



2017 A New View of Tele/Conferencing

*Networking People Together Digitally
Via Video, Mobile, AI, Robots,
Wearables, Desktop Sharing,
Electronic Whiteboards, Text, Video,
Special Images and other means.*

By Thomas B. Cross

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NOTE: This was originally published years ago is now being updated and re-written. As such many of the "date-sensitive" references may not be relevant now, however, many of the fundamental communications concepts are as relevant today as they were then.

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PREFACE

"There was a great sense that the world had shrunk."

Dr. Christopher Stockbridge

Telecommunications technologies—"telephones, satellites, computers, television—make possible communication among all points on earth. To date, however, the technology that enables people to communicate electronically has far outstripped people's awareness of and sophistication about its potential applications. In this book we explore many applications of teleconferencing and show how it is hardly restricted to the world of management and business. Educators, doctors, politicians, and artists are among those whose applications of teleconferencing technologies illustrate the many creative possibilities. The potential of teleconferencing, we believe, is limited only by people's imagination.

We like to think of teleconferencing as something old and something new. Teleconferencing is "old hat": I tele you, you tele her, she tele me. . . . What's new? Teleconferencing is instantaneous verbal, graphic, and data communications with anyone anywhere around the world. Beyond the obvious, people talk about teleconferencing as a "meeting of minds," "creating a synergy of minds," "freeing the mind," and more pragmatically, as "bringing together the right people with the right information at the right time." With teleconferencing, you can "be there" without having to "go there." You can be "on the road" and still be "in touch." You can "be in more than one place at the same time" and participate in more than one meeting at a time. Or, you can

"meet" with others after they have already met, that is, when it's convenient for you. Once "on-line" in the new "electronic space," you can find others with similar interests and concerns. Teleconferencing, in short, expands the options. There are now more choices about both the frequency and the form of communications.

Communication is a principal theme of this book. In order to teleconference successfully, we must communicate effectively. What is effective communication? This book addresses some of the basics of good communication as well as some of the new ideas about the role of communications in organizations. Thomas J. Peters and Robert H. Waterman, Jr., authors of *In Search of Excellence*, note that in the best-run companies: (1) communications systems are informal; (2) communication intensity is extraordinary; (3) communication is given physical support (hardware); (4) there are "forcing devices," for example, programs that bring together people from different disciplines or different parts of the organization; and (5) the communication system acts as a remarkably tight control system. Teleconferencing, we illustrate, instills a sense of being able to "wander around" the organization, check out new ideas, and easily touch base with those only peripherally involved in a project. Teleconferencing technology is the hardware that links good ideas.

Teleconferencing, we believe, enables an organization to follow the good advice of Peters and Waterman in their "search for excellence." They advocate that an organization:

- Take an action orientation: keep the organization fluid and emphasize small-group interactions, for example, *ad hoc* task forces, quality circles, temporary structures.
- Get "close to the customer" and stay close.
- Provide a support system for those who have innovative ideas, "champions."
- Create simultaneous "loose-tight" properties that foster a climate where there is dedication to the central values of the company.

Teleconferencing, we argue, links people together who might not otherwise have the opportunity to communicate. A sense of "connectedness" results. Psychologists have always noted how "being in touch" with others is crucial to a sense of personal self-esteem and well-being. In this respect, the purpose of teleconferencing is "high touch," even though its underpinnings are "high tech." The personal benefits of teleconferencing overflow to the professional realm, we suggest, and improve "the quality of work life." Users frequently talk about how

teleconferencing improves morale and a sense of belonging to the organization.

In this book, we attempt to go beyond "stage one" of teleconferencing, the stage in which vendors dominated and tended to sell their hardware to those already familiar with electronic technology. Because the development of teleconferencing has been technology- rather than user-driven, manufacturers have also been prominent in asserting who "needs" teleconferencing. Typically, they claim that managers and executives "need" teleconferencing to eliminate travel and substitute for face-to-face meetings. Not surprisingly, these ideas have not sat well with those who already know quite well how to conduct their own business! In this book we address the *concerns of management*, that is, how to manage time, travel, and meetings, the ongoing productivity crisis, the need to reschool workers, and how to support knowledge workers. Our focus in this book is upon people, and our aim is to show how teleconferencing technologies enable people to change the way they meet, study, organize, manage, interact, carry out projects, and do business. Teleconferencing technology, we show, has opened up the possibilities for small organizations to move into a global communications network, for long-term planning and management to become the norm rather than the exception, and for collapsing "information float" and making the "production" of information an almost instantaneous process. Teleconferencing, we also believe, makes it possible for communications to cross barriers of hierarchy and status, thereby making possible development of human potential that has been traditionally locked into functions, roles, titles, and positions. Like the telephone, teleconferencing makes it possible for people to "connect," despite whatever "rules of the game" may be in effect.

This book is written for the person who is unfamiliar with teleconferencing and is curious about the possibilities of electronic communication for management, consultation, networking, information exchange, education, or whatever other endeavor he or she may have in mind. The first chapter presents a quick glance at teleconferencing and includes an overview and summary of the book. With the purpose of demonstrating how teleconferencing can be used to improve quality of work life and thereby affect productivity in the office, the second chapter explores the possibilities of combining teleconferencing's information/communication capabilities for increased productivity, enhanced communications, information management, and continuing education. The third chapter is a guide to introducing teleconferencing into an organization and highlights the crucial steps that must be taken if teleconferencing is to be used to optimum advantage in an organization. The fourth chapter is a guide to structuring a successful teleconference

and illustrates how the objectives and format of various types of meetings can be matched with the appropriate technology to produce successful teleconferences. This chapter also discusses the various protocols that should be used in a teleconference and offers many "teletips" for communicating electronically. The next four chapters take a closer look at each of the teleconferencing technologies: audio, audiographic, video, and computer teleconferencing.

THOMAS B. CROSS



TELECONFERENCING AT A GLANCE: AN INTRODUCTION AND OVERVIEW

WHAT IS TELECONFERENCING?

Teleconferencing means conferring at a distance or holding a long-distance conference. The conference participants are geographically separated, and they "meet" with the aid of technical media that transmit their voices and/or images. Teleconferencing allows several persons to participate in meetings without the necessity of face-to-face contact. Participants can be geographically dispersed and still "meet," using the technology as the means that brings them together.

Interactive electronic communication among three or more people in two or more locations—the generic definition of teleconferencing—encompasses a wide variety of possibilities. The number of participating sites can range from two to hundreds. The number of participants in a teleconference can range from three to thousands. All the participants can be physically separated, or, as often happens, some can be grouped together at one or more sites. The teleconference can thus entail individual face-to-face interaction, local group interaction, and remote interaction, as well. The teleconference can be a one-time event, lasting an hour or so, or it can be an ongoing event, lasting days or even months. The types of technical media used in teleconferencing range from the very simple to the very complex: from the telephone to closed-circuit television to the computer. Teleconferencing employs a myriad of trans-

mission technologies: telephone lines, cables, microwaves, and satellites. The teleconference can be as simple as a telephone conference in which three people dial up and, with the assistance of the operator, "meet" on the telephone to discuss daily activities or as complex as a meeting arranged months in advance that includes full-motion, live television projection of people and graphics that is broadcast to thousands of people around the globe.

Teleconferencing lets people meet electronically when they cannot meet any other way. Hiltz and Turoff, two pioneers in research and

What Is Teleconferencing? 3

creative applications of teleconferencing, note that it has not been until relatively recently that a dependence upon traditional forms of communicating information—the mail, telephone, television, radio, and printed and published matter—has been broken. Moreover, these traditional forms (with the exception of the telephone) are one-way communications. They point out that in order for a group of people to interact, it has been necessary to schedule a "communicative event"—a meeting, a conference, a convention—in order to bring them all together in the same place:

There has been no means for a *group* of people to adequately exchange information among themselves and reach decisions, other than to meet frequently face to face and talk it out.¹

This, they feel, is "no change since the caveman gathered around campfires." The linking of the telephone, television, and the satellite allows instant communication of people who are dispersed around the globe, and it expands the options for organizing, exchanging, and creatively using information and personal interactions. Teleconferencing, in short, adds value to information by making it timely.

Teleconferencing changes communication patterns, including the frequency, regularity, and manner in which people communicate. It broadens and synchronizes communications, increasing people's "reach" to a greater number of people, locales, and informational resources. Teleconferencing lets people find each other and share information about their projects, their resources, and their jobs. It tends to promote high-quality communication by providing easy access to data sources, expertise, and key people, as well as graphic support aids.

Teleconferencing Is a Meeting of Minds

The principal feature of teleconferencing technology is that it allows interactive communication. Even though participants in a teleconference are geographically separated, they can "get their heads together." Unlike unidirectional communication, such as a letter or a television broadcast, in which a person either sends a message without getting any cues from the recipient or is a passive recipient of information, interactive communication allows people to be both senders and receivers of information simultaneously. Interactive communications gives each person the opportunity to initiate and respond to information as the process unfolds.

¹ Star Roxanne Hiltz and Murray Turoff, *The Network Nation*. Reading, MA: Addison-Wesley Publishing Company, Inc., 1978. p., xxv.

With teleconferencing, despite the fact that people are not meeting in the same room, the key dimension of face-to-face meetings is preserved: the give-and-take quality of interaction. The technology permits voice, graphic, and full-motion video interaction among the participants. Teleconference participants can converse, talk things over, negotiate, joke, see one another, and exchange numerical and graphic information. When people use teleconferencing to "meet," a synergy of minds is created. Users find that a greater sense of involvement and trust develops among people who are using teleconferencing to carry out a project as compared to a project that relies upon unidirectional communication.

Teleconferencing Is Moving Ideas, Not People

Time and energy can be conserved by using teleconferencing, because information and ideas, rather than people, can be exchanged. Making this point pragmatically and graphically, Isaac Asimov, keynote speaker at the first North American seminar on teleconferencing and visionary *extraordinaire* (author of more than 200 books on science and science fiction), noted,

It is much simpler to transmit a message than to transmit a human being simply because he is carrying the message. There is no need to carry 70 kilograms of flesh and blood for thousands of miles when at the speed of light any message in speech, in writing, in any image, can be transmitted.



Figure 1-2 Teleconferencing is a meeting of minds. (Courtesy: Vitalink Communications Corporation)

The whole world becomes one with virtually zero energy expenditure compared to what would exist before the electronic age.²

Teleconferencing technology makes it easy for ideas to travel when people cannot. Educational programs can be made more widely available and easier to participate in for those who are located in remote regions or cannot easily travel for any of a number of reasons. Teleconferencing opens up the possibilities for continuing education, education for the handicapped, education at the workplace, and education for people located in remote areas. It permits a high level of interaction to take place between the teacher and students, a critical component of learning. Without sacrificing the visual component of teaching, for example, writing on the blackboard, seeing students' reactions to the material being presented, and the like, teleconferencing makes it possible to bring the classroom to the home, the workplace, or wherever it is convenient for students to carry out their studies. Specialized courses, for example, are currently made available to health workers in the Canadian hinterlands.

