

The hidden messages in computer networks

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What many managers regard as merely a tool for storing and transmitting information has significant and far-reaching long-term social effects, this author suggests. Because computer networks break down hierarchies and cut across organizational boundaries, people behave differently when using them – and once the social context is altered, the organization changes. The author outlines some of these social effects – both positive and negative – and exhorts managers to be both cautious in designing networks and imaginative in harnessing their potential.

Computers were once the exclusive province of scientists and engineers. Today, as they grow more powerful and versatile and less expensive, more people are using them. People usually perceive computers as special-purpose tools for calculations and data storage. But where we have studied them – in companies and educational organizations – people use them as a general-purpose tool to gather and distribute information and to talk with others.

As computers become a shared technology, they influence not only the organization of work but also the work itself and enter the

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domain of management. Accordingly, managers are asking many questions about the impact of computers on the workplace:

- ¶ Does a computer network make managers more effective?
- ¶ When introducing computer mail into an organization, do managers spend less time in decision making?
- ¶ What kind of computer conference system is best suited to long-distance management?
- ¶ What are the changes technologies make that people care about the most?

New technology has three orders of effects. The first is the intended technical effects – the planned improvements in efficiency that justify investments in new technology. The second is the transient effects – the very important organizational adjustments made when a technology is introduced but that eventually disappear. The third is the unintended social effects – the permanent changes in the way social and work activities are organized. Smart executives try to make decisions about technology that win on the first order, minimize losses on the second, and retain flexibility and options on the third.

A tale of two technologies

While the computer is today's most prominent new technology, it has much in common with past technical innovations, like the telephone and typewriter, that have had great social impact. We can and should learn from the histories of these other innovations.

The elevator is a technology whose intended effect was more efficient use of energy and space. If it had not been for the elevator we could not have built skyscrapers. The elevator also produced second-level outcomes – transient effects. When the elevator was introduced, people were afraid of stepping into a dangling cage. Eventually, regular elevator inspections, the posting of inspection forms in elevators and, of course, their ubiquity and good safety record alleviated such fears.

The permanent third effect of elevators came about unintentionally and indirectly over a longer period. The elevator made it possible to build structures that increased the numbers of people who lived or worked in proximity but did not know one another. People

became neighbors in the geographical but not in the personal sense; social contacts became more superficial. And now, as more people live and work surrounded by strangers, they feel more alienated and distanced from each other than they did before the advent of the skyscraper.

When *the telephone* was introduced, it was supposed to improve business communication. A hundred years ago, the Pittsburgh telephone directory was six pages long and all but six of the 300 listings were business numbers. Even the six residential telephones were used for business purposes by their owners, who felt the need to keep in constant touch with their workplaces. The telephone did improve business: it made it possible for managers to leave the factory floor, for salespeople to change orders in quick response to client demands, for customers to order products directly, and for companies to establish branch offices.

The telephone also had transient effects. Because of party lines and central operators, people using the telephone had no privacy. Another problem was “phonies” who used the telephone’s anonymity to trick people into fake business deals. Understandably, people became concerned about whether to trust callers they didn’t know.

In the end, though, the social effects of the telephone have been even more striking than the technical and transient outcomes. Today people use the telephone more for social and personal purposes than for business. In the early part of the century, farms and ranches were dismal, lonely and even dangerous places. The telephone made it possible for people to sustain friendships and help each other quickly and easily. In urban and suburban areas, the telephone came to be used as a babysitter and, like household appliances, it increased women’s independence. Because it encouraged sustained interaction outside school, the telephone also made teenage peer groups socially important.

The workplace has also felt the social effects of the instrument. When it was introduced, many managers imagined they would use the telephone to enhance their control; they thought that when they were physically absent, they could use the telephone as a broadcast device for transmitting orders and information to their employees. But the telephone performed even better as a conversation medium than as a broadcast medium. Thus it gave employees a chance to talk back to their supervisors, to exchange information, and to send it up the hierarchy as well as receive it. The telephone did not militarize the workplace; it democratized it.

