

## 5) Interface

A person sends and receives electronic mail by using a computer program designed to manage mail. These mail programs may provide only primitive mechanisms for sending and receiving mail, or they may offer a rich set of facilities. Here is a list of features sometimes found in these programs:

- Composing a message using a word processor or text editor. Other text files can be copied into the message. The mail program may check the names and addresses of recipients to detect typographical errors. The mail program dispatches the message.
- Extracting incoming mail from a mailbox and displaying a short summary of each message.
- Selecting one or more messages and displaying them on the terminal or printing them on a printer.
- Searching a mailbox or a set of saved messages by date, keyword, or sender's name.
- Deleting a message.
- Copying a message to a computer file for permanent storage or some other use.
- Replying to a message, using conventional message-preparation tools, but without having to specify the name of the recipient. Some systems allow one to reply by annotating the original message, distinguishing original and reply text.
- Displaying messages by category, such as name of sender or subject.
- Determining whether a message has been read by its recipient—a form of “return receipt requested.”
- Finding mail addresses for individuals or groups in directory services.
- Maintaining a group list—for example, adding or removing a name from distribution lists.
- Directing a mail agent to process mail automatically—for example, to reply to each message received with a message announcing you are on vacation for two weeks.

Some of these features depend not only on the mail program but on features of the underlying mail system and mail transport protocols, such as distribution lists.

**16) Social Features**

Despite differences in particular implementations, electronic mail technologies share six characteristics that differentiate them socially from other communication technologies. First, electronic mail is asynchronous. Senders and receivers do not need to attend to the same communication at the same time. They can send and receive at their convenience. Asynchrony is not only a matter of personal convenience; it means communication crosses time as well as space. Although there are electronic communications programs for simultaneous communication ("TALK"), they are little used in organizations at present.

Second, electronic mail is fast. An electronic message can be transmitted in seconds or minutes down a hall, across a continent, or around the world. Replies can flow back just as rapidly. Speed is not just a matter of convenience either. Speed makes possible long-distance conversation, decision making, and almost any other interaction requiring give and take.

Third, electronic mail is text-based. Messages convey typographic characters, not video images or speech. Only a few of today's mail programs allow pictures or forms to be transmitted. The text in electronic communication makes it useful for exchanging documents, as well as messages. But more important, electronic communication looks pretty much alike no matter what is sent. It lacks social information and reminders of the social rules and statuses that usually regulate communication.

Fourth, electronic mail has multiple-receiver addressability: someone can send a message to one, twenty, or hundreds of people wherever they may be. This attribute means that without respect to physical, temporal, or social location, people can delegate work, collaborate, form new groups, and make collective decisions.

Fifth, electronic mail has built-in external memory. The contents of electronic messages can be stored and retrieved later. This property is important for social memory. For instance, people can participate in a group project over months or years and save in memory all of the interactions of the group. At any time, this group memory can be accessed by members who want to trace the history of an issue or by newcomers who want to learn about the group's activities.

Finally, the external memory is computer processable. It can be conveniently searched, edited, partitioned, and shared with others. This attribute extends the power of social memory by allowing analyses of issue trends,

participation patterns, consensus points, and other social memory characteristics.

Other communication technologies have some of these attributes, as we show in table A.1, but the six attributes taken together comprise a unique and peculiarly social technology. We avoid considering cost as an attribute here because the assumptions one must make to compare costs are quite arbitrary. For instance, a face-to-face conversation is cheap—unless the parties are separated by a continent and must travel to their meeting place. An electronic network is typically expensive to install, but electronic mail is inexpensive to operate insofar as one considers the cost of an additional message or of putting an additional person on the network. Hence cost is

**Table A.1**  
Comparing communication on a computer network with other communication technologies

	Technology Attributes					
	Asynchrony	Fast	Text content only	Multiple addressability	Externally recorded memory	Computer-processable memory
Meeting	no	yes <sup>a</sup>	no	yes	no <sup>b</sup>	no
Telephone	no	yes <sup>a</sup>	no	no <sup>b</sup>	no <sup>b</sup>	no
Letter	yes	no	no	no <sup>b</sup>	yes	no <sup>c</sup>
Telex	yes	yes	yes	no	yes	no <sup>c</sup>
Facsimile	yes	yes	no	no <sup>b</sup>	yes	no <sup>c</sup>
Voice mail	yes	yes	no	yes	no <sup>b</sup>	no
Electronic mail	yes	yes	yes	yes	yes	yes

a. Although conversation is instantaneous, meetings are fast only if people do not have to travel to the meeting place. Telephone conversations are fast only when both parties are simultaneously available to talk and don't have to play telephone tag.

b. Special actions can be taken to approximate the attribute in question. For example, memory can be provided by recording or transcribing meetings or telephone conversations. Voice messages can be stored. Multiple addressability is achieved with conference calls, certain facsimile machines that can be programmed to dial multiple telephone numbers, and letters that are copied and mailed to several people.

c. Special actions can be taken to improve retrieval properties of paper-based technologies. Vertical filing systems improve the retrievability of paper documents. Imaging systems that "annotate" facsimile images make the resulting documents easier to search. When facsimile or other image-handling technologies are integrated with computers, their retrievability capabilities approach those of electronic communication.

closely tied to scale of use. Furthermore, many electronic networks are installed and maintained principally to support remote access to databases and processing power. In these settings, electronic mail adds function with relatively low marginal cost.