By substituting teleconferencing for travel, the teacher/expert's energy is conserved while, at the same time, his or her message is reaching a much wider audience than it would in a typical classroom situation. People's energy is thus conserved while their knowledge is disseminated. Additionally, when teachers are teleteaching they are more conscious of the need for, and they tend to encourage, active participation of their students in the learning process. One enthusiastic "teleteacher" notes, "We believe that it is interaction itself which instructs."³

Teleconferencing Is a New Managerial Tool

As with the telephone and the computer, the basic advantage of teleconferencing is improved access to people and information. Teleconferencing puts people in contact with the resources they need, especially other people, in order to make decisions. Decision making is improved when personal interactions are increased and the options for organizing and exchanging information are expanded. Teleconferencing

² Quoted in Joseph Kaselow, "The Spectre of Dehumanization; Futurists, Psychologists, Businesspeople Give Teleconferencing Vote of Confidence," *Business Screen*, May 7, 1982, p. 7.

³ Betty Hill Braucher, "Teleteaching: Interaction on a Shoestring," *Teleconferencing and Electronic Communications II: Applications, Technologies and Human Factors*, ed. Lome A. Parker and Christine H. Olgren. Madison, WI: Center for Interactive Programs, University of Wisconsin—Extension, 1983, p. 72.

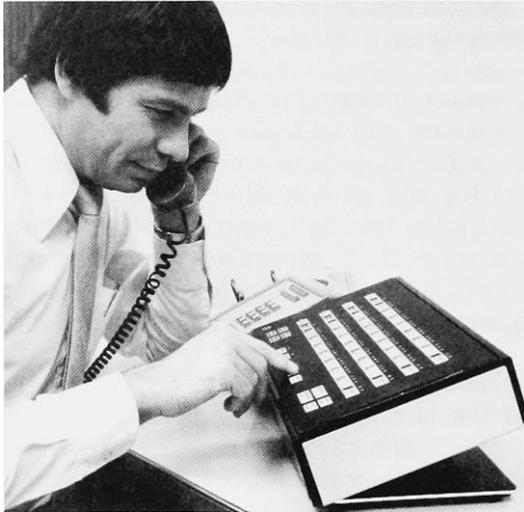


Figure 1-3 Using the quorum teleconferencing bridge to connect locations for a teleconference. (Courtesy: AT&T Bell Laboratories)

provides access to more expertise, shortens an organization's reaction time to changes occurring either within or outside it, and enables quicker response to economic opportunities.

Teleconferencing lets more people participate in the decision-making process. Advantages of group decision making, compared to individual decision making, include the availability of a greater range of experience than that held by any one individual, a more diverse set of intellectual approaches and capabilities, and a greater tendency to subject ideas to scrutiny and debate. Decision making is improved with teleconferencing, because it encourages participation of those people who are not directly involved in the decision-making process of a particular project; for example, research and development engineers can participate in a conference about marketing. Teleconferencing also allows people, such as the administrative staff who would not normally attend a distant face-to-face meeting participate in the decision-making process. Their participation ensures that they understand the subject discussed, especially the nuances and overall thrust of the decision-making process, often not captured in a written report of a meeting. This, in turn, means that the decision is more likely to be implemented efficiently and effectively.

Another feature of teleconferencing is that it allows managers, executives, and professionals in all fields to manage their time, travel, and meeting schedules in such a way as to allow time for concentrated work in their area of expertise. Time and information management, in turn, lead to greater managerial productivity in the sense that decision making is more timely, more accurate, more thorough, and more likely to be implemented.

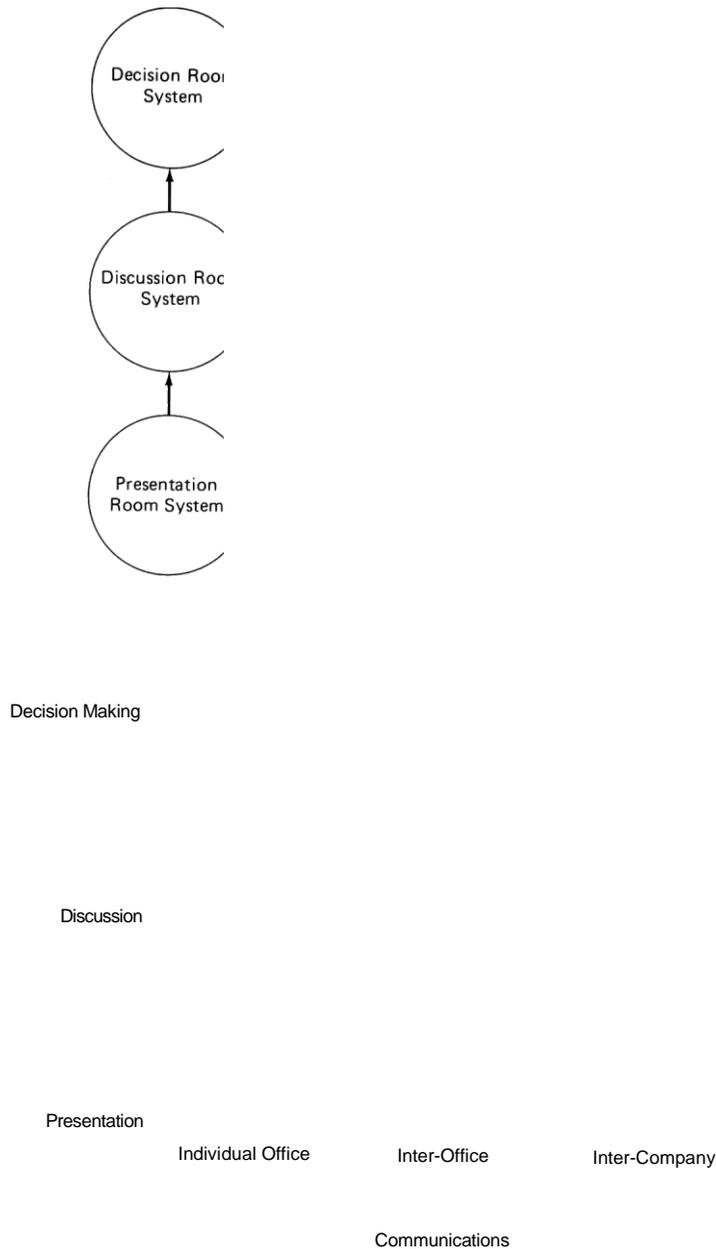


Figure 1-4 Computer communications. (Source: NEC American, Inc.)

**Teleconferencing Is
the People Side
of Office Automation**

Teleconferencing makes its greatest contribution in the qualitative rather than quantitative changes it can bring about. Teleconferencing creates the conditions that improve the quality of life at the workplace: communication that is open and a greater sense of participation in the organization as a whole. The outcome of greater participation and involvement is a company-wide sense of teamwork. For people who are busy and travel frequently, teleconferencing can be substituted for

some meetings. This, in turn, relieves stress associated with travel and improves morale by creating leisure time that lets people see more of their family and friends.

ADVANTAGES AND DISADVANTAGES OF TELECONFERENCING

Teleconferencing can be economical, efficient, productive, flexible, and easy to use, or it can be misunderstood, underutilized, perceived as a career threat, and can fail to achieve its cost-benefits. Most of the ad-

vantages of teleconferencing with respect to communication, management, and so forth, have already been mentioned. Noted here are the ways in which teleconferencing affects and is affected by time and geographical factors, public relations, and costs of traveling. The disadvantages of teleconferencing are also discussed.

Time Factors

Traditional time barriers, for example, different individual schedules and different time zones, can be overcome with teleconferencing. Store-and-forward aspects of electronic and voice mail and computer teleconferencing let people send messages into the teleconference when they have the time and at their own convenience. This means that people can participate independently of each other's time schedules. Teleconferencing can also be substituted for some meetings, thus eliminating time spent arranging to travel and traveling, time spent away from the job, as well as time spent reintegrating into the job upon return. Additionally, research indicates that teleconferenced meetings are better organized and of shorter duration than face-to-face meetings. Studies have demonstrated that teleconferencing participants tend to organize their presentations, comments, and questions more tightly than during conventional meetings, resulting in time savings of 25 to 30 percent. There tend to be more, not fewer, meetings that, when given a positive interpretation, mean a regularization of communication. Improved "organizational velocity," or the extent to which the decision-making process is sped up, and consequently how this improves the timeliness of decisions, is the result. A quicker crisis reaction time is also ensured with teleconferencing, as emergency meetings can be called whenever necessary.

Geographical Factors

Teleconferencing lets a person "be in more than one place" at a time, making possible the following types of situations:

- A manager can participate in a number of remotely located conferences without having to travel.
- A person who fights crosstown traffic (often viewed as less desirable than out-of-town traveling) several times a week in order to pick up messages and confer with staff can substitute much of this hectic commuting with teleconferencing.
- Overseas personnel can participate in weekly staff meetings at headquarters.
- An industrial worker can take continuing education courses at the workplace without having to travel to another site.

LOCATION (where work is done)	NUMBER OF PEOPLE (in millions)	COST (in billions)
	14.3	\$53.4
	5.5	\$20.9
	2.8	\$10.6
Customer premises	2.2	\$ 8.4
	1.9	\$7.2
		\$2.7
		\$2.3
TOTAL	28.0	\$105.5

This chart is based on calculations that assume a yearly average cost of \$38,000 per full-time information worker, including organizational overhead and fringe benefits. The numbers, accurate or not, do point out that a large portion of office work is actually being performed outside the physical office.

Figure 1-5 Where work is carried out. (Courtesy: Marc Rosenthal)

Distances need not be barriers to the smooth operation of an organization that has remotely located personnel, clients, customers, or students. Teleconferencing provides access to people and prevents them from feeling isolated. Higher motivation, morale, and sense of organizational identity result when there is ongoing interaction between professors at the central campus and their students who are located in remote regions, for example, or when doctors are in communication with their patients who are located off shore on oil rigs.

Teleconferencing seems especially applicable to organizations with overseas branches. Teleconferencing lets overseas people participate in many more decisions than they would if they had to travel to headquarters. Decision making is improved because region-specific information is taken into consideration. It is also possible for an international organization to train its overseas personnel without an undue amount of travel. For organizations that provide not just a product but also the follow-up services crucial to its use, teleconferencing can replace much of the need for consultant "follow-up" travel. Teleconferencing can extend an organization's services to its remotely located clients in the form of educational support services, delivery of new or modified plans, notification of new products, and changes in service procedures. Some of the other applications of international teleconferencing include management of office procedures, mail between headquarters and subsidiaries, joint venture coordination, securities trading, and funds authorization.