A new management challenge

In recounting this history, I have two general points in mind. First, the social effects of new technologies are hard to foresee. Hence, we tend to exaggerate the technical changes and the significance of transient issues, and we underestimate the social effects. Second, the long-run social effects of a new technology are not the intended ones, but have more to do with the technology's indirect demands on our time and attention, and with the way it changes our work habits and our interpersonal relations.

In the case of the computer, these technological and social effects have been particularly noticeable in their impact on communication in organizations. To judge from current research, the effects of computers on communication are a critical new area for managers to understand and exploit.

In organizations we have looked at, computer-mediated communication is changing the kind of information people receive and distribute. For one thing, people use the computer at their own discretion as a general-purpose tool for communication. They overcome temporal and geographical barriers to exchange information. But more important, computer-mediated communications can break down hierarchical and departmental barriers, standard operating procedures and organizational norms.

All organizations control communication through structures and norms. Lightening the information burden on people contributes to organizational efficiency, but separating people from crucial information can be a barrier to effectiveness. Obviously, the costs of lacking important information are the costs of repairing the damage caused by that lack. But having too much information can mean costly attention to things that don't need it. Because computer networks reach so many people so fast, the information effects are magnified. Changing the nature of information or its distribution in this environment can be very costly. Managers who introduce computers and computer networks are therefore in a position to make critical decisions.

Electronic mail

The most widely used computer-mediated communication technology is computer mail, often called electronic mail. An electronic mail system uses computer text-editing and communications facilities to provide a high-speed information exchange service. Anyone with a computer account can use a terminal to compose a

message or document and send it to any mailbox on that computer network or to any other computer linked into that network. Communicating computers may be in the same building and connected by a local area network or in different states, countries, or continents and connected by long-distance telecommunications.

A defining characteristic of the technology is its combination of text, speed, asynchrony and potential audience reach. Computer mail is a writing medium, but it is more versatile than paper memoranda and postal mail. People can exchange any text – messages, documents, data files, even computer conferences consisting of the conversations of many people. Computer mail can be transmitted instantly, down the hall or across a continent.

Computer mail is sent at the convenience of the sender and read at the convenience of the recipient. The frustrations of scheduling telephone and face-to-face conversations vanish. Supervisors can send messages to a thousand people as easily as to one person, and automatically, within seconds, all specified recipients can get copies. Understandably, computer mail is attractive to organizations.

Three other features of electronic mail are also organizationally important:

- ¶ Senders and receivers usually process their own electronic mail; computer messages do not have to go through an intermediary who processes them.
- ¶ There are no tangible artifacts. Messages are composed on and read from video terminals (rather than teletype machines) with no hard copy left behind. It is possible to store messages on computer files and to create hard copies of them, but most messages are never put on paper; and if stored, they are stored electronically.
- ¶ Senders can transmit their electronic messages in any format they choose: a corporate newsletter, an interoffice memo, a bulletin board notice, or a casual note. And it can be a two-word greeting or a two-thousand-word soliloquy.

People who design and sell computer technology assert that, because electronic mail produces more timely and convenient information, managers and employees make better decisions. Everyone understands that information can be irrelevant, misin-

terpreted, or manipulated. But the first-order effect is presumed to be the addition of more timely and convenient information.

The hidden effects

Unnoticed by technologists, however, is the third-order effect: computer mail limits the information communicators get about the social context. Consider first the *absence of dynamic personal information*. Senders have no way to link the content or tone of messages to the receivers' responses so as to evaluate how their messages are being received. Similarly, without nonverbal tools, a sender cannot easily alter the mood of the message, communicate a sense of individuality, or exercise dominance or charisma.

When communication lacks dynamic personal information, people focus their attention on the message rather than on each other. Communicators feel a greater sense of anonymity and detect less individuality in others than they do talking on the phone or face-to-face. They feel less empathy, less guilt, less concern over how they compare with others, and are less influenced by norms.

Consider the *absence of static personal information* that relates to place, position and person in computer mail. When a person sends a computer-mail message, the transmission is instant. Because there is no hard copy and little delay between composing the message and sending it, the sender has little incentive to reflect on the message. Moreover, the large and easily accessible audience is a social hodgepodge. All computer mail looks pretty much the same. The only clue the sender has to the receiver's identity and situation may be his or her name and writing style; all indications of the receiver's job title, status, departmental affiliation, gender, race, appearance and demeanor are missing. Missing also is information about the person's background, personality, style and intention.