The explosion of facsimile machines in recent years provides an alternative to electronic mail, but one with quite different properties. Facsimile has some advantages over electronic mail: images of all sorts can be transmitted, and any fax machine can talk to any other fax machine because they are connected to the pervasive dial telephone network rather than to isolated computer networks and because they all transmit images in a compatible format. But today's facsimile lacks some important properties that we consider essential for electronic communication. The documents sent or received by facsimile are hard to manipulate: on a personal computer, one can't receive a facsimile document, add three sentences in one paragraph, revise a chart, reformat the results, and then send the revised document onward to a group of reviewers. Facsimile images are expensive to store and hard to search, edit, send to groups, or process by other computer programs (McCarthy 1989). And most fax images never make it into a computer; they are printed on paper and destroyed. Thus fax is convenient for one-time, one-to-one communication, especially when handwritten material or images are required, but it is not as good as electronic mail for collaborative or ongoing efforts. This is changing; improved image quality will allow techniques like optical character recognition to extract computer-processable text from facsimile messages, more personal computers will be outfitted with facsimile interfaces, and we can generally expect electronic mail and facsimile capabilities to fuse into a general form of computer-based communication.

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## Notes

### Introduction

1. See, for these other technologies, such works as de Sola Pool (1977), Chandler (1977), Perrin (1980), Sharpe (1952), White (1962), Stilgoe (1983), Pelto and Muller-Wille (1972), and Barley (1986).
2. See, for instance, Thomas and Carroll (1981), Card, Moran, and Newell (1983), Shneiderman (1987), and Caswell (1988). The technical journals, *Human-Computer Interaction* and *Communications of the ACM* carry many articles on this topic.
3. See, for instance, Uhlig, Farber, and Bair (1979).
4. See Markus (1987), for example, for critical mass arguments or Crawford (1982), Nyce and Groppa (1983), and Caswell (1988) for implementation strategies.

### Chapter 1

1. We are not the first to offer social analyses of electronic communication technologies. For a far-ranging early view that in important ways forecasted our work, see Hiltz and Turoff (1978). Studies as far back as the late 1960s began to evaluate the impact of teletyped computer communication on groups (Sinaiko 1963; Chapanis 1972; Short, Williams, and Christie 1976; for a review see Williams 1977). Rice and Associates (1984) have described their more recent research on electronic mail technologies. Another relevant domain is that of general office computing (see Kling 1980; Bikson and Gutek 1983; Turner 1984; Zuboff 1988). We will refer to these and many other sources as they are relevant throughout the text.
2. See Schelling (1978) for an analysis of these processes.
3. Writers who have talked about the difficulty of anticipating things that have never been done before include Bell (1973), Zuboff (1988), and Rule and Attewell (1989).
4. See Beniger (1986) for the history of the Hollerith machine and other early developments in office automation.
5. See Smith and Alexander (1988) for the early development of personal computers and printers.

6. For more extensive reviews of the characteristics of these technologies, see Rice and Associates (1984), Culnan and Markus (1987), Johansen, (1988), and Kraemer and King (1988).

7. Hybels and Barley (1990) provide a labor market explanation of human resource policies in high-technology organizations.

## Chapter 2

1. See Caswell (1988:16-17) for more detail.

2. See Meyer and Boone (1987:155) for a value-added analysis of this use of electronic mail.

3. See Kraut, Egido, and Galegher (1990) for the importance of face-to-face meetings in scientific project groups.

4. See Meyer and Boone (1987:210-211) for this story in more detail.

5. Kmetz (1984) describes a nonelectronic form of information buffers in the avionics repair industry.

## Chapter 3

1. For example, see Kahn (1952) and Hochstim (1967). For a review of this literature, see Sudman and Bradburn's (1974) discussion of response effects.

2. See Kolnar et al. (1982) and Sundstrom and Sundstrom (1986) for descriptions of how tangible cues in the office reinforce social distinctions.

3. Weizenbaum has been deeply distressed by many developments in the evolving relationship between people and computers. See Weizenbaum (1976).

4. For a review of electronic marketing surveys, see Synodinos and Brennan (1988). A common application of computer interviewing is vocational and career guidance (Sampson 1983). Such programs are used in more than 25 percent of the high schools in the United States and in at least a thousand postsecondary institutions. For instance, see Katz (1984) on SIGI, a program that does career advising. Less common is computer interviewing for therapy, but see, for instance, Wagman (1980) on PLATO DCS, a program for counseling college students; Ghosh, Marks, and Carr (1984), Ghosh and Marks (1987), and Chandler et al. (1988) on computer-based treatment for phobias; Burnett, Taylor, and Agras (1985) on a program for weight control; and Selmi (1983) on computer-assisted therapy for depression.

5. For a review of research on deindividuation, see Forsyth (1983:307-338).

6. See Myers (1987) and Finholt and Sproull (1990) for descriptions of how people can create different electronic personalities.

## Chapter 4

1. For a technical discussion of research on groups, see McGrath (1984). A research-based textbook is Forsyth (1983).

2. See, for instance, Berkowitz and Bennis (1961), Dubin and Spray (1964), Berger et al. (1977), Weiner and Goodenough (1977), Ridgeway (1981), Strodbeck and Lipinski (1985), Kirchler and Davis (1986), Holtgraves (1986), and Jablin (1987).

3. Half the groups first make decisions face to face and then electronically; the other half reverses this order.

4. Others using decision support systems, asynchronous computer conferencing, or other forms of computer-mediated communication, have found similar effects. See, for instance, Zigurs (1987) and Easton (1988). Reviews comparing different forms of computer-mediated communication may be found in Kraemer and King (1988) and Dennis et al. (1988).

## Chapter 5

1. See, for instance, Festinger, Schachter, and Back (1950), Newcomb (1961), Monge and Kirste (1980).
2. This literature is reviewed in Fischhoff et al. (1981). Also see Dawes (1988).
3. See Jablin (1987) for a review of research supporting this observation. Managers tend to dominate the conversation, and subordinates expect them to. Further, subordinates are reluctant to convey bad news or negative information to their bosses ( Rosen and Tesser 1970; O'Reilly and Roberts 1974; Linde 1988).
4. Research reviews for the past thirty years have failed to find a consistent positive relationship between job satisfaction and performance (Brayfield and Crockett 1955; Vroom 1964; Petty, McGee, and Cavender 1984; Iaffaldano and Muchinsky 1985; Podsakoff and Williams 1986).
5. See, for instance, Mayer and Greeno (1972), Chi and Glaser (1984), Rouse and Morris (1986).

