sign of consensus and support. The more messages making the same point, the more attention the developer would pay to that point.

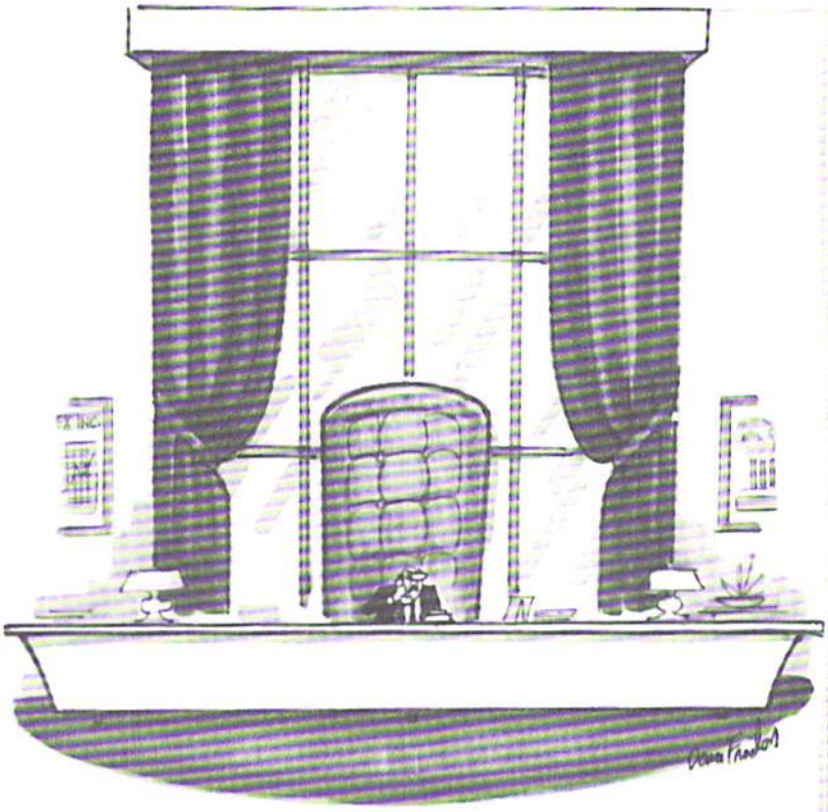
Ideally the request would have gone to only the people for whom it was relevant, and only replies containing information not previously sent by

someone else would have been returned. Some developers might be tempted to build special-purpose intelligence-gathering systems to target questions and filter replies, thereby reducing some of the costs described. Unfortunately special-purpose systems impose their own costs in both requiring askers to specify their questions precisely and requiring potential answerers to specify their areas of expertise equally precisely. A ubiquitous, general-purpose tool like broadcast electronic mail seems a better compromise between ease of use and costs of possibly inappropriate use.

2.3 Conclusion

Because information is not always where it should be, organizations incur information processing and transmission costs. Because people are busy and physically separated, the speed and asynchrony of electronic mail allow it to act like an information accelerator for one-to-one communication. Many organizations have discovered its utility in this domain and wax enthusiastic about its merits in reducing the delays of telephone tag and snail mail. While we think it's fine to reduce telephone tag, we believe that more important organizational consequences may stem from the fact that electronic group communication is as easy as one-to-one communication. By simultaneously linking and buffering people, electronic mail can reduce group coordination costs for conventional groups, and it can support very large groups of physically separated people that would be otherwise impossible.

"Doing new things" is not simply a matter of adding new activities to an unchanging base, like hanging ever more exotic ornaments on a Christmas tree. Doing new things leads to thinking in new ways and thereby to fundamental changes in how people work and interact. In the early days of the automobile, some of its most important potential benefits were expected to come from horse-related savings. (Of course, people were also worried about potential injury to horses involved in accidents with cars.) It strikes us that electronic mail is to telephone tag as the automobile is to horse-related savings—true but ultimately not very important. The more profound impact of the automobile has come from changing patterns of work and residential density and interaction. The more profound impact of computer-based communication may similarly come from changing patterns of organizational interaction.



"Do you know who you're talking to, Buster? You're talking to the guy with the biggest desk, biggest chair, longest drapes, and highest ceiling in the business!"

Drawing by Dana Fradon; ©1981
The New Yorker Magazine, Inc.

3

Do You Know Who You're Talking To?

A departmental meeting is about to begin. The clock shows 9:55 A.M. *Chairs surround a rectangular table. People in business dress drift into the room. They stand near a side table, helping themselves to coffee. Gradually they seat themselves; most choose a chair near someone they like well. The department head enters the room at 10 o'clock and sits at the head of the table. His secretary follows and distributes a memorandum to the people around the table. The memo says, "Treasure Hunt Clues and Map." Guffaws rock the room. People jump up and take plastic bags and little notepads from their briefcases. They run from the room, and soon it is empty. The time is 10:15* A.M.

The scenario is jarring because the setting is inconsistent with typical behavior. The time on the clock face, the coffee pot, the conference table and chairs, the secretary's actions, and peoples' clothes and demeanor are social cues defining the situation as a business meeting. Yet the participants do not act according to the norms of a business meeting. The participants are not crazy; their behavior is perfectly compatible with the norms of a party. Suppose it is late evening. Chairs haphazardly circle a low table. Everyone is dressed in jeans. Hosts serve wine and beer. In a corner of the room, the department head lounges on the floor. Unlike the cues in the meeting room, these cues suggest a party where loud laughter and a treasure hunt are appropriate.