Public Relations

An organization that incorporates state-of-the-art information/communication technologies is often perceived as closer to the cutting edge of contemporary business by prospective clients than one that does not. When all other factors are equal, the organization that can advertise that it uses the latest in information technologies to carry out its services for clients will often be perceived by them as the most "forward-looking" firm. Perhaps more important, when an organization makes teleconferencing available to its clients, it is in effect saying, "We want you to communicate with us." It is concrete evidence to the client that its input and feedback regarding product use is sought, not merely in a routine fashion as a minimal kind of sales follow-up, but rather as a means of soliciting customer input. Subsequent client relations improve as do the organization's reputation and image.

Cost Factors

Two approaches can be taken to the relationship of costs and teleconferencing: cost savings and cost avoidance. The travel cost savings that are often associated with the use of teleconferencing include:

- Costs of scheduling travel.
- Ground transportation.
- Air transportation.
- Hotels.

- Meeting rooms.
 - Opportunity costs that accrue to the company when an employee is away from his or her desk.

Although organizations, in their desire for a "dollars-and-sense" rationale, often use cost-benefit methods of justifying teleconferencing, these are often less substantive than they are made to appear. It is often assumed that teleconferencing means direct cost savings for the organization. The prior assumption is that teleconferencing substitutes for travel to in-person meetings and thus eliminates costs associated with travel. Research indicates, however, that the matter is more complex. There is evidence of an increase in communication with the introduction of teleconferencing, but not sufficient evidence to show a decrease in travel.

Calculation of cost avoidance, for example, costs avoided due to trips *not* taken, may make more sense than calculating travel cost savings. One telecommunications researcher notes, however, that when cost avoidance is thus construed, it is a hypothetical measure and therefore not a convincing one.⁴ Cost avoidance, in other words, becomes a measure of trips not taken by those who might not take them anyway. It is a quantitative argument for hypothetical dollar savings, rather than a qualitative argument for improved communications and management.

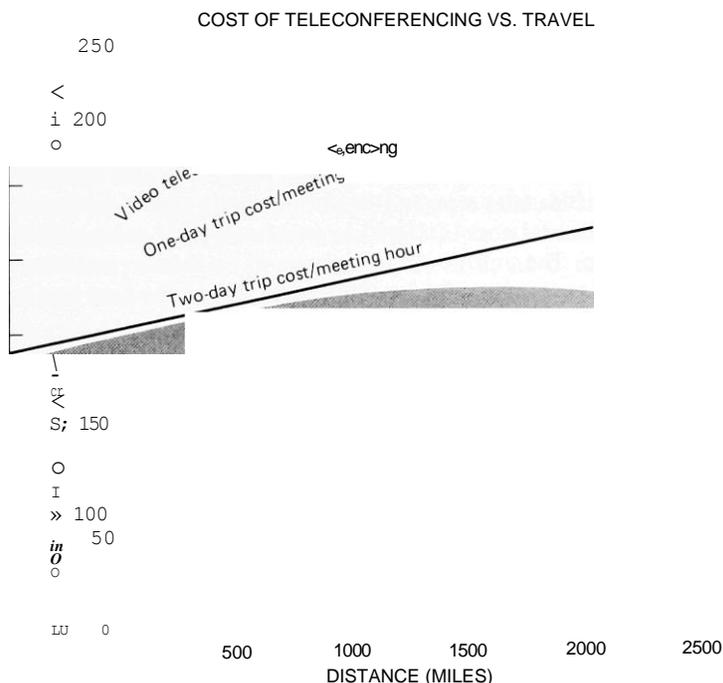


Figure 1-6 Cost of teleconferencing versus travel. (Source: Quantum Science Corporation)

⁴Elliot M. Gold, "Attitudes to Intercity Travel Substitution," *Telecommunications Policy*. Vol. 3, No. 2, June 1979, pp. 88-104.

Cost avoidance can; however, be clearly demonstrated in those situations where teleconferencing is used to extend manpower and resources. Training and one-time events need not be repeated many times at many different sites with teleconferencing, saving repeat expenditures for speakers, training resources, travel, and so forth. If, for example, an oil company has more oil rigs than engineers and technicians to service them, then teleconferencing can make the scarce expertise available to each site. Teleconferencing thus extends resources and conserves scarce and expensive manpower.

Despite the fact that teleconferencing cannot be shown empirically to reduce travel, cost-benefit factors nonetheless provide a major rationale upon which decisions to purchase and install teleconferencing systems are based. In a survey carried out by the Center for Interactive Programs (CIP) of the University of Wisconsin-Extension, 34 percent of the organizations surveyed (40 out of 136) noted that travel reduction was a reason for starting a teleconferencing system. Additionally, the report notes, respondents *perceive* that teleconferencing is cost effective:

In one organization, for example, [it is claimed that] teleconferencing saves an average of \$1,000 in travel costs per hour of use. Another organization claims \$3 million saved in travel costs over a two-year period.⁵

Companies tend to calculate cost displaceables—airline tickets, hotel bills, and cost of time lost in transit—and project a payback to the company for teleconferencing equipment and room costs based on an estimated percentage displacement of travel and attendant costs. Fairly typical is the following type of assessment:

One unit of Exxon Corp., New York, found it could pay for a sophisticated video-conferencing system between New York and Houston in less than two years if it could replace 10% of the 7,200 yearly trips between the two cities. It assumed a cost of \$800 per trip and a total annual travel bill of nearly \$6 million. The unit now has a system in operation—and Exxon as a whole may install as many as 50 teleconferencing sites in the next two to three years.⁶

Elton's approach to the question of the relationship between teleconferencing and travel seems to be the most realistic:

Teleconferencing should certainly not be dismissed as irrelevant if one wishes to reduce travel. Rather, one should employ a line of reasoning such as the

Christine Olgren and Lome Parker, "Study Surveys 147 Teleconferencing Users," *Telcoms*, Vol. V, No. 2. Feb./Mar. 1982.

Lad Kuzela, "Electronic Meetings Win Believers," *Industry Week*. August 10, 1981, p. 83.

following. Organizations that wish to reduce business travel by their employees have direct controls at their disposal, notably travel budgets. In using them, there is, however, the danger of reducing overall effectiveness. Customer relations may suffer; good ideas may be missed; and so on. The role of teleconferencing in this context should be to minimize the risks that are incurred in using direct measures to reduce travel.⁷

The reasons for considering and installing a teleconferencing system are often intuitively felt factors such as enhanced communications and higher productivity. Until studies are carried out that carefully delineate the actual dollar savings or advantages associated with specific gains in productivity due to using teleconferencing, however, the travel displacement argument will continue to be employed.

Other economic factors that should be considered with respect to teleconferencing are the opportunities for creating new business, extending an association's membership, or fund raising among a politician's constituency. Teleconferencing lets an organization reach new or specialized audiences, market research and test research new products, bring in resources for special clients, and provide training as a customer service.

Some Disadvantages

Problems can arise with teleconferencing in three general areas: introducing it into the organization, communications protocols, and technical issues.

Problems associated with introducing teleconferencing into an organization are the same as introducing any new technology. First, at the most general level, people fear change and the unknown. With teleconferencing, people fear that their meetings will become impersonalized, and, indeed, teleconferencing can initially seem impersonal. The most prevalent hesitation that people express about teleconferencing is that it will decrease their person-to-person contact and, as a result, their ability to influence and convince others. They also fear that teleconferencing will impersonalize their work, make their work more abstract, less people-oriented, and less sensory. Second, people suspect that with the introduction of new technology the "rules of the game" will change. People may perceive the introduction of teleconferencing into an organization to be a threat to the status quo, the established lines of communication, and the established status hierarchy of the organization. Third, people can be mistrustful of the new technology itself. They think that they will not know how to use it, that they will break the equipment,

⁷Martin C. J. Elton, *Teleconferencing: New Media for Business Meetings*. New York: American Management Associations, 1982, pp. 45-6.

and so forth. Most of these fears can be allayed, however, once people have had the opportunity for "hands-on" training. Users typically become advocates when they can directly experience advantages to incorporating teleconferencing into their own work.

Other perceived disadvantages of teleconferencing include the opposite interpretations of what are considered positive aspects of teleconferencing. For example, while regularized communication between headquarters and a subsidiary appears to be an advantage, it can curtail freedom of decision making at remote sites and become overcontrol by management. Similarly, because meetings are easier to arrange with teleconferencing, meetings may be called unnecessarily, and there may be more meetings or more time spent unproductively in meetings. As always, "more" (technology, communication, management, and so forth) does not equate with "better."

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The major disadvantage of teleconferencing is not attributable to misuse or overuse of the medium or even people's fears about it, but rather to the communication process itself. Teleconferencing tends to reinforce or highlight a person's lack of communication skills. This is sometimes due to the nature of teleconferencing itself. For example, a teleconference participant often cannot see the audience, and this makes it harder to assess reactions to what is being said. Lack of visual feedback can make people uneasy about their status and their freedom to interrupt someone else, making them reluctant to participate in the discussion. Additionally, except in video teleconferencing, the usual nonverbal cues, for example, body language, eye messages, handshake, backslap, and the like, cannot be sent or received. In computer teleconferencing, the keyboard is the outlet for expression, and it is sometimes difficult to communicate the nuances and subtleties of a message. More often than not, however, problems that arise with teleconferencing are due to lack of communications skills *per se*, including lack of speaking, meeting, writing, and organizational skills. It is always important that good communication and meeting skills are incorporated into the teleconference, if for no other reason than that people will tend to blame the teleconferencing system rather than their own lack of meeting skills as the reason why their experience with it was less than they expected.

Finally, technical problems can indeed arise in a teleconference. These include excessive audio noise as a result of open microphones, poor video resolution, unsatisfactory audio bridge operations, and operating controls that are too complex. Also, due to the nature of the technology, information can be made too widely available, creating security problems. This is especially a problem with full-motion video teleconferencing that is transmitted via satellite.

TYPES OF TELECONFERENCING

Four types of teleconferencing technology exist: audio, audiographic, video, and computer teleconferencing. These can be combined or used separately in order to accomplish the particular task of the conference. In the simplest teleconference, the audio teleconference, individuals use telephone handsets at their own desks or they meet in a conference room equipped with hands-free teleconference sets. Their verbal interaction with other meeting participants can be enhanced with additional equipment, for example, an electronic blackboard or slow-scan television, which allows graphic information to be transmitted as part of the teleconference. The most technically sophisticated teleconference system allows full-motion video television interaction among the participating sites, enabling the teleconference participants to see each other as though they were in the same conference room. These technologies are described in greater detail below.

Audio Teleconferencing

The telephone conference is the most widely-used and least expensive form of teleconferencing. Audio teleconferencing allows voice communications among three or more persons who are geographically dispersed. The main advantage of this type of teleconferencing is that a person can simply pick up a telephone and participate in a conference. Voices of teleconference participants are transmitted through conventional telephone circuits. There is no special equipment necessary for an audio teleconference at any site unless there is more than one person at a particular site. In that case, conference participants sit at a table with a microphone in the center that allows them to speak in a regular voice and have their hands free. A speakerphone or portable conference telephone picks up the voices of the assembled group with receiver amplification for the incoming voices, giving everyone in the group the ability to speak to and hear remote participants. The equipment may be permanent or portable and may include elaborate meeting rooms with built-in microphones and loudspeakers. Standard telephone lines or dedicated, single-purpose lines and/or rooms can be used.