## Chapter 6

1. See, for instance, Pettigrew (1972), Allen (1977), Porter, Allen, and Angel (1981), Artewell (1986), and Rule and Brantley (1990).
2. See Innis (1950), Eisenstein (1979), and Katz (1989) for analyses of how earlier communication technologies were introduced and initially controlled by elites.
3. Danziger et al. (1982), Laudon (1986), and Dunlop and Kling (forthcoming) discuss these issues. Rahav (1988) illustrates the potential threats to privacy of databases in his article on Israel's psychiatric case register.

## Chapter 7

1. The importance of what one measures is illustrated in Coca-Cola's attempt to change its recipe for Coke. Market share measures indicated that Coke was losing customers. In blind taste experiments, customers preferred the taste of Pepsi. But management had not measured the symbolic importance of Coke to consumers and so was totally surprised by the furor engendered when "old" Coke was removed from the market.

## Chapter 8

1. James V. McGee, "Boundary Spanning Systems and Organizational Integration" (seminar at the Graduate School of Industrial Administration, Carnegie Mellon University, May 9, 1990).
2. See Egido (1990) for a review of the failures of video communication.
3. Some research laboratories are beginning to develop experimental video links for informal synchronous interaction at a distance (Root 1988; Abel 1990). It is likely to be years before these become commercially viable.

4. Public networks outside the organizational context may function quite similarly to extend citizen's personal neighborhoods (Glossbrenner 1983).

### **Chapter 9**

1. For more information on interface design, see Shneiderman (1987) and Dumas (1988).
2. For more discussion of organizational dilemmas, see Aram (1976), Hood (1976), Drucker (1977), and McLaren (1982).
3. See Root (1988), Abel (1990), and Borenstein and Thyberg (in press).



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## References

- Abel, M. (1990). Experiences in an exploratory distributed organization. In J. Galegher, R. Kraut, and C. Egido (Eds.), *Intellectual teamwork: Social and technological foundations of cooperative work* (pp. 489–510). Hillsdale, NJ: Erlbaum.
- Adams, J. S. (1976). The structure and dynamics of behavior in organizational boundary roles. In M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology* (pp. 1175–1199). Chicago: Rand-McNally.
- Allen, T. J. (1977). *Managing the flow of technology*. Cambridge, MA: The MIT Press.
- Aram, J. D. (1976). *Dilemmas of administrative behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Aronson, E. (1966). The psychology of insufficient justification: An analysis of some conflicting data. In S. Feldman (Ed.), *Cognitive consistency* (pp. 115–133). New York: Academic Press.
- Aronson, S. H. (1971). The sociology of the telephone. *International Journal of Comparative Sociology*, 12, 153–167.
- Attewell, P. (1986). Imperialism within complex organizations. *Sociological Theory*, 4, 115–125.
- Barley, S. R. (1986). Technology as an occasion for structuring: Evidence from observations of CT scanners and the social order of radiology departments. *Administrative Science Quarterly*, 31, 78–108.
- Barley, S. R., and Williams, L. K. (1985). *Could a funny thing happen on the way to the office of the future?* (ILR Report 23, pp. 11–20). Ithaca, NY: Cornell School of Industrial and Labor Relations.
- Becker, F. D. (1986). Loosely-coupled settings: A strategy for computer-aided work decentralization. *Research in Organizational Behavior*, 8, 199–231.
- Belasco, W. J. (1979). *Americans on the road: From autocamp to motel, 1910–1945*. Cambridge, MA: The MIT Press.
- Bell, D. (1973). *The coming of post-industrialized society*. New York: Basic Books.
- Beniger, J. R. (1986). *The control revolution*. Cambridge, MA: Harvard University Press.

- Benson, I., Ciborra, C., and Proffitt, S. (1990, October). Social and economic consequences of groupware for flight crew. *Proceedings of the Third Conference on Computer-Supported Cooperative Work* (pp. 119–129). New York: The Association for Computing Machinery.
- Berger, J., Fisek, M. H., Norman, R. Z., and Zelditch, M. (1977). *Status characteristics and social interaction*. New York: Elsevier.
- Berkowitz, N. H., and Bennis, W. G. (1961). Interaction patterns in formal service-oriented organizations. *Administrative Science Quarterly*, 6, 25–50.
- Besston, T., and Tucker, T. (1984). *Hooking in: The underground computer bulletin board workbook and guide*. Westlake Village, CA: ComputerFood Press.
- Bikson, T. K., and Gutek, B. A. (1983). *Advanced office systems: An empirical look at utilization and satisfaction* (N-1970–NSF). Santa Monica, CA: The Rand Corporation.
- Bikson, T. K., Gutek, B. A., and Mankin, D. A. (1987). *Implementing computerized procedures in office settings* (R-3077–NSF/IRIS). Santa Monica, CA: The Rand Corporation.
- Binik, Y. M., Westbury, C. F., and Servan-Schreiber, D. (1989). Case histories and shorter communications. *Behavioral Research Therapy*, 27(3), 303–306.
- Borenstein, N., and Thyberg, C. (in press). Power, ease of use, and cooperative work in a practical multimedia message system. *The International Journal of Man Machine Studies: Special Issue on Computer-Supported Cooperative Work and Groupware*.
- Brayfield, A. H., and Crockett, W. H. (1955). Employee attitudes and employee performance. *Psychological Bulletin*, 52, 396–424.
- Burnett, K. F., Taylor, C. B., and Agras, W. S. (1985). Ambulatory computer-assisted therapy for obesity: A new frontier for behavior therapy. *Journal of Consulting Clinical Psychology*, 53, 698–703.
- Burns, L. (1989). Matrix management in hospitals: Testing theories of matrix structure and development. *Administrative Science Quarterly*, 34(3), 349–368.
- Card, S. K., Moran, T. P., and Newell, A. (1983). *The psychology of human computer interaction*. Hillsdale, NJ: Erlbaum.
- Caswell, S. A. (1988) *E-Mail*. Boston: Artech House.
- Chandler, A. D., Jr. (1977). *The visible hand: The managerial revolution in American business*. Cambridge, MA: Belknap Press of Harvard University Press.
- Chandler, G. M., Burck, H., Sampson, J. P., and Wray, R. (1988). The effectiveness of a generic computer program for systematic desensitization. *Computers in Human Behavior*, 4, 339–346.
- Chapanis, A. (1972). Studies in interactive communication: The effects of four communication modes on the behavior of teams during cooperative problem-solving. *Human Factors*, 14, 487–509.
- Chi, M. T. M., and Glaser, R. (1984). Problem solving abilities. In R. Steinberg (Ed.), *Human abilities: An information processing approach* (pp. 227–248). San Francisco: Freeman.