Proponents of the efficiency benefits of computer-based communication often assume that it delivers the same message as any other medium but simply does so more rapidly. That view is misleading because a message—even the "same" message—changes its meaning depending on the forum within which people convey it. For instance, people generally exaggerate reports of how frequently they do socially desirable acts like voting in political elections, wearing a seat belt, or attending cultural events. When

people discuss these behaviors in a face-to-face interview, they exaggerate their frequency more than people do who discuss them in an anonymous paper-and-pencil questionnaire.[1] Similarly, people underreport socially undesirable behaviors and do so more in personal interviews than in paper and pencil questionnaires. Further, messages change depending upon to whom people convey them. The cliché is that the boss is always the last to hear the bad news. Research shows that people are reluctant to tell others bad news (in comparison with good news) and are especially reluctant to tell the boss (Rosen and Tesser 1970; O'Reilly and Roberts 1974).

Every familiar communication situation has norms or conventions for appropriate behavior. Many also have explicit rules and regulations. Consider a radio call-in show, a board of directors meeting, an employment interview, and filling out an IRS tax return. Each entails norms and explicit rules for what can be said and how it can be said. There is partial overlap in norms across situations; for instance, it is conventional across a variety of situations for speakers or authors to identify themselves. There is also variation within situations across settings; for instance, conventional behavior in a business meeting of General Motors executives probably differs in some measure from conventional behavior in a business meeting of Motown Records executives.

Three general strategies guide behavior in different communication situations—instruction, experience, and reading cues in the situation itself. Instruction comprises all the ways in which authorities convey advice or rules about appropriate behavior. Instruction ranges from the general rules of social politeness that parents teach children (for instance, "Don't talk with your mouth full") to advice manuals (for instance, "How to run a meeting" or "How to make power phone calls") to rule books (for instance, "The following kinds of questions are illegal to ask when interviewing potential employees. Do not ask them."). Instruction can pertain broadly to many communication situations when it is remembered and is applicable. Because computer-based communication technology is somewhat new, instruction and experience are not as powerful in guiding behavior as they are in other media.

The most immediate guide to behavior is reading cues in the situation itself. When we enter a building with a reception area, the receptionist's appearance and surroundings evoke an image of the correct business visitor. The height of the reception counter says something about the amount of formality or friendliness expected. Even the lighting in the area

may be a guide to behavior. The waiting rooms of restaurants, airline baggage claim offices, and dental clinics frequently have dim lights to encourage calm and relaxed behavior in their visitors. Other people's behavior is also an important cue to how to behave (Latane and Darley 1968).

When technological change creates new social situations, traditional expectations and norms lose their power. People invent new ways of behaving. In the early years of the automobile, tourists stopped overnight at campsites in fields or towns along the road. The campsites, precursors of the modern motel, offered greatly reduced privacy as compared with hotels. Travelers went about preparations for meals, sleep, and personal hygiene (and of course automobile repairs) in full view of one another. This situation was a stimulus to other intimacies. Soon a new custom developed—strangers exchanged deep personal secrets but understood that they should keep their surnames to themselves (Belasco 1979).

Computer-based communication today, like the automobile of yesterday, creates a new social situation. Unlike automobile campsites, which were rich in social cues and shared experience, today's electronic technology is impoverished in social cues and shared experience. People "talk" with other people, but they do so alone. Reminders of other people and conventions for communicating are weak. Thus in this new forum, messages are likely to display less social awareness. The advantage is that social posturing and sycophancy decline. The disadvantage is that so, too, do politeness and concern for others.

In this chapter we show how computer-based communication technology creates a new forum for human communication, one whose rules are not like those of any other forum. In the previous chapter, we showed how people could use electronic mail to talk more efficiently and to create new kinds of groups and group interactions. We did not analyze the text of particular messages to see what was said or how it was said. Now we move inside electronic mail exchanges to understand how people talk to one another using this technology. We describe how two characteristics of computer-based communication—plain text and perceived ephemerality of messages—make it relatively easy for a person to forget or ignore his or her audience and how reduced social awareness leads to messages characterized by ignoring social boundaries, self-revelation, and blunt remarks. Then we look at ways to guide behavior in this medium.

The Social Information in Computer-Based Communication

Two features of computer-based communication combine to create a relatively unstructured communication situation. First, computer-based communication relies almost entirely on plain text for conveying messages. Second, the text is ephemeral, appearing on and disappearing from a screen without any necessary tangible artifacts. In combination, these two features make it easy for a sender to forget or ignore his or her audience. Without reminders of an audience, people become less constrained by conventional norms and rules for behavior. (With special software it is possible to restructure the communication situation in a variety of ways. We discuss this topic in chapters 4 and 9.)

When Plain Text Is the Medium

Harold Geneen, the former head of ITT, discovered that his response to the European subsidiaries of ITT was different if they made their request by teletype to him in New York versus talking face-to-face with him in Europe: "In New York, I might read a request and say no. But in Europe, I could see that an answer to the same question might be yes... it became our policy to deal with problems on the spot, face-to-face" (cited by Trevino et al. 1987). The richness of face-to-face communication is illustrated in a study that found 93 percent of peoples' intent was conveyed by tone of voice and facial expression (Meherabian 1971). When communication lacks the dynamic personal information of face-to-face communication or even of telephone communication, people focus their attention more on the words in the message than on each other. Communicators feel a greater sense of anonymity and detect less individuality in others. They feel less empathy, less guilt, less concern over how they compare with others, and are less influenced by social conventions (Short, Williams, and Christie 1976; Kiesler, Siegel, and McGuire 1984).

The primary medium of electronic mail is text. Consider how this removes dynamic personal information and feedback. Senders have no way to link the content or tone of messages to the receivers' responses so they can evaluate how their messages are being received. Similarly, without nonverbal tools, it is difficult for a sender to convey nuance, communicate a sense of individuality, or exercise dominance or charisma.

Chapter 2 described the case of a product developer who sent a message to distribution lists reaching thousands of people. We noted that he did not have to know in advance who would have helpful information for him. He