Similarly, a person receiving a message learns very little about the sender's social position, not even the information that a letter-head or a signature conveys. In addition, an electronic mail message contains scant information about a situation's norms. Reminders of the sender's setting are unavailable. Of course, people may possess relevant information from other sources, but the computer itself provides very few cues to evoke that knowledge.

Why is this effect important? When social definitions are weak or nonexistent, communication becomes unregulated. People are less

bound by convention, less influenced by status, and unconcerned with making a good appearance. Their behavior becomes more extreme, impulsive and self-centered. They become, in a sense, freer people.

To some degree all communication technologies weaken the controls over information distribution that people have in dealing with each other face to face. For instance, the telephone not only reduces distance constraints, it also eliminates direct access to visual cues. The telephone, therefore, reduces one's ability to clearly define the other person or grasp the situation. Over the telephone, though, one gets considerable information about the social context in nonvisual ways – from the secretary who answers or places calls, from variations on standard ways of greeting, and especially from the other person's pauses and tone of voice.

Because computer mail provides neither static nor dynamic cues, users have less social context information than with other communication devices, including paper. Paper communication still reminds people of the social context through such cues as hard copy, secretaries, letterheads, titles, handwriting variances, and the sending and receiving routines. True, a standard interoffice memorandum does not convey much social information, but interoffice memoranda are typically used as broadcast devices, not as conversation devices. Computer mail is unique because, like the telephone, it is used for personal interaction but, like the memo, it lacks social context information.

The new communication network advances – automatic file sending, electronic mail and distribution lists, computer conferencing and bulletin boards – allow people to do things faster. Executives now beginning to deploy these technologies can realize intended technical effects such as cost savings. But if we look beyond efficiency, at behavioral and organizational responses, we'll see where the real payoff is likely to be. These technologies overcome communication barriers and reduce social context information more than any other communication technology. The real payoffs, as well as the social issues, will come from the way the technologies loosen up communication.

The social impact

These technologies will have at least three important social effects. One effect is *adding new information*. In some organizations, computers automatically send production statistics, person-

nel data, or marketing analyses to managers regardless of whether they request them. In one large *Fortune* "500" company that has used electronic mail for 15 years, administrators receive approximately 23 messages per day, most of them from distribution lists. Of those messages, some 60 percent would not have been received any other way.

A second social effect is the *creation of new groups*. The distribution list is a list of people who will automatically receive messages sent to the "electronic group." At the company just mentioned, there are distribution lists for people located in the same unit, as well as for people interested in particular technical projects: Chinese cooking, science fiction, or using a new computer. Many of these groups are composed of employees who are geographically or organizationally distant from one another and who have never had or might never have an opportunity to meet. Yet through these electronic groups they can explore common interests, exchange information and sometimes get to know one another very well.

The third social effect is *new forms of social interaction*. In one company, a product developer's message asking for suggestions about how to add a feature to a product was sent to distribution lists that reached hundreds of people. Within two weeks, he had received more than 150 messages cutting across geographical, departmental, divisional and hierarchical boundaries. Some of the messages told the manager quite bluntly why it was a bad idea to add the feature.

Electronic group communication allows supervisors to build project groups around a topic, independent of other work they are doing. At both Digital Equipment and AT&T, bulletin boards and computer conferences form electronic project or decision-making groups whose members are chosen with more regard for their expertise or relevance to the decision than for their location, organizational unit, or place in the hierarchy. Most of these groups deal with routine organizational issues, but some use the electronic medium because it helps them to respond promptly to serious problems.

Effects of anonymity

Electronic group dynamics are unlike the dynamics of face-to-face groups. In a number of decision-making experiments we asked some managers, both as individuals and as members of a three-person group, to make decisions about some investments. The

executives made half the decisions face-to-face and half of them using a computer-mediated communication program that allows people to talk simultaneously, each using one “window” on the computer screen.