- Clark, K. B., Chew, W. B., and Fujimoto, T. (1987). Product development in the world auto industry. *Brookings Papers on Economic Activity*, 3, 729-781.
- Cohen, W., and Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35, 128-152.
- Connolly, T., Jessup, L. M., and Valacich, J. S. (1990). Idea generation using a GDSS: Effects of anonymity and evaluative tone. *Management Science*, 36(6), 689-703.
- Crawford, A. B. (1982). Corporate electronic mail—A communication-intensive application of information technology. *MIS Quarterly*, 6, 1-14.
- Culnan, M. J., and Markus, M. L. (1987). Information technologies. In F. M. Jablin, L. L. L. Putnam, K. H. Roberts and L. W. Porter (Eds.), *Handbook of organizational communication* (pp. 420-444). Newbury Park, CA: Sage Publications.
- Curtis, B., Krasner, H., and Iscoe, N. (1988). A field study of the software design process for large systems. *Communications of the ACM*, 31(11), 1268-1287.
- Danziger, J. N., Dutton, W. H., Kling, R., and Kraemer, K. L. (1982). *Computers and politics: High technology in American local governments*. New York: Columbia University Press.
- Danziger, J. N. (1979). Technology and productivity: A contingency analysis of computers in local government. *Administration and Society*, 11, 144-171.
- Davis, J. H., and Restle, F. (1963). The analysis of problems and prediction of group problem solving. *Journal of Abnormal and Social Psychology*, 66, 103-116.
- Dawes, R. M. (1988). *Rational choice in an uncertain world*. San Diego: Harcourt Brace Jovanovich, Publishers.
- Dennis, A. R., George, J. F., Jessup, L. M., Nunamaker, J. F. Jr., and Vogel, D. R. 1988. Information technology to support electronic meetings. *MIS Quarterly* (December), 591-619.
- DeSanctis, G., & Gallupe, R. B. (1987). A foundation for the study of group decision support systems. *Management Science*, 33, 589-609.
- de Sola Pool, I. (1977). *The social impact of the telephone*. Cambridge, MA: The MIT Press.
- Diehl, M., and Stroebe, W. (1987). Productivity loss in brainstorming groups: Toward the solution of a riddle. *Journal of Personality and Social Psychology*, 53, 497-509.
- Drucker, P. F. (1977). *An introductory view of management*. New York: Harper and Row.
- Dubin, R., and Spray, S. L. (1964). Executive behavior and interaction. *Industrial Relations*, 3, 99-108.
- Dubrovsky, V., Kiesler, S., and Sethna, B. (in press). The equalization phenomenon: Status effects in computer-mediated and face-to-face decision making groups. *Human Computer Interaction*.

- Dumas, J. S. (1988). *Designing user interfaces for software*. Englewood Cliffs, NJ: Prentice Hall.
- Dunlop, C., and Kling, R., (Eds.). (forthcoming). *Computerization and controversy: Value conflicts and social choices*. New York: Academic Press.
- Earls, J. (1990). *Social integration by people with physical disabilities: The development of an information technology model based on personal growth and achievement*. Unpublished doctoral dissertation, The University of Wollongong, Wollongong, Australia.
- Easton, G. K. (1988). *Group decision support systems vs. face-to-face communication for collaborative group work: An experimental investigation*. Unpublished doctoral dissertation, University of Arizona, Tucson.
- Egido, C. (1990). Teleconferencing as a technology to support cooperative work: Its possibilities and limitations. In J. Galegher, R. E. Kraut, and C. Egido (Eds.), *Intellectual teamwork: Social and technological foundations of cooperative work* (pp. 351–371). Hillsdale, NJ: Erlbaum.
- Einhorn, H. J., Hogarth, R. M., and Klempner, E. (1977). Quality of group judgment. *Psychological Bulletin*, 84(1), 158–172.
- Eisenstein, E. (1979). *The printing press as an agent of change* (Vol. 1). Cambridge: Cambridge University Press.
- Electronic Services Unlimited (1987). *Telework: A multi-client study*. New York: Author.
- Emmett, R. (1982). VNET or GRIPENET. *Datamation*, 48–58.
- Englebart, D. (1989, November). *Bootstrapping organizations into the 21st century*. Paper presented at a seminar at the Software Engineering Institute, Pittsburgh.
- Eveland, J. D., and Bikson, T. K. (1988). Work group structures and computer support: A field experiment. *Transactions on Office Information Systems*, 6(4), 354–379.
- Fanning, T., and Raphael, B. (1986). Computer teleconferencing: Experience at Hewlett-Packard. *Proceedings of Conference on Computer-Supported Cooperative Work* (pp. 291–306). New York: The Association for Computing Machinery.
- Feldman, M. S. (1987). Electronic mail and weak ties in organizations. *Office: Technology and People*, 3, 83–101.
- Festinger, L., Schachter, S., and Back, K. (1950). *Social pressures in informal groups*. New York: Harper.
- Finholt, T., and Sproull, L. (1990). Electronic groups at work. *Organization Science*, 1(1), 41–64.
- Finholt, T., Sproull, L., and Kiesler S. (1990). Communication and performance in ad hoc task groups. In J. Galegher, R. Kraut, and C. Egido (Eds.), *Intellectual teamwork: Social and technological foundations of cooperative work* (pp. 291–325). Hillsdale, NJ: Erlbaum.
- Fischer, C. (1985). *Touch someone: The telephone industry discovers sociability, 1876–1940*. Unpublished manuscript, University of California, Berkeley.