Regular dial-up, long-distance telephone circuits can be used to connect the teleconference participants. Operator assistance can be used to establish multiple connections among many participants. "Meet me" audio bridges can also be used to link three or more telephone lines. In a "meet-me" audio teleconference, each participant dials a predetermined access code and "meets" the other participants on a conferencing bridge. Used mostly by the nation's few private teleconferenc-

ing services, the meet-me bridge can link any location in the world served by telephone. The bridge allows operator monitoring and assistance. Audio bridges incorporate new technology that improves signal quality and reduces echo, ensuring high-quality transmission among the sites.

Audio plus Graphics Teleconferencing

An audio teleconference can be supplemented with visual material through a number of electronic devices that permit the simultaneous interchange of visual information. Audiographic teleconferencing adds an interactive visual element to the audio teleconference and includes facsimile, telewriting, and the Electronic Blackboard®.

Facsimile is an invaluable tool for introducing and exchanging detailed documents prior to and during a teleconference. Since many organizations currently have facsimile devices at their operating locations, printed matter can easily be exchanged to support the voice conversation. In most cases, an additional dial-up connection must be made. If dedicated facilities are employed in the teleconference, facsimile transmissions can take place just prior to and during breaks in the meeting at no additional cost.

Telewriting refers to fully interactive graphics systems that consist of an electronic writing pad and pen, graphic processor, and color television monitor. These systems allow a conference participant to use the pad and pen to write or draw figures and schematics and then transmit what is written to remote TV monitors. Images can be altered and erased. Conference participants may add to or delete information already on the "common screens." Since a telewriting system operates simultaneously with the voice conversation, it can be used at any time during the meeting to clarify, expand on, or introduce a new subject. Additionally, a video printer can be used to obtain a hard copy of the information on the television screen.

The *Electronic Blackboard* is another graphic aid that can be used to enhance an audio teleconference. This is the Bell System's Gemini 100 Electronic Blackboard®. The "blackboard" consists of a 42-inch by 56-inch writing surface that the teleconference participant uses to write or draw upon with an ordinary piece of chalk. Whatever is written or erased on the Blackboard is transmitted to a television monitor at the remote sites. The Electronic Blackboard operates in black and white only, requires a separate circuit, and can be used in either a dedicated or dial-up mode. NEC offers a whiteboard version of this technology.

Audio plus Slow-Scan Television

Slow-scan television (also called freeze frame) transmits still-video images (much like snapshots sent at approximately 35-second

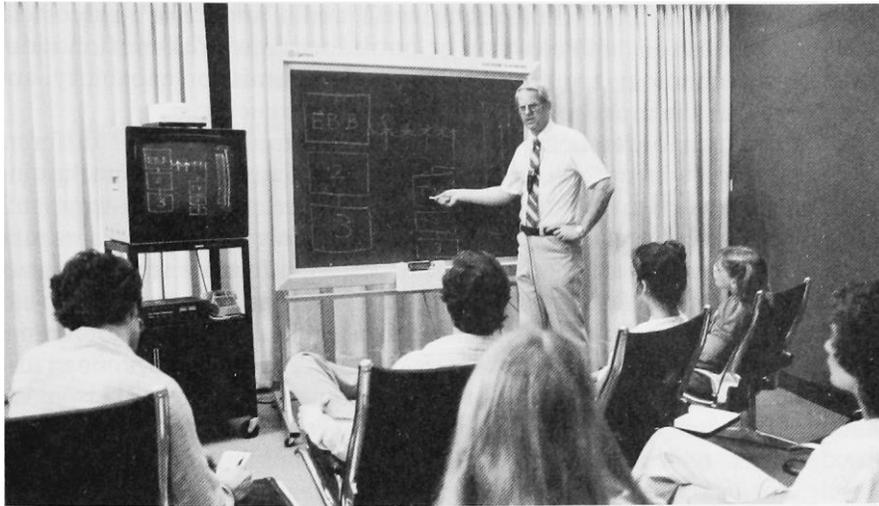


Figure 1-7 Interactive group communication is possible with the Gemini Electronic Blackboard. (Courtesy AT&T Bell Laboratories)

intervals) via regular telephone lines. Closed-circuit television images of conference participants or three-dimensional objects are "frozen" into still images and then transmitted over regular telephone lines to remote monitors. The transmission speed of the complete image depends on the bandwidth of the channel. Typically, a different image can be picked up by the distant monitor every 35 seconds. Images can be transmitted and stored so that at the receiving end there is always waiting in reserve an image to project onto the monitor. The equipment is easy to use and can be handled at each site by one person alone. Two regular dial-up telephone lines are utilized, one to transmit the visuals and another to transmit the audio. Advantages of slow-scan television teleconferencing over full-motion video teleconferencing include equipment portability, ease of use, the relatively inexpensive initial cost of the equipment, and the comparatively low cost of a slow-scan video teleconference (due to the fact that it requires less bandwidth and channel capacity than full-motion video teleconferencing). A slow-scan video teleconferencing system, if properly planned, can also be a cost-effective, entry-level system for a full-motion video teleconferencing system.

Video Teleconferencing

Video teleconferencing is the transmission of full-motion, live television images from the production site to remote sites. Video teleconferencing offers an approximation of face-to-face meetings by means

of two-way electronic connections, with audio and "live" video television transmission between two or more locations. Full-motion video television technology requires a wide-band transmission capability, and therefore it is the most costly form of teleconferencing.

Video teleconferencing can be arranged in a number of different ways. A video teleconference can be point-to-point, point-to-multipoint, and multipoint-to-multipoint. The transmission can be two-way, full-motion video via satellite combined with two-way audio via regular telephone lines. Additionally, the video teleconference can take place on a fairly regular basis between dedicated facilities constructed on-site at the organization's locale or on an *ad hoc* basis, from a conference room located in a hotel or convention center. The presentation can also originate from a professional studio so that sophisticated broadcast techniques, such as combinations of live action and video tape, can be used. Video teleconferencing can be carried out in a fully interactive mode, for example, two-way video and two-way audio, or a broadcast mode, for example, one-way video with two-way audio return.

Two-way video/two-way audio. This type of teleconferencing is carried out on a regular basis by organizations that have dedicated rooms to video teleconferencing that are fully equipped with the necessary specialized equipment. Conveying a sense of being in the same room, even sometimes at the same conference table, is the main idea of full-motion video teleconferencing. The teleconference participants face the TV monitor where the distantly located participants can be seen. While looking at the monitor, images of the local participants are picked up and transmitted by a camera located on the same wall as the TV monitor they are watching. The effect is that all participants are looking directly at one another. The speaker's voice activates camera switching, and the camera automatically focuses on the speaker and transmits his or her image. Other cameras pick up and transmit an overview of all the participants. A main advantage of full-motion video is that body language, a vital element of communication, can be transmitted. The audience gathers in large groups at receiving sites and watches the presentation on the TV monitor. Verbal interaction between the audience and the speaker is established by means of regular telephone lines. When a comment is made by someone in the audience and directed at the presenter, everyone at the different sites can hear it.

One-way video/two-way audio. This type of teleconferencing is usually carried out on an *ad hoc*, special-event, basis. Rooms or studios and network time is leased. There is typically full-motion video transmission via satellite of the main site to the remote sites and telephone connections via regular telephone lines of all the receiver sites to the main site.

Interaction between sites through the two-way audio connection is usually for a scheduled question-and-answer period.

Computer Teleconferencing

Computer teleconferencing is the ability to conduct an ongoing meeting with personnel in different geographic locations using video terminals, for example, CRT (cathode ray tube) or VDT (video display terminal), personal computers, or computer systems connected via a normal telephone line to a computer in which information is processed, stored, and transmitted. Computer teleconferencing uses a computer software system that is installed on a central mini/mainframe computer to provide a form of teleconferencing based on written or text communications. More sophisticated than electronic mail (which is simply the exchange of messages through the use of a computer terminal), computer teleconferencing is an advanced software system that is used to structure group communications. In this way, computer teleconferencing can accommodate very large groups for project management, strategic planning, sales and marketing, field service coordination, and other types of communication.

Computer teleconferencing is carried out by participants who sit at their terminal keyboard and type in their contributions to the on-line meeting. Participants can either meet synchronously, each being at his or her keyboard at the same time, or asynchronously, each entering a contribution to the teleconference when convenient. Similarly, at the participant's convenience, he or she can read the other participants' contributions. An electronic message system is used to record communications among meeting participants. Each person involved in the meeting can access, read, and respond to these communications, regardless of whether other participants are communicating simultaneously or not. The system thus provides a verbatim written log of the meeting, and the asynchronous method of participation offers extraordinary flexibility, especially if meeting members travel frequently or are in different time zones.

Some computer teleconferencing systems are quite sophisticated and complex in the sense that they are programmer-oriented and have ready access to and retrieval of information from the computer. Others are more user-friendly, and structure communication in such a way as to facilitate information exchange, interaction, and decision making among a potentially large group of people. A computer teleconference can thus be highly structured or minimally structured, depending upon the participants' choice and the task at hand. A computer teleconference can also be completely open-ended, lasting over a period of days, weeks, or as long as necessary to accomplish the purpose of the conference.

Electronic mail systems are generally incorporated into computer teleconferencing systems. The electronic mail system is used for preparation, storage, distribution, and redistribution of messages. With electronic mail, one message can be sent to multiple locations, and messages can be sent and stored until the person at the distant site has the chance to read them. With electronic mail, worldwide communications can be synchronized, meaning that the message can be sent in the sender's prime time and reviewed in the user's prime time.

HOW IS TELECONFERENCING USED?

Imagination is the only limiting factor in innovative applications of teleconferencing. Present applications of teleconferencing are varied and diverse. Some typical and innovative uses include the following:

- Audio teleconferencing is used in tediagnosis in rural areas, providing a link for paramedics from the "base to the field," and in seminars to introduce new pharmaceutical products and medical techniques.
- Computer teleconferencing decision support systems are used in strategic planning of large corporations.
- Electronic mail is used to form networks among researchers for idea generation, brainstorming, transfer of information, and joint research topic development.
- An association nominating committee uses audio teleconferencing as a means for the committee to interview possible candidates for various offices.
- A pharmaceutical firm holds weekly teleconferences between the vice-president for sales and the regional sales manager. This meeting is followed by individual meetings between each regional direction and the field staff.
- A leading religious denomination holds national and regional press conferences during an international teleconference.
- A sales force meets on a daily basis to deal with a temporary but critical period in which a key product is in short supply. The meetings are used to determine, on a daily basis, where products should be shipped that day.
- A stock brokerage firm uses teleconferencing to pace its brokers' activities to changing situations in the marketplace.
- A major university coordinates alumni activities through a regular series of teleconferences with its alumni agents around the country.