In one experiment, the choice we gave the groups was one that has been of great interest to decision science researchers: Faced with a choice between a safe investment that is guaranteed to return \$20,000 over two years and an investment that has a 50 percent chance of returning \$40,000 and a 50 percent chance of returning nothing, which would you choose? Researchers have found that most people are risk-averse and choose the safe alternative. When asked to weigh one loss against another, however, and to choose between a sure bet of *losing* \$20,000 and a chance of losing nothing or \$40,000, they are risk-seeking and choose the latter option.

In our experiment, groups that met face-to-face were risk-averse for gain choices and risk-seeking for loss choices. When the same groups met using the computer, however, they were slightly risk-seeking no matter what the choice was. In other words, the face-to-face encounters produced conventional decisions whereas the computer-mediated discussions produced surprising decisions (at least they were surprising to us). We have learned that much of this effect came from risk-taking group members who initiated the move to break precedent. After that, the managers using the computer to communicate were just as influenced by majority rule as they were in the face-to-face situation. And they were every bit as confident of the decisions they made via computer as they were about those they made in person.

In that the experiment found unconventional decision making side by side with strong confidence in decisions, these findings are consistent with the notion that computer-mediated communication reduces social context information and increases self centeredness.

In all our experiments, group members spoke uninhibitedly when they used the computer, engaging in name calling or making personal remarks to others (computer buffs call this “flaming”). Flaming is a third-order effect of computer communication; it happens because senders and receivers flame when they are ignorant of the social context and feel free to express themselves.

Finally, members of computer-mediated groups tend to join in more readily than they do in face-to-face encounters. In a typical

three-person group, one person may talk 45 percent of the time while another person may talk only 20 percent of the time. Usually, the person who talks the most is the person who has the highest social status or the most authority in the organization. It seems that in computer-mediated groups, where there are no salient reminders of status differences, communication is less closely regulated. Increasing the pool of information and mitigating the effects of status could contribute to organizational strength. It may also contribute to organizational instability.

The management issues

What can executives do in managing the introduction of computer systems to assist organizational communication? There are a number of computer network design issues that management should take into account, in particular (1) communication effectiveness, (2) managerial discretion and organizational control, (3) organizational social life, and (4) decision-making policy. Let us consider each of these in turn.

1. *Communication effectiveness.* How effective is a manager who dictates a memo that a secretary will type, give back for corrections, and send through the interoffice mail, compared with a manager who uses a computer keyboard to type a memo that will be sent immediately and informally? At a video teleconference at Westinghouse Electric, one person responsible for monitoring the use of technology in the company told me: "I can measure how much this video teleconferencing equipment costs and guess about how much it saves us in travel expenses, but I haven't the slightest idea how good the decisions are that our people reach when they use it."

Although we know that effective communication results in acceptable outcomes and actions that meet people's goals, we do not have a clear understanding of how to measure the communication's effectiveness.

I recently talked with some people at AT&T, where a team deals with the implementation of internal communications. The issue of how far it should go in implementing electronic communication facilities depends, in part, on whether managers can be expected to work on special projects and committees using the computer and, if they can, how to design a computer conference system that will actually enhance the managers' effectiveness. If you just add technology to the office, you may wind up having more com-

munications to monitor, more things to type, and more projects initiated that don't get completed; you may not improve performance. Because it is so expensive to implement a system and wait to see what happens, smart managers will consider the higher level effects.

Consider what you want management to accomplish. One of an executive's main jobs is to stand at the intersection of the organization and its environment, sensing external problems that his or her group should address. An organization may not adapt to change in the external environment because the managers are isolated from outside information or because the mechanisms filtering information to them are overly fine. The collected information determines what data managers use in making choices and also indicates what issues the organization thinks are important. At Sears they regularly collect information on employee morale and opinion. Inevitably, executives who receive this information are aware that top management thinks employee morale is important and are more likely than managers who don't receive such information to take employees into account when making decisions.

Communicating through computer-mediated networks can help executives span organizational boundaries. These networks gather new informants as well as genuinely new or previously uncirculated information. The question is whether the organization needs to be aware of all this information. The cost is that more people will spend their effort attending to external forces and coordinating responses to outside interests. The benefit is that the organization's problem-sensing capacity enlarges.