- Fischhoff, B., and Johnson, S. (1990). The possibility of distributed decision making: Appendix to B. Fischhoff (Ed.), *Distributed decision making: Workshop report*. Washington, DC: National Academy Press.
- Fischhoff, B., Lichtenstein, S., Slovic, P., Derby, S. L., and Keeney, R. L. (1981). *Acceptable risk*. New York: University Press.
- Fiske, E. B. (1990, January 7). Reform by high-tech. *New York Times*, p. 48.
- Forsyth, D. R. (1983). *An introduction to group dynamics*. Monterey, CA: Brooks/Cole Publishing Co.
- Fox, J. M. (1982). *Software and its development*. Englewood Cliffs, NJ: Prentice-Hall.
- Garbarino, C. (1990). *E-mail delivers Tandem's competitive edge*. Unpublished manuscript, Tandem Computers, Inc., Cupertino, CA.
- Geneen, H., and Moscow, A. (1984). *Managing*. Garden City, NY: Doubleday.
- Ghosh, A., and Marks, I. M. (1987). Self-treatment of agoraphobia by exposure. *Behavioral Therapy*, 18, 3-16.
- Ghosh, A., Marks, I. M., and Carr, A. C. (1984). Self-exposure treatment for phobias: A controlled study. *Journal of Royal Society of Medicine*, 77, 483-487.
- Glossbrenner, A. (1983). *The complete handbook of personal computer communications: Everything you need to know to go on-line with the world*. New York: St. Martin's Press.
- Goldman, M. I. (1987). *Gorbachev's challenge: Economic reform in the age of high technology*. New York: W. W. Norton.
- Greif, I. (Ed.). (1988). *Computer-supported cooperative work: A book of readings*. San Mateo, CA: Morgan Kaufmann Publishers.
- Halper, M. (1988, November). Portables get raves on the road. *Datamation*, pp. 55-58.
- Hannaway, J. (1989). *Signals and signalling: The workings of an administrative system*. New York: Oxford University Press.
- Harkness, R. C. (1977). *Technology assessment of telecommunications-transportation interactions*. Menlo Park, CA: Stanford Research Institute.
- Hesse, B., Sproull, L., Kiesler, S., and Walsh, J. (1990). *Computer network support for science: The case of oceanography*. Unpublished manuscript, Carnegie Mellon University, Pittsburgh.
- Hiltz, S. R., and Turoff, M. (1978). *The network nation: Human communication via computer*. Reading, MA: Addison-Wesley.
- Hirschhorn, L. (1985). Information technology and the new services game. In M. Castells (Ed.), *High technology, space, and society*, 28 (pp. 173-188). Urban Affairs Annual Reviews. Beverly Hills, CA: Sage.
- Hochstim, J. R. (1967). A critical comparison of three strategies of collecting data from households. *Journal of the American Statistical Association*, 62, 976-989.

- Holtgraves, T. (1986). Language structure in social interaction: Perceptions of direct and indirect speech acts and interactants who use them. *Journal of Personality and Social Psychology*, 51, 305–314.
- Hood, C. C. (1976). *The limits to administration*. London: John Wiley and Sons.
- Huff, C., and King, R. (1988, August). An experiment in electronic collaboration. In J. D. Goodchilds (Chair), *Interacting by computer: Effects on small group style and structure*. Symposium conducted at the meeting of the American Psychological Association, Atlanta.
- Huff, C., Sproull, L., and Kiesler, S. (1989). Computer communication and organizational commitment: Tracing the relationship in a city government. *Journal of Applied Social Psychology*, 19, 1371–1391.
- Hybels, R. C., and Barley, S. R. (1990). Co-optation and the legitimation of professional identities: Human resource policies in high technology firms. In L. R. Gomez-Mejia and M. W. Lawless (Eds.), *Organizational issues and high technology management* (pp. 199–213). Greenwich, CT: JAI Press.
- Iaffaldano, M. T., and Muchinsky, P. M. (1985). Job satisfaction and job performance: A meta-analysis. *Psychological Bulletin*, 97, 251–273.
- Innis, H. (1950). *Empire and communication*. Oxford: Clarendon Press.
- Jablin, F. M. (1987). Formal organization structure. In F. M. Jablin, L. L. Putnam, K. H. Roberts and L. W. Porter (Eds.), *Handbook of organizational communication* (pp. 389–419). Newbury Park, CA: Sage.
- Janis, I. (1972). *Victims of groupthink*. Boston: Houghton Mifflin.
- Johansen, R. (1988). *Groupware: Computer support for business teams*. New York: Free Press.
- Kahn, R. L. (1952). *A comparison of two methods of collecting data for social research: The fixed-alternative questionnaire and the open-ended interview*. Unpublished doctoral dissertation, University of Michigan.
- Kahneman, D., and Tversky, A. (1979). Prospect theory: An analysis of decisions under risk. *Econometrica*, 47, 262–291.
- Katz, E. (1989). *The new media and social segmentation*. Unpublished manuscript, Hebrew University of Jerusalem, Israel.
- Katz, M. R. (1984). Computer-assisted guidance: A walkthrough with running comments. *Journal of Counseling and Development*, 63, 153–157.
- Kaufman, R. L., Parcel, T. L., Wallace, M., and Form, W. (1988). Looking forward: Responses to organizational and technological change in an ultra-high technology firm. In I. H. Simpson and R. L. Simpson (Eds.), *Research in the sociology of work*, 4 (pp. 31–67). Greenwich, CT: JAI Press.
- Keegan, W. J. (1974.) Multinational scanning: A study of the information sources utilized by headquarters executives in multinational companies. *Administrative Science Quarterly*, 19, 411–421.
- Kiesler, C., and Kiesler, S. (1969). *Conformity*. Reading, MA: Addison-Wesley.
- Kiesler, S., Siegel, J., and McGuire, T. W. (1984). Social psychological aspects of computer-mediated communication. *American Psychologist*, 39(10), 1123–1134.