Physicians receive monthly continuing education programs via teleconferencing, utilizing outstanding authorities as presentors, resource persons who would never be available to attend all the sites in person.

A national professional medical society conducts regular series of continuing education programs via teleconferencing. By 1985, they expect to be offering, on the average, a program a day.

A major university has taught every imaginable type of course over a statewide telephone network for the past 15 years. Today, over 35,000 enrollees a year participate in over 200 offerings a year.

WHO USES TELECONFERENCING?

The Center for Interactive Programs of the University of Wisconsin-Extension completed a study of 147 organizations that use interactive teleconferencing on a regular basis.⁸ The survey included 62 companies in business and industry; 55 colleges, universities, and medical groups; 19 government agencies; and 11 other organizations. It was found that the most prevalent form of teleconferencing used is audio teleconferencing. The most frequently used visual medium, the study reported, was freeze-frame or slow-scan video. The 62 business firms surveyed use the following types of systems:

- 44% - audio teleconferencing
- 18% - audio and audiographics
- 29% - freeze-frame video (with some audiographics)
- 10% - full-motion video

The 55 colleges, universities, and medical organizations surveyed use the following types of systems:

- 74% - audio teleconferencing
- 2% - audio and audiographics
- 7% - freeze-frame video
- 16% - full-motion video

Systems used by the 19 government agencies included:

⁸ Chris Olgren and Lome Parker, "Study Surveys 147 Teleconferencing Users," *Telcoms*, Feb./Mar., 1982, pp. 1-2.

- 37% - audio teleconferencing
- 16% - audio and audiographics
- 10% - freeze-frame video
- 32% - full-motion video

The study also reported that 81 percent of the organizations perceived their teleconferencing systems to be effective, and they listed benefits of teleconferencing as faster communications, convenience, and improved productivity. Respondents that reported negatively to teleconferencing noted problems with low use, technical operation, and resistance to teleconferencing as a travel substitute.

THE EMERGING CONTEXT FOR TELECONFERENCING

Even though teleconferencing has existed since the 1930s, interest in teleconferencing increased significantly only in the last few years. The major factors that have contributed to the growth of teleconferencing are changes in the socioeconomic *milieu* and advances in technology. Socioeconomic and technological change interact, the one making the other possible. Increased travel and energy costs, for example, increase the demand for technology that can eliminate these costs. Conversely, applications are sought for a new technology that will increase an organization's ability to operate in a cost-efficient manner. When new technology is introduced, it brings about social changes, for example, the way people interact, make decisions, communicate, and get things done; and the impact of this change is felt at every level—individual, organizational, national, and worldwide. The emerging context for teleconferencing thus depends not only on advances in the technology but also on how people perceive it, respond to it, use it to carry out their projects, and incorporate it into the infrastructure of business, education, government, and medicine.

The socioeconomic forces that are promoting growth of teleconferencing and the effects of teleconferencing on promoting socioeconomic change can be noticed in several different arenas, and these are briefly discussed below.

Increasing Competition/ Globalization of the Market

Increasing competition for markets in the domestic sphere has pushed organizations into international competition. As commercial

markets become more sophisticated and more vulnerable to economic fluctuations around the globe, decision making in an organization is more complex. The organization is more dependent upon factors over which it has little control, for example, international mail that is often inefficient and untrustworthy. There is also a greater need for dependable and rapid communication when business operations are subject to the rules and regulations of international law as well as to those of the country where it is located. Teleconferencing makes it possible for an organization to internationalize its interests without negatively affecting its communication/information flow and decision-making structure.

Research suggests that much international travel can be substituted with teleconferencing. A study carried out by Glen Kaiser found that teleconferencing will replace 16 percent of international business travel and become a \$2.4 billion market by 1986.⁹ In describing Teleglobe's efforts to develop an international teleconferencing service between Canada and selected European points, James Johnson, a Teleglobe Canada manager, noted :

Intuitively, the economic viability of videoconferencing should increase with the distance that would otherwise have to be travelled. Data collected on existent trial services supports this in that the conference link that is the longest is the link in greatest use. This implies that videoconferencing will find greater application in the international arena as an alternative to business travel, particularly between continents.¹⁰

Companies such as AT&T, Satellite Business Systems (SBS), and ISACOMM are promoting international teleconferencing. SBS, for example, is uniting with British Telecom to provide transatlantic freeze-frame videoconferencing and full-motion video. To date, however, international teleconferencing has been faced with a number of barriers that block effective implementation. Johnson points out that the principal impediment blocking frequent use of international video teleconferencing is the end-to-end transmission costs under existing space-segment and terrestrial tariffs. Other constraints, he notes, include the following:

- Dependence on broadcast video (i.e., television) standards and facilities.

⁹ Glen Kaiser, "The Outlook for International Teleconferencing: A Study by AT&T," presented at Conference on International Teleconferencing, Secaucus, NJ, October 1982.

¹⁰James W. Johnson, "Canadian Plans for an International Hybrid Teleconferencing Service," *Teleconferencing and Electronic Communications II: Applications, Technologies and Human Factors*, Volume II, ed. Lome A. Parker and Christine H. Olgren, Regents of the University of Wisconsin System, 1983, p. 121.

- Different video standards in various countries of the world (PAL/SECAM/NTSC) and the need for conversion.
- Lack of available international wideband video links between customer premises.
- Preemptibility of video conference links because they are implemented on the normally unused "protection" channel of systems carrying telephony and/or standard broadcast video.
- Time zone differences that essentially limit intracorporate conferences between North America and Europe to a three-to-four-hour common work period (Toronto/London) each day.
- Current standard broadcast video transmission facilities and analog technologies that limit the number of simultaneous conferences that can be conducted during this time period.
- Conservative and often nationalistic policies governing the implementation of new technology and the pricing of new services."

Change to an Information Society

The U.S. economy is increasingly dominated by the gathering, accessing, evaluation, retrieving, processing, transfer, and storage of information. Economists calculate that over half of the U.S. gross national product is made up of the "production" of information and characterize ours as an "information economy." Some of the trends that Naisbitt, in his book *Megatrends*, feels are key in an information society include the following:

- Innovations in communications and computer technology will accelerate the pace of change by collapsing the *information float*.
- New information technologies will at first be applied to old industrial tasks, then gradually give birth to new activities, processes, and products.
- The technology of the new information age is not absolute. It will succeed or fail according to the principle of high tech/high touch.¹²

In an economy the major product of which is information, "information float"—the time it takes to complete information processing, decision making, and action implementation—is directly related to "financial float," which refers to unused financial resources that are "on hold"

Johnson, "Canadian Plan," p. 121.

John Naisbitt, *Megatrends: Ten New Directions Transforming Our Lives*. New York: Warner Books, Inc., 1982, p. 19.

while information is transferred back and forth. Without proper management, information loses timeliness and relevance and thus its potential as a valuable resource. Today, all forms of information—data, voice, and video—can be digitized and sent almost instantaneously to any spot around the world via satellite. Advances in communication technology, for example, digital audio bridges, compression codecs for digital video, and improved technologies for packet switching, have helped to bring about an electronic information age. These, in turn, have brought about dramatic changes in the way that people access, process, and communicate information. As Naisbitt alludes, however, these electronic tools will be effective only to the extent that they lead to innovative applications and let people be more, not less, in touch with one another.

Increasing Environmental Concerns

For both environmental and economic reasons, business, education, and government are placing a greater premium upon less-energy-consuming communications. The U.S. Federal government, for example, concerned about rising energy costs and decreasing energy resources, carried out research that indicated that the use of teleconferencing could reduce as much as 5 percent the country's annual petroleum consump-

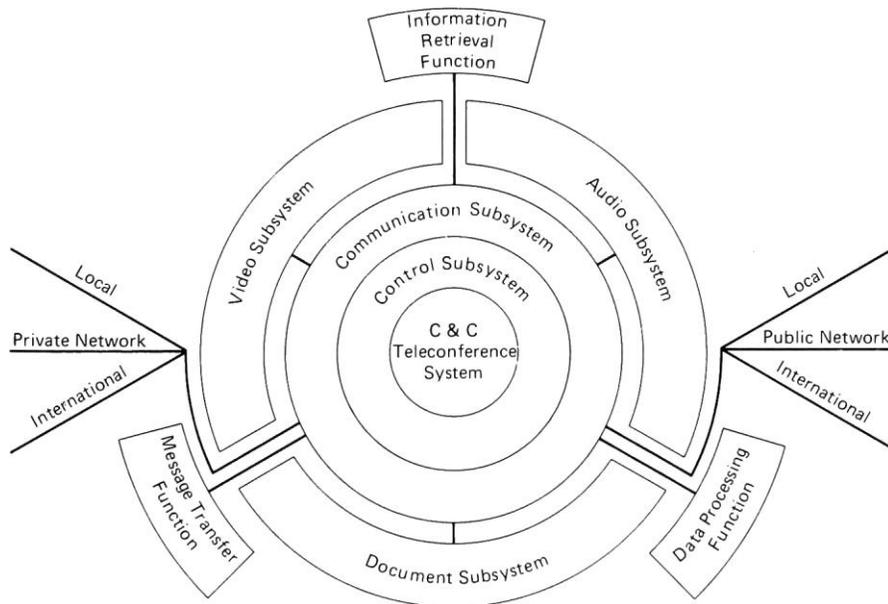


Figure 1-8 C&C teleconference system reduces information float. (Source: NEC America, Inc.)

tion.¹³ The government of Ontario, Canada, recognizing that it consumes about 3.5 billion litres of petroleum-based fuel each year, created a Task Force in 1980 as part of its Transportation Energy Management Program (TEMP) to promote the use of audio and video teleconferencing. Evaluations of the 18-month initial test period of the broadband audio system at the Ministry of Transportation and Communications revealed that 461 return trips involving 2,068 hours of travel time were replaced with a savings calculated at \$50,000 and 42,000 litres of oil.¹⁴

Changes in the Work Force and Corporate Culture

The way work is carried out, people's attitudes about work, and the philosophy and style of large organizations has changed significantly over the past few decades. These changes have been both the cause and

TABLE 1-1. Key Emerging Factors **Promoting Teleconferencing in the Future**

Over Last 10 Years	In the Future
<ul style="list-style-type: none"> • <i>Cheap</i> Energy/Transportation • Travel Seen as Executive "Perk" • Increasing Labor Costs/Mobility 	<ul style="list-style-type: none"> • <i>Expensive</i> Energy/Transportation • Executive Swing to Health/Leisure/Family • Continuing Shortages of Executive, Professional, Sales Personnel/Increasing Immobility
<ul style="list-style-type: none"> • Limited Office Automation, mostly typing, copying, telephones • Limited/expensive wideband communication facilities • Recent opening up of competition in carrier services in U.S. 	<ul style="list-style-type: none"> • Increasing Office Automation, especially among executives • Proliferation of satellite links and fiber optics channels • Continuation of competition in the U.S. with AT&T, SBS and direct satellite reception
<ul style="list-style-type: none"> • Growth of electronic conferencing technology in laboratories, limited field tests • Lack of standardization, especially internationally 	<ul style="list-style-type: none"> • Availability of cost-effective electronic conferencing products in the office • Emergence of standards, primarily driven by AT&T, PTT's

Source: Strategic Incorporated

Richard Harkness, *Technology Assessment of Telecommunications/transportation Interactions, Final Report*, Vol. 1. Springfield, VA: U.S. Department of Commerce, National Technical Information Services, 1977, p., vii.