2. *Managerial discretion and organizational control.* The more information managers receive, the more they need the wherewithal to respond to that information. Computer-mediated networks move information from computer account to computer account, but management makes the policy decisions about who has access to that information and who can act on it. Will the systems allow group communication? Who will have access to group accounts? Who can create electronic distribution lists or bulletin boards? Who can send computer mail to whom? How closely will messages be monitored? And who passes on or responds to the information contained in these messages?

A light-handed policing policy that provides open access to the system will raise managerial initiative and the importance of local

expertise. It might also require executives to coordinate and control those initiatives and to monitor their applications.

3. *Organizational social life.* How far does management want to go toward creating electronic communities? In one of our studies, people reported that they receive many work-related messages on the computer they would not have received any other way. Consequently, they feel dependent on the technology and connected with the other people on the network.

They also receive a great many messages that have nothing to do with work. People like to be sociable and will use a technology that makes sociability easy. Moreover, as we have seen, computer-mediated communication loosens cultural constraints (for instance, against “wasting time”) by reducing the reminders a person gets of norms. Eliminating surveillance and social feedback, like laughter or a frown, reduces any embarrassment over being considered foolish and eliminates a feeling of obligation to respond in a certain way. Hence even busy, shy, or obnoxious people can communicate comfortably.

An important issue for managers to consider, then, is the extent to which the sociability that computer-mediated communication allows produces feelings of affiliation and commitment to the organization. By limiting access to the systems for control reasons, therefore, managers might also be limiting an important social benefit.

4. *Decision-making policy.* Computer-mediated communication permits wide information searches. Because it promotes confrontation with minority views, it can be a bias buster: for instance, people from dispersed departments or locations can mobilize to get things changed. In implementing a computer network, a company needs to address certain questions. Do we want to make important decisions on the computer? What kinds of decision processes is it simply inappropriate to leave to computer messages? Conventionally, one would think that important collective decisions should be made face-to-face. But as in the case of the six-to-four jury that always votes to acquit, decisions arising from group action can be narrow-minded, inefficient and prejudicial against minority views.

On the other hand, when decisions are important – as when employees’ safety, lives of the public, large investments, or jobs are affected – one would want decision makers to be sensitive to all the

social and organizational information available and personify this sensitivity in face-to-face discussion. Executives need to recognize that computer-mediated communication and information systems can never replace personal conversations.

The computer as symbol

This contrast between computer-mediated decision making and traditional decision making brings to light one final issue. The choice to use computer-mediated communication to aid any organization function may be as influenced by the symbolic meaning computers have for people as by the machines' other organizational consequences.

In large part, the positive symbolic meaning of computers dominates their introduction and use in organizations, and this may be true for some time to come. A group of students, concerned about their small college's heavy investment in computers, asked the president, "What about the new student union we need?" The president replied, "With a computer network, the whole campus will be your student union."

It makes sense to realize that computer technology design, acquisition and implementation in organizations typically affect one another. In one organization, when it became apparent that the growing use of computers would increase the organization's legitimacy and market strength, executives decided to develop a new computer network. The technical network development team made a detailed plan of what the new one would look like.

It took several people more than a year to develop the plan, which required them to make a series of technical decisions and think about each very deeply. One team member asked a technical colleague, "How can I price this system?" The colleague answered, "You can't price workstations, but you can put a cost on delivering computer mail." The team made the decision without any intervention by management and without considering the higher-level effects of pricing communication constraints.

Managers sometimes make decisions in this casual way without realizing that their actions are leading to a technology system that will have considerable management import. In making technology decisions, smart executives are aware of the three orders of technology effects and their whole array of organizational consequences.

New computer-mediated communication technologies are on the rise and will change the way information is distributed in organizations. In the computerized organization, more people will have information that always existed and some people will have new information. Computer networks will change existing groups and will create new, electronic groups. People will relate to one another in different ways, and the dynamics of decision making may change.

The effects can be potentially very interesting to technology designers and decision makers, but managers need to think more broadly. Today we can perform more and more technical miracles with computers, but real managerial leverage will come from asking what social miracles we perform with them.

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