- Kiesler, S., and Sproull, L. (1982). Managerial response to changing environments: Perspectives on problem sensing from social cognition. *Administrative Science Quarterly*, 27, 548-570.
- Kiesler, S., and Sproull, L. S. (1986). Response effects in the electronic survey. *Public Opinion Quarterly*, 50, 402-413.
- Kiesler, S. and Sproull, L. (1987). *Computing and change on campus*. Cambridge: Cambridge University Press.
- Kiesler, S., Zubrow, D., Moses, A. M., and Geller, V. (1985). Affect in computer-mediated communication: An experiment in synchronous terminal-to-terminal discussion. *Human Computer Interaction*, 1, 77-104.
- King, J. L. (1983). Centralized versus decentralized computing: Organizational considerations and management options. *Computing Surveys*, 15(4), 319-349.
- Kinsley, M. (1989, December). Corporate Luddism. *New Republic*, p. 4.
- Kirchler, E., & Davis, J. H. (1986). The influence of member status differences and task type on group consensus and member position change. *Journal of Personality and Social Psychology*, 51(1), 83-91.
- Kling, R. (1987). Defining the boundaries of computing in complex organizations. In R. Boland and R. Hirschheim (Eds.), *Critical issues in information systems* (pp. 307-362). London: John Wiley.
- Kling, R. (1980.) Social analyses of computing: Theoretical perspectives in recent empirical research. *Computing Surveys*, 12, 61-110.
- Kmetz, J. (1984). An information processing study of a complex workflow in aircraft electronics repair. *Administrative Science Quarterly*, 19, 255-280.
- Kolnar, E., Sundstrom, E., Brady, C., Mandel, D., and Rice R. W. (1982). Status demarcation in the office. *Environment and Behavior*, 14, 561-580.
- Kraemer, K. L., and King, J. L. (1988). Computer-based systems for cooperative work and group decision-making. *ACM Computing Surveys*, 20(3), 115-146.
- Kraut, R. E. (Ed.) (1987). *Technology and the transformation of white-collar work*. Hillsdale, NJ: Erlbaum.
- Kraut, R. E., Egidio, J., and Galegher, J. (1990). Patterns of contact and communication in scientific research collaborations. In J. Galegher, R. E. Kraut, and C. Egidio (Eds.), *Intellectual teamwork: Social and technological foundations of cooperative work* (pp. 149-171). Hillsdale, NJ: Erlbaum.
- Kraut, R. E., Fish, R., Root, R., and Chalfonte, B. (In press). Informal communication in organizations: Form, function, and technology. In S. Oskamp and S. Scacapan (Eds.), *Human reactions to technology*, Claremont Symposium on Applied Social Psychology. Beverly Hills, CA: Sage Publications.
- Kraut, R. E., and Streeter, L. A (1990). *Satisfying the need to know: Interpersonal information access*. Unpublished manuscript, Bell Communications Research, Morristown, NJ.
- Latane, B., and Darley, J. M. (1968). Group inhibition of bystander intervention in emergencies. *Journal of Personality and Social Psychology*, 10(3), 215-221.

- Laudon, K. C. (1986). *Dossier society: Value choices in the design of national information systems*. New York: Columbia University Press.
- Laughlin, P. R. (1980). Social combination processes of cooperative problem solving groups on verbal intellectual tasks. In M. Fishbein (Ed.), *Progress in social psychology* (pp. 127–155). Hillsdale, NJ: Erlbaum.
- Laughlin, P. R., and Ellis, A. L. (1986). Demonstrability and social combination processes on mathematical intellectual tasks. *Journal of Experimental Social Psychology*, 22(3), 177–189.
- Lederberg, J. (1978). Digital communications and the conduct of science: The new literacy. *IEEE Proceedings*, 66(11), 1314–1319.
- Levin, J. A., and Cohen, M. (1985). The world as an international science laboratory: Electronic networks for science instruction and problem solving. *Journal of Computers in Mathematics and Science Teaching*, 4, 33–35.
- Lichtenstein, S., Slovic, P., Fischhoff, B., Layman, M., and Combs, B. (1978). Judged frequency of lethal events. *Journal of Experimental Psychology: Human Learning and Memory*, 4, 551–578.
- Licklider, J. C. R., and Vezza, A. (1978). Applications of information networks. *IEEE Proceedings*, 66, 1330–1346.
- Linde, C. (1988). The quantitative study of communicative success: Politeness and accidents in aviation discourse. *Language and Society*, 17, 375–399.
- Litterer, J. (1961). Systematic management: The search for order and integration. *Business History Review*, 35, 461–476.
- Lorant, S. (1988). *Pittsburgh, story of an American city*. Lenox, MA: Authors' Edition.
- Losada, M., Sanchez, P., and Noble, E. E. (1990). Collaborative technology and group process feedback: Their impact on interactive sequences in meetings. *Proceedings of the Conference on Computer-Supported Cooperative Work* (pp. 53–64). New York: The Association for Computing Machinery.
- Lynn, L. (1986). *Office automation in Japan and the United States*. Unpublished manuscript, Case Western Reserve, Cleveland.
- McCarthy, J. (1989). Networks considered harmful for electronic mail. *Communications of the ACM*, 32(12), 1389–1390.
- McFarlan, F. W., and McKenney, J. L. (1983). *Corporate information systems management*. Homewood, IL: Richard D. Irwin.
- McGee, J. V. (1990, May). *Boundary spanning systems and organizational integration*. Seminar at the Graduate School of Industrial Administration, Carnegie Mellon University, Pittsburgh.
- McGrath, J. E., and Hollingshead, A. B. (1990). *Effects of technological enhancements on the flow of work in groups: Preliminary report of a systematic review of the research literature* (Report 90–1). Urbana, IL: University of Illinois.
- McGrath, J. E. (1984). *Groups: Interaction and performance*. Englewood Cliffs, NJ: Prentice-Hall.