¹⁴"Audio Teleconferencing: The Only Way to Go Proponents Say" and "The Teleconference Option," *The Problem Solver*, The Ontario Government, April 1981, March 1982, June 1983.

consequence of seeking new approaches to getting work done. Among these are the following:

- Changes in the characteristics of the labor force: Levels of skill, experience, education have increased. The profile of entry-level workers has changed significantly. For example, many entry-level workers are skilled in data processing and have computer programming skills. Additionally, large organizations are providing continuing education, training, retraining, and technical education for their employees.
- Increased attention to "quality of work life" issues: Many studies have found that workers are more motivated by meaningful, gratifying jobs than they are by purely monetary incentives. Rather than valuing income *per se*, people prefer jobs that call for initiative, motivation, and the ability to put their education and experience to use, as well as the recognition that comes with a job well done. Management is responding by creating the conditions that enable people to get the job done, exploring participative management theories, incorporating new communications systems, introducing office automation, and the like.
- Changes in attitudes: Given a higher level of education, people tend to have a more egalitarian attitude and want more equal treatment. A survey of workers' attitudes conducted by the Gallup Poll for the U.S. Chamber of Commerce in 1979 discovered that "the overwhelming majority believe that if they are more involved in making decisions that affect their jobs, they would work harder and do better." Studies show that people value jobs that call for initiative, motivation, and putting their education and skills to use over income *per se*. Significant changes are also occurring in people's perceptions of the relationship of work and leisure. Automation has decreased the need for much routine work and created new leisure time. Among all workers, but executives in particular, there is a swing toward a health/leisure/family orientation.
- Intersectoral shifts: Automation is creating some jobs and eliminating others, resulting in a mismatch between demand and supply for particular job categories. There are at present shortages in communications and computer-related sectors, as well as shortages in medical, health, and other service areas, creating a high demand for professional, technical, and service workers.
- Increased attention to the capital-labor ratio: Renewed attention to productivity indicators in the past several years has led to the realization that fixed business investment declined significantly in the period 1973-78, down to an annual rate of 1.4 percent (as

compared to an annual rate of 3.9 percent of the 1947-74 period).¹⁵ Substantial capital increases, particularly in the form of office automation, are being devoted to the efforts of middle-level management.

The above-mentioned issues all affect productivity and thus have received a lot of attention by economists and policy makers over the past few years. Indicators suggest that successful management of human resources will be the key to improved productivity in the coming decade. This entails creating the conditions that make the typical worker (a knowledge worker) more effective and productive, including the creation of teleconferencing networks.

Technological Development

Communications technology is advancing rapidly. Significant advances in telecommunications technology and integration of this technology with other types of technology is changing the way people communicate. Audiographic work stations that integrate computers and videotexts with teleconferencing, for example, will soon make desk-top teleconferencing commonplace. Value-added carriers are adding telecommunications services for intercity communication by interfacing incompatible equipment. These include Tymnet, Autonet, Uninet, GTE's Telenet, Faxpax, and Graphnet. Other carriers such as Sprint and MCI provide alternatives to the public telephone network. Additionally, communications networks are expanding from local to national to worldwide networks, helping to establish teleconferencing as part of a trend toward extended networks that integrate information processing and communications in the automated office. Two significant areas of improved technology that affect teleconferencing are digital technology and communications satellites.

Advances in digital technology (in which information is sent in discrete intervals as opposed to continuous or analog signals) has made possible a decrease in bandwidth required for the transmission of information. New codecs (coders/decoders) reduce video pictures to 56 kilobits for significant decrease in transmission costs. Digital communication now includes digital voice, graphics, video, and digital networks. Digital audio bridges, for example, integrate voice and graphics and improve transmission quality and system control. International transmission of digitalized facsimile is also both significantly quicker and less

William Bowen, "The Prospects for Productivity," *Working Smarter*, by the editors of *Fortune*. New York: The Viking Press, 1982, p. 7.

costly than equipment that incorporates more traditional technology and circuits.

The development of communications satellite technology is also having a significant impact on teleconferencing. Communications satellites break the dependency upon terrestrial telephone networks, making it possible for every type of information to be received at any place around the globe. The amount of communications that is going through U.S. domestic satellites is already doubling every three years. A study carried out by Frost and Sullivan predicts that present U.S. production of communication satellites will more than double its 1980 rate, \$300 million, reaching \$630 million by 1991. Sales of earth stations in North America, they predicted, which was a \$522 million market in 1980, will quadruple to \$2.1 billion in the next 10 years. Forces promoting this growth include the following:

- The cost of earth stations is decreasing, and as a result the number of earth stations is increasing. One study predicts that there may be 35,000 earth stations installed in the United States by 1986.
- Satellites are being integrated into long-distance networking by common carriers.
- Private business networks are proliferating, increasing the demand for data, electronic mail, and video and voice communication.



Figure 1-9 Satellites make global communication possible. (Courtesy: Vitalink Communications Corporation).

- An increasing number of options are available for *ad hoc* video teleconferencing.
- There are an increasing number of companies involved in satellite communications that are offering additional services and channels, resulting in decreased costs to users.
- The costs of digital compression codecs are falling.

Direct satellite broadcasting, in which programs are produced at one location and transmitted directly to earth stations via communications satellites, significantly lessens dependence upon the traditional television networks and even upon the newer cable broadcast systems. Direct satellite broadcasting allows organizations to have their own video networks. When one organization has many locations, direct satellite broadcasting can be very cost-effective. The future will see large organizations directly involved in the broadcasting business.

A User Orientation

In recent years, there has been a significant swing away from an engineering approach to new technology, for example, the development of increasingly sophisticated technologies for their own sake, to an emphasis on the factors that lead to the acceptance of new technologies. User needs and attitudes, as well as factors such as an organization's infrastructure and the management theories that it has in practice, are gaining widespread attention by those who develop, promote, and sell computers, word processors, teleconferencing systems, and other automated office equipment. A user orientation can be seen in the following different arenas:

- "User friendly" designs are being developed that make it easy for the new user to become acquainted with the new system by structuring into it, for example, on-line help and guidance.
- Training, software, and support structures are increasingly being offered by vendors with the sale of new equipment.
- Many new companies have emerged that offer services to the new organizational user, including consulting in the following areas:
 - - Deciphering present and future communications needs
 - - Carrying out cost-benefit analyses
 - - Interviewing prospective users and carrying out surveys that discern people's attitudes about and needs for the new equipment
 - - Custom-designing the system and rooms so that they incorporate organization-specific needs and applications

- - Training new users
- - Developing innovative applications of the new technology
- - Evaluating the impact of the new technology

These efforts, together with the analysis and publicizing of attempts to integrate automated office technology, are indeed leading to a widespread acceptance of the *idea* of new technology as well as a greater appreciation and understanding of the usefulness of the new equipment by the individual and the organization alike.

THE TELECONFERENCING BOOM

In recent years, teleconferencing has become a rapidly emerging, high-growth equipment and service industry. Nearly 60 percent of the organizations using teleconferencing have implemented it since 1976, and 39 percent of these started using teleconferencing in 1979 or more recently.¹⁶ Due to the "push" and "pull" factors mentioned in the previous sections such as (1) recent awareness in the private and public sectors of the need for greater productivity, (2) soaring transportation costs, and (3) increased attention paid by designers to user needs and by manufacturers to marketing and support services, all the most recent prognostications point to a veritable boom in teleconferencing during the 1980s and thereafter. There are several different ways of looking at the "coming boom" as well as several different studies that predict it.

- An estimated \$21 billion annually is spent by American businesses on corporate travel and related expenses. It is estimated that 15 percent of this could be diverted to teleconferencing. Industry analysts see half of this amount being spent on transmission services and the other half on communications hardware, which includes voice-activated microphones and video cameras, graphics generators, communications processors, hard-copy devices, and facsimile equipment.¹⁷
- A study carried out for the Air Transport Association of America (ATA), Washington, D.C., estimated that, of the \$34 billion expected to be spent on business travel in 1985, as much as 1 percent, or \$340 million, could be diverted from air-travel expenses to tele-

¹⁶Lome A. Parker, Christine Olgren, "CIP Releases New Teleconferencing Study," *Telcoms*, January 1982, pp. 1, 8.

¹⁷Stephen Shaw, "Teleconferencing vs. \$21 B Annual U.S. Business Travel," *Electronics Business*, June 1981, p. 76.

conferencing systems. In a few companies, the study reported, the diversion could amount to as much as 5 percent to 10 percent.

. Dale Kutnick, research director for the consulting firm The Yankee Group, has predicted that from their 1981 level of about \$85 million, sales of teleconferencing equipment and services have grown at a 15 percent annual rate. By 1983-84 annual growth had reached 20 percent, and will possibly reach 30 percent this year. "Teleconferencing," Kutnick noted, "could easily hit the \$2 billion mark by 1990."¹⁹

- John Stein, manager of communications services at Future Systems, Inc., thinks that the field will double in sales about every 18 months. From a \$200 million level in 1984, he predicts teleconferencing sales will reach \$500 million by 1986. By the end of the decade, he foresees a \$5 billion market for teleconferencing.²⁰
- A survey that was conducted by International Data Corporation indicates that \$30 million was spent on teleconferencing in the United States in 1978, with \$10 million of that amount for hardware. In 1985, the U.S. market for teleconferencing equipment and service is being projected at \$220 million, achieved largely through increasing use of communications services.²¹
- Based on sales figures gathered from the suppliers of various teleconferencing equipment, systems, and services, the editor of *Telespan Newsletter*, a monthly publication devoted to the field of teleconferencing, forecasts that *ad hoc* video teleconferencing will continue to grow at the 1982 level for several years, a 200 percent annual rate.²²
- Future Systems, Inc., forecasts that by 1985 telecommunications networking revenues gained from teleconferencing will increase to \$330 million and by 1990 to \$5 billion.²³

At least three research firms have conducted major studies of telecon-

Lad Kuzela, "Electronic Meetings Win Believers," *Industry Week*, August 10, 1981, p. 83.

¹⁹ Shaw, *op. cit.*, p. 76.

²⁰ *Ibid.*

David Barcomb, *Office Automation, A Survey of Tools and Techniques*. Bedford, MA: Digital Press, 1981, p. 137.

²² Elliot Gold, "Trends in Teleconferencing Today Indicate Increasing Corporate Use," *Communications News*, October 1982, pp. 48-49.

Future Systems, Inc., "Teleconferencing: A New Communications Service for the 1980's," Gaithersbury, MD, 1980.