- McGuire, T., Kiesler, S., and Siegel, J. (1987). Group and computer-mediated discussion effects in risk decision making. *Journal of Personality and Social Psychology*, 52(5), 917-930.
- Mackay, W. (1989). Diversity in the use of electronic mail: A preliminary inquiry. *ACM Transactions on Office Information Systems*, 6(4) 380-397.
- Mackay, W., Malone, T., Crowston, K., Rosenblitt, D., Rao, R., and Card, S. (1989). How do experienced information lens users use rules? *Proceedings of the ACM Conference on Human Factors in Computing Systems* (pp. 211-216). Reading: Addison-Wesley.
- McLaren, R. I. (1982). *Organizational dilemmas*. New York: Wiley.
- Maier, N. R. F., and Solem, A. R. (1952). The contribution of a discussion leader to the quality of group thinking: The effective use of minority opinions. *Human Relations*, 5, 277-288.
- Malone, T. (1987). Modeling coordination in organizations and markets. *Management Science*, 33, 1317-1332.
- Malone, T. W., Grant, K. R., Turbak, R. A., Brobst, S. A., and Cohen, M. D. (1987). Intelligent information-sharing systems. *Communications of the ACM*, 30, 484-497.
- Manasse, M. S. (1990). Complete factorization of the ninth Fermat number. Electronic message, June 15.
- Manning, P. K. (1979). Semiotics and loosely coupled organizations. Revised version of a paper presented to the Southern Sociological Society, Atlanta.
- March, J. G. (1987). Old colleges, new technology. In S. Kiesler and L. Sproull (Eds.), *Computing and change on campus* (pp. 16-27). Cambridge: Cambridge University Press.
- March, J. G., and Sproull, L. S. (1990). Technology, management, and competitive advantage. In P. G. Goodman and L. S. Sproull (Eds.), *Technology and organizations* (pp. 144-173). San Francisco: Jossey-Bass.
- March, J. G., Sproull, L. S., and Tamuz, M. (in press). Learning from samples of one or less. *Organization Science*, 2.
- Markus, M. L. (1987). Toward a "critical mass" theory of interactive media: Universal access, interdependence and diffusion. *Communication Research*, 14, 491-511.
- Markus, M. L., and Pfeffer, J. (1983). Power and the design and implementation of accounting and control systems. *Accounting Organizations and Society*, 8(2/3), 205-213.
- Martin, J. (1982). Stories and scripts in organizational settings. In A. H. Hastorf and A. M. Isen (Eds.), *Cognitive social psychology* (pp. 225-305). New York: Elsevier-North Holland.
- Maruyama, M. (1963). The second cybernetics: Deviation-amplifying mutual causal processes. *American Scientist*, 51(2), 164-179.
- Marwell, G., and Ames, R. (1979). Experiments on the provision of public goods. I. Resources, interest, group size and the free-rider problem. *American Journal of Sociology*, 84, 1335-1360.

- Mason, R. O. (1970). *Beyond benefits and costs: A study on methods for evaluating the NASA-ERTS program*. Unpublished manuscript, Southern Methodist University, Dallas.
- Mayer, R. E., and Greeno, J. G. (1972). Structural differences between learning outcomes produced by different instructional methods. *Journal of Educational Psychology*, 63, 165-173.
- Mead, T. (1990, April). The IS innovator at DuPont. *Datamation*, pp. 61-68.
- Meherabian, A. (1971). *Silent messages*. Belmont, CA:Wadsworth.
- Messick, D. M., and Brewer, M. B. (1983). Solving social dilemmas: A review. In L. Wheeler and P. Shaver (Eds.), *Review of personality and social psychology* (pp. 11-44). Beverly Hills, CA: Sage.
- Metcalfe, J., III (1986). Decision making and the Grenada rescue operation. In J. G. March and R. Weissinger-Baylon (Eds.), *Ambiguity and command* (pp. 277-297). Marshfield, MA: Pitman.
- Meyer, N. D. and Boone, M. E. (1987). *The information edge*. New York: McGraw-Hill.
- Meyer, J. W., and Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. *American Journal of Sociology*, 83, 340-363.
- Mintzberg, H. (1973). *The nature of managerial work*. New York: Harper & Row.
- Monaco, C. (1988). The difficult birth of the typewriter. *American Heritage of Invention and Technology*, 4, 11-21.
- Monge, P. R., and Kirste, K.K. (1980). Measuring proximity in human organizations. *Social Psychology Quarterly*, 43, 110-115.
- Moreland, R. L., and Levine, J.M. (1982). Socialization in small groups: Temporal changes in individual-group relations. *Advances in Experimental Social Psychology*, 15, 137-192.
- Morison, E. E. (1966). *Men, machines, and modern times*. Cambridge, MA: The MIT Press.
- Myers, D. (1987). Anonymity is part of the magic: Individual manipulation of computer-mediated communication contexts. *Qualitative Sociology*, 10(3), 251-266.
- National Research Council, Panel on Information Technology and the Conduct of Research, Committee on Science, Engineering, and Public Policy (1989). *Information technology and the conduct of research: The user's view*. Washington, D.C.: National Academy Press.
- National Research Council, Committee on the Effective Implementation of Advanced Manufacturing Technology, Manufacturing Studies Board, Commission on Engineering and Technical Systems (1986). *Human resource practices for implementing advanced manufacturing technology*. Washington, D.C.: National Academy Press.
- Newcomb, T. R. (1961). *The acquaintance process*. New York: Holt, Rinehart, and Winston.

- Newman, D. (1990). Opportunities for research on the organizational impact of school computers. *Educational Researcher*, 19(3), 8–13.
- Nyce, H. E., and Groppa, R. (1983, May). Electronic mail at MIT. *Management Technology*, 65–72.
- O'Reilly, C. (1989). Corporations, culture, and commitment: Motivation and social control in organizations. In M. Tushman, C. O'Reilly, and D. Nadler (Eds.), *Management of organizations* (pp. 285–303). New York: Harper and Row.
- O'Reilly, C. (1980). Individuals and information overload in organizations: Is more necessarily better? *Academy of Management Journal*, 23, 684–696.
- O'Reilly, C., and Roberts, K. (1974). Information filtration in organizations: Three experiments. *Organizational Behavior and Human Performance*, 11, 253–265.
- Orton, J. D., and Weick, K. E. (1990). Loosely coupled systems: A reconceptualization. *Academy of Management Review*, 15(2), 203–223.
- Ouchi, W. G. (1980). Markets, bureaucracies, and clans. *Administrative Science Quarterly*, 25, 129–140.
- Palys, T. S., Boyanowsky, E. O., and Dutton, D. G. (1984). Mobile data access terminals and their implications for policing. *Journal of Social Issues*, 40(3), 113–127.
- Pelto, P. J., and Muller-Wille, L. (1972). Snowmobiles: Technological revolution in the Arctic. In H. R. Bernard and P.J. Pelto, (Eds.), *Technology and social change* (pp. 65–199). New York: Macmillan.
- Pelz, D. C., and Andrews, F. M. (1976). *Scientists in organizations: Productive climates for research and development*. New York: Wiley.
- Perin, C. (in press). The moral fabric of the office: Panopticon discourse and schedule flexibilities. In S. Bacharach, S. R. Barley, and P. S. Tolbert (Eds.), *Research in the sociology of organizations*. Greenwich, CT: JAI Press.
- Perrin, N. (1980). *Giving up the gun: Japan's reversion to the sword 1543–1879*. Boulder, CO: Shambhala.
- Pettigrew, A. M. (1972). Information control as power resources. *Sociology*, 6, 187–204.
- Petty, M. M., McGee, G. W., and Cavender, J. W. (1984). A meta-analysis of the relationships between individual job satisfaction and individual performance. *Academy of Management Review*, 9, 712–721.
- Pfeffer, J. (1978). *Organizational design*. Arlington Heights, IL: AHM.
- Pfeffer, J. (1981). *Power in Organizations*. Marshfield, MA: Pitman Publishing.
- Pfeffer, J., and Leblebici, H. (1977). Information technology and organizational structure. *Pacific Sociological Review*, 20(2), 241–261.
- Philip, G., and Young, E. S. (1987). Man-machine interaction by voice: Developments in speech technology Part I: The state-of-the-art. *Journal of Information Science*, 13, 3–14.

- Podsakoff, P. M., and Williams, L. J. (1986). The relationship between job performance and job satisfaction. In E. A. Locke (Ed.), *Generalizing from laboratory to field settings* (pp. 207–253). Lexington, MA: Lexington Books.
- Poole, M. S., Holmes, M., and DeSanctis, G. (1988). Conflict management and group decision support systems. *Proceedings of the Second Conference on Computer-Supported Cooperative Work* (pp. 227–243). New York: The Association for Computing Machinery.
- Porter, L., Allen, R. W., and Angel, H. L. (1981). The politics of upward influence in organizations. In L. L. Cummings and B. M. Staw (Eds.), *Research in organizational behavior*, 3 (pp. 109–150). Greenwich, CT: JAI Press.
- Rahav, M. (1985). Computers and society, the case of Israel's psychiatric case register. In D. Harper (Ed.), *Proceedings of Two Conferences, June 1984 and June 1985* (pp. 97–100). Rochester, NY: University of Rochester.
- Reddy, R. (1990). A technological perspective on new forms of organizations. In P. S. Goodman and L. S. Sproull (Eds.), *Technology and organizations* (pp. 232–253). San Francisco: Jossey-Bass.
- Reich, R. B. (1987, August). Bread and circuits. *New Republic*, 197(5), pp. 32–33.
- Rice, R., and Associates (1984). *The new media: Communication, research and technology*. Newbury Park, CA: Sage.
- Ridgeway, C. L. (1981). Nonconformity, competence, and influence in groups: A test of two theories. *American Sociological Review*, 46, 333–347.
- Ridgway, V. F. (1956). Dysfunctional consequences of performance measurements. *Administrative Science Quarterly*, 1, 240–247.
- Roberts, L. G., and Wessler, B. D. (1970). Computer network development to achieve resource sharing. *AFIPS SJCC Proceedings*, 36.
- Robey, D., Farrow, D., and Franz, C. R. (1989). Group process and conflict in system development. *Management Science*, 35(10), 1172–1191.
- Root, R. (1988). Design of a multi-media vehicle for social browsing. *Proceedings of the Second Conference on Computer-Supported Cooperative Work* (pp. 25–30). New York: The Association for Computing Machinery.
- Rosen, S., and Tesser, A. (1970). On reluctance to communicate undesirable information: The MUM effect. *Sociometry*, 33, 253–264.
- Rouse, W. B., and Morris, N. M. (1986). On looking into the black box: Prospects and limits in the search for mental models. *Psychological Bulletin*, 100, 349–363.
- Rule, J., and Attewell, P. (1989). What do computers do? *Social Problems*, 36(3), 225–241.
- Rule, J., and Brantley, P. (1990). *Surveillance in the workplace: A new meaning to "personal" computing*. Unpublished manuscript, State University of New York, Stony Brook.
- Sampson, J. P., Jr. (1983). An integrated approach to computer applications in counseling psychology. *The Counseling Psychologist*, 11, 65–74.