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ferencing, focusing on all types of teleconferencing, including audio, audiographics, video, and computer teleconferencing. Their aim was to research the potential of teleconferencing in business and industry through the present decade until about 1990.

According to Strategic Incorporated, a research and consulting firm based in San Jose, California, use of teleconferencing will grow by 133 percent through the 1980s. From a base of \$550 million in 1980, their revenue forecasts for the teleconferencing market suggest that, in 1985, a total of \$3.6 billion will be spent on services, equipment, maintenance, facilities, and transmission tolls. The total is expected to rise to \$8.6 billion by 1990. About 90 percent of the projected revenues, the report notes, will be made up of transmission costs. In 1980, Strategic estimates, only about 1 percent of all potential office applications had been penetrated. By 1985 penetration will have reached 50 percent, according to Strategic, and, if only technological advances are considered, by 1995 there will be virtually universal use of teleconferencing of one form or another within business and industry.²⁴

²⁴, * Strategic, Inc., "Electronic Conferencing Impact and Opportunities,"

Report No. 307, San Jose, CA, 1981.

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Figure 1-11 Penetration of electronic conferencing in the United States by Mode. (Source: Strategic Incorporated)

Gnostic Concepts, a Menlo Park, California, market research organization, published a study called "Digital Communications" in 1982 that predicts that total end user expenditures on teleconferencing will leap from about \$50 million in 1980 to about \$250 million in 1985 and then to about \$900 million in 1990. The study predicted that computer teleconferencing would experience an annual compound growth rate in excess of 40 percent and that video teleconferencing would experience a compound annual growth rate in excess of 50 percent for the period from 1980 to 1990. The fastest rate of growth from 1980 to 1985, the study predicted, were to be in audiographic systems, increasing from 20 to 30 percent of the market in the five-year span and leveling out after 1985 to make up about 35 percent of the market in 1990. Sharply rising travel costs, escalating labor costs associated

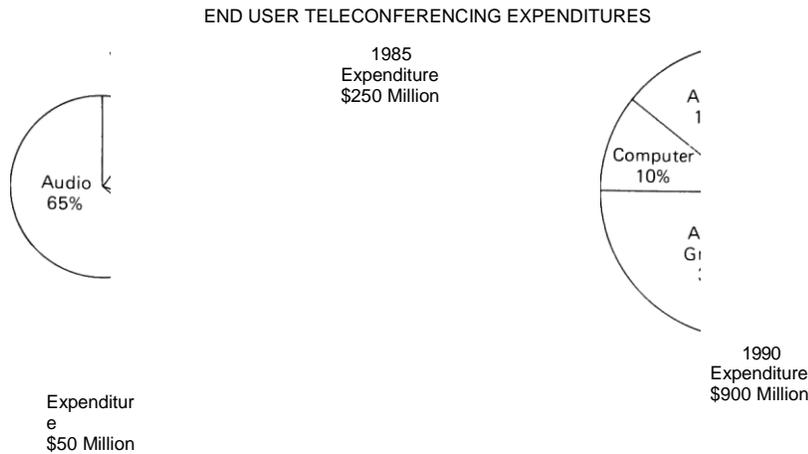


Figure 1-12 End user teleconferencing expenditures. (Source: Gnostic Concepts, Inc.)

with meetings, and an 11 percent decline in telecommunications costs were expected to fuel this rapid growth, according to the report. The majority of revenues resulting from teleconferencing activities will go to the common carriers providing the network facilities.²⁵

Gnostic Concepts' report, as well as other studies, suggest that there will be a growing demand for "systems integrators" who manufacture, distribute, and market a total system of teleconferencing equipment and services, including hardware, software, facilities, and training.²⁶

Quantum Science Corporation forecasts that, from a base of \$19.3 million in 1981, teleconference equipment and transmission services by business and industry will grow to \$520 million by 1986. A growth rate of 126 percent a year for transmission and 74.6 percent for equipment is predicted for this period. The 1986 transmission costs are expected to be \$286.5 and the equipment costs \$233.8 million. Additionally, the report notes, the number of installed teleconference rooms will increase from 575 in 1981 to 4,340 in 1986, including 1,165 for full-motion video, 1,425 for slow-scan video, and 1,750 for audiographics. Large organizations will be the principal users of teleconferencing until the late 1980s, the report indicates, at which time advances in transmission technologies—digital termination systems, interactive cable,

²⁵ Gnostic Concepts, Inc., "Digital Communications," Menlo Park, CA, 1982.
²⁶ "Teleconferencing Market \$900 Million by 1990," *Telcoms*, Aug./Sept. 1982, p. 6.
²⁷ Teleconferencing at a Glance: An Introduction and Overview

fiber optics, and switched loop capability—will make teleconferencing more available to small enterprises and the retail sector. The Quantum Science report also indicates that about 12,000 desk-to-desk teleconferencing work stations that integrate text, graphics, and images will be shipped by 1986 with a value of \$120 million.²⁷

Quantum Science Corporation, 'Report on the Teleconferencing Market,'
New York, 1981.

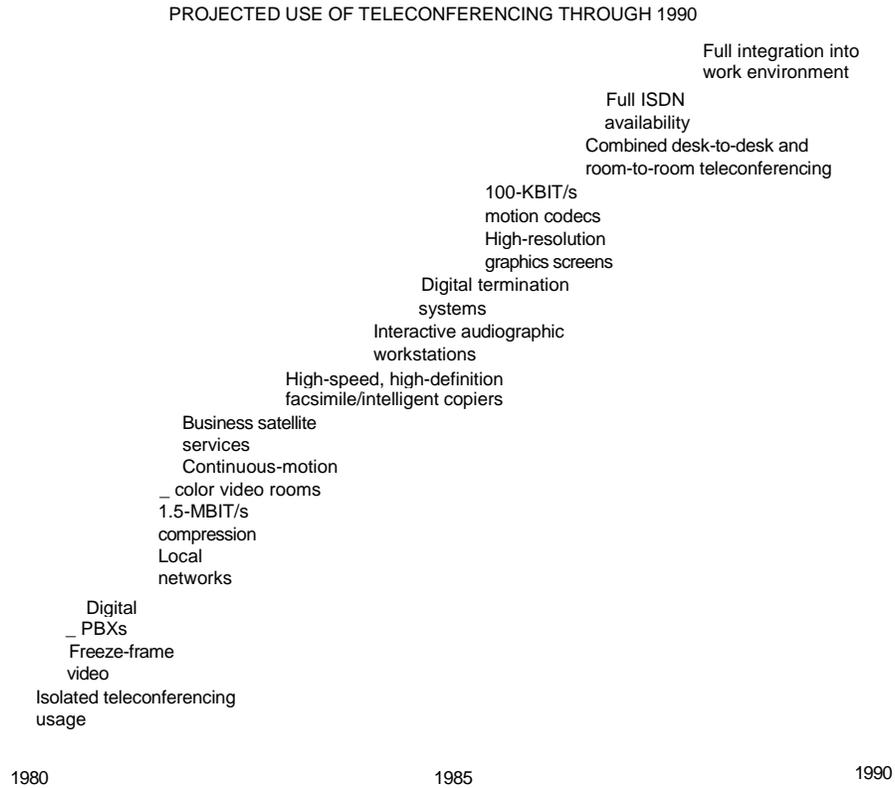


Figure 1-14 Projected use of different types of teleconferencing systems through 1990. (Source: Quantum Science Corporation and Data Communication)

2

PEOPLE, PRODUCTIVITY, AND TELECONFERENCING

INTRODUCTION

During the past several years, significant declines in the rate of productivity in the United States have been a cause of concern for management in the private and public sectors alike.¹ Productivity, defined as output per hour of work, has declined from an average annual growth rate of 3.5 percent between 1948 and 1966 to 1.1 percent between 1973 and 1978. Between 1978 and 1981, the productivity growth rate declined by .3 percent, falling to an average of only .8 percent. During this period, the United States ranked tenth in productivity among industrialized nations. While Japan reported productivity gains of 107 percent and West Germany 70 percent for a ten-year period, the United States reported gains of only 27 percent.

To account for this decline in productivity, analysts have pointed to a myriad of interrelated factors: insufficient capital investment, in-

¹ See, for example, John W. Kendrick and Elliott S. Grossman, *Productivity in the United States: Trends and Cycles*. Baltimore: Johns Hopkins University Press, 1980, pp. 1-10. Burton G. Malkiel, "Productivity—The Problem Behind the Headlines." *Harvard Business Review*, 1979, May-June, pp. 81-91. Campbell R. McConnell, "Why Is U.S. Productivity Slowing Down?" *Harvard Business Review*, 1979, Mar./Apr., pp. 36-60.

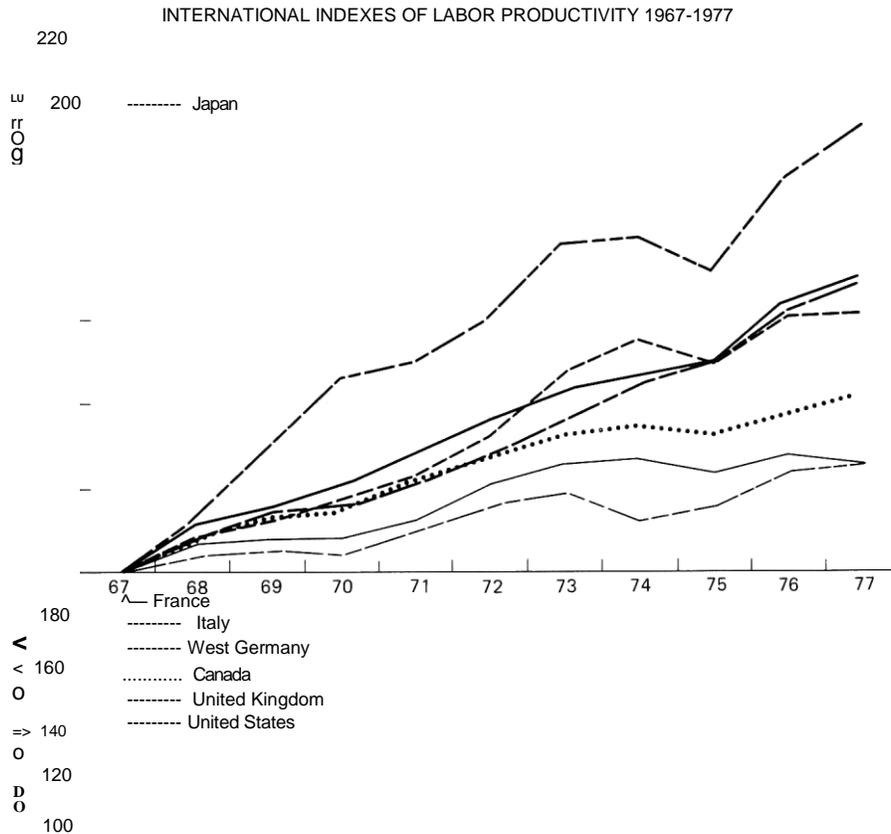


Figure 2-1 International indices of labor productivity, 1967-1977.
 (Source: Department of Commerce; graphic presentation by Drexel Burnham Lambert, Inc.)

creased energy costs, proliferation of government rules and regulations, changes in the characteristics and composition of the labor force, as well as a slowdown of research and development and related lack of technological innovation.

Information, Technology, and Production

The information sector of the U.S. economy today represents over half of all economic activity. The "information industry" encompasses most government organizations, much of the banking and financial industry, the advertising industry, the administrative functions of most companies, and the automated or semi-automated production of goods. As early as 1967, this sector of the economy was growing faster than that of the economy as a whole.² Despite the crucial role of information in the economy, however, office productivity has increased only 4 percent during the past decade (as compared to an 83 percent increase

²M. U. Porat, *The Information Economy: Definition and Measurement*, OT Special Publication 77-12 (1). U.S. Department of Commerce, Office of Telecommunication, May 1977.

in manufacturing).³ The failure to improve information-handling and communications technology is believed to account for a significant part of the decline in white-collar productivity. It is often noted that the typical office manager has much less capital equipment supporting him or her (\$2,000) than a factory worker (\$25,000) or a farmer (\$69,500). This situation is rapidly changing, however, as the following chart suggests.

	1980 Worker Capitalization	1985E Worker Capitalization	Per Annum Growth
Average U.S. Farm Worker	\$69,500	\$78,750	2.5%
Average Factory Worker	\$25,000	\$43,250	11.6%
Average Office Worker	\$2,000	\$7,500	30.3%

Figure 2-2 Application of new technologies. (Source: Drexel Burnham Lambert, Inc.)

Management ineffectiveness is thought to be the single greatest cause of declining productivity in the United States. Consequently, attention has been turned to examining more closely the production role of information in the U.S. economy, and as a result, researchers in the field of economics and technology are advocating the use of new informations/communications technology. Michael Tyler, for example, notes that:

- Very *substantial productivity gains* can be obtained from the intelligent application of new telecommunication and information services and technologies.
- However, *this can only be achieved if the organizational systems into which these innovations are introduced are properly understood*. It is easy to find examples where promises of large productivity gains led in practice to poor investments and even *reductions* in productivity, and we are beginning to understand clearly why this happens.
- Not only can the new technologies replace existing ways of carrying on informational tasks, which reduce cost and increase ef-

Strategic Inc., "Electronic Conferencing Impact and Opportunities," Report No. 37. San Jose, CA, 1981.

fectiveness, the resulting improvements open up *opportunities for additional profitable business activity* ("generated" business).⁴

Data regarding the economic benefits of incorporating office automation was made available by Booz-Allen & Hamilton in their 1981 study of white-collar professional productivity. They concluded that, with the introduction of office automation, the productivity of the typical manager could have increased by 15 percent by the year 1985, estimated to have a value of \$125 billion. By 1990, they estimated that figure would further increase to \$300 billion per year.⁵

The Human Side of Production

Many experts now believe that at the core of declining productivity in the United States is not simply a failure to utilize technology but

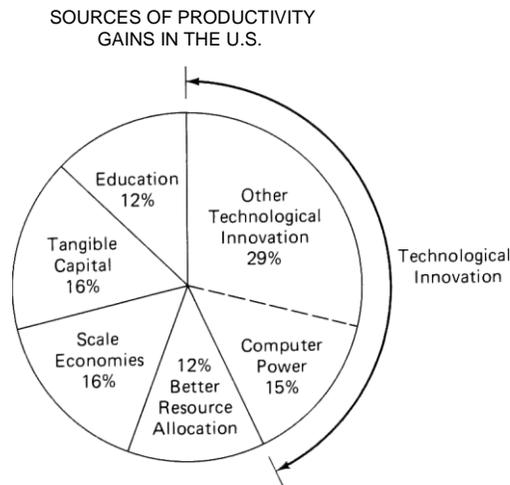


Figure 2-3 Sources of productivity gains in the United States. (Source: Brookings Institute; graphic presentation by Drexel Burnham Lambert, Inc.)

⁴Michael Tyler, "Telecommunications and Productivity: The Need and the Opportunity," Mitchell L. Moss, ed., *Telecommunications and Productivity*, based on the International Conference Sponsored by the Center for Science and Technology Policy, Graduate School of Public Administration, New York University, January 29-30, 1980. Reading, MA: Addison-Wesley Publishing Company, Inc., 1981, p. 45, emphasis added.

⁵Booz-Allen & Hamilton, "Managerial/Professional Productivity Report," New York, 1981.

rather a more fundamental failure to cultivate and manage human resources. Jerome Rosow, president of the Work in America Institute, notes that the prevailing managerial ethic errs in its emphasis upon capital investments and technology, rather than upon the human factor in productivity. People power, Rosow argues, is grossly underrated:

The human factor in productivity is subtle and usually underestimated; if not ignored. Yet productivity studies show that the human factor contributes from 10 to 25 percent to productivity growth. In terms of controllable costs, they often exceed 50 percent of such costs. In labor-intensive service and government, people account for 70 to 85 percent of all costs. The manager who ignores the human side of the enterprise does so at his own peril.

When 49 chief executive officers of major U.S. corporations and presidents of national labor unions were invited by Secretary of Commerce Malcolm Baldrige to participate in a teleconference to consider productivity issues in the United States, one conclusion they reached was that "the single greatest opportunity for increasing the productivity of the American economy lies in a better utilization of human resources."⁷ They emphasized a "renewed attention to the human side of production," noting that "relationships between people are at the origin of many of our productivity problems, and improved relationships will be the major resource for their solution."⁸ They stressed that involvement of people in the decision-making processes of the organization is crucial and that what produces organizational involvement is trust and confidence. They noted:

An atmosphere of trust and confidence may be based on many different things: the absence of imposed authority, employee gainsharing, worker involvement in group planning and decision making—including personnel policies, an employment maintenance program, and policies recognizing the employees' need for personal support.

Restrictive work rules, uncooperative unions, a management deaf to the needs of its workers, authoritarian management styles, and the creation of intra-organizational we/they barriers are all antithetical to the growth of a participative corporate culture.⁹

Jerome M. Rosow, "Solving the Human Equation in the Productivity Puzzle," *Management Review*, August 1977, p. 41.

Final Report, United States Department of Commerce Teleconference on Productivity, conducted by the Western Behavioral Sciences Institute, Grant #RED-795-G-82-13(99-7-13603), p. 29.

⁷*Ibid.*, p. 29.

⁹*Ibid.*, p. 32.

Participative management was seen as a key to involving people and fully utilizing their resources. The chief executives warned, however, that "participative management programs and slogans detract from what is truly needed, a 'participative culture.'"¹⁰

A "participative culture" assumes that in a post-industrial, information society, people themselves are the principal resource, and the key to productivity gains is the involvement of people in such a way that their talent is cultivated, their skills and experience utilized, and their achievements recognized. Flexibility in adopting new ideas and human talents are key resources. A participative culture creates a team approach to problem solving and involves people in all steps of the process, from formulation of the problem to implementation of the decision, not simply in carrying out orders from the top. A participative culture also creates an environment in which risk taking and innovative problem solving are encouraged, one in which successful attempts are recognized and failures tolerated. A participative culture, in short, creates the conditions that accentuate the positive performance of people.

"How do we accentuate the positive performance of people—'turn them on' to the organization?" Rosow asks. He notes several goals for improving the quality of life at work that mesh with the goals of higher productivity. These include:

- **Growth and development:** Personnel systems that consider the individual employee as a growing, developing human asset. Employees may compete for training, development, recognition, and promotion. Career paths providing for upward mobility and professional growth and advancement. Work assignments that are diverse, varied, and challenging enough to expand skills, abilities and knowledge. Programs to prevent skill obsolescence and to provide normal facilities for self-renewal and learning on the job, to keep the employee in pace with the organization. Work assignments that have a positive effect on self-esteem, involvement, and motivation.
- **Social integration:** A workplace ambiance where the employee enjoys a feeling of belonging and being a meaningful part of the whole organization. A climate that encourages openness, a sense of community, freedom from prejudice, and personal equality irrespective of rank in the hierarchy. An organization that encourages teamwork and group cooperation within and across organization units.
- **Participation:** Linkage of employee participation to the productive goals of the enterprise. The recognition of individual creativity,

¹⁰ *Ibid.*, p. 30.

initiative and talent to open the channels of communications and to encourage the free and easy flow of ideas throughout the organization. To reward participation, to respond to ideas, and to explain decisions that reject ideas. Thus, participation is a self-perpetuating force that opens employees to new ideas and opens the organization to the ideas of its employees.

- Total life space: Work should be a balanced part of the entire lifestyle. Work schedules, travel demands, career pressures, and overtime should operate within a reasonable balance with the needs and responsibilities for family, leisure, recreation and self-renewal.¹¹

Management studies have shown the positive impact on productivity of an organizational structure that creates a foundation to build team processes, reduces the uncertainties associated with expanded employee involvement and participation, and recognizes areas of mutual need and support.¹² One recent study, for example, was carried out by the New York Stock Exchange Office of Economic Research to discover the effects on productivity of an organizational structure that specifically valued "human resources" and maintained open lines of communication. This study found that over half of the corporations with a management style that was democratic, participatory, and flexible reported lowered costs, improved worker productivity, and improved services.¹³

Machines, People, and Production

Labor costs constitute the principal costs of information processing. The changing composition of the labor force, the increasing professionalization of jobs, the higher level of education of workers, the increasing level of specialization of skills, as well as the shift to labor-intensive services have all added to the rising cost of wages and benefits. Thus, despite recognition by management of the merits of the quality-of-work-life movement, management is nonetheless faced with a hard reality: labor costs have more than doubled in the past decade.¹⁴ Management is likely to conclude: "Labor costs are ascending and hardware costs are descending. Let's go with the hardware." Quality-of-work-life issues are often perceived as "luxuries," located at the other end of the spectrum from the nuts-and-bolts issues of efficiency, effectiveness, productivity, and profits. Management is turning to technology—the

Rosow, *op. cit.*, pp. 42-43.

¹²Ira B. Gregarman, *Knowledge Worker Productivity*. AMA Management Briefing, AMACOM, New York, 1981, p. 34.

¹³Ed Wakin, "Quality of Work Life: Labor's Love Found," *Today's Office*, Vol. 18, No. 2, July 1983, pp. 34-36.

¹⁴Strategic Inc., "Electronic Conferencing Impact and Opportunities," Report No. 37, San Jose, CA, 1981.

"office of the future"—in hopes that it will resolve the slump in white-collar productivity. Too often, however, the new technology becomes a *deus ex machina* in the scenario of declining white-collar productivity, and managers are led to believe that technology *per se* will resolve problems that are actually much more fundamental—both structural and social.

While management is apparently caught in the middle—between demands for efficiency and productivity coming from the top and demands for greater participation and equality coming from the bottom—this is more of an illusion than a reality. Too often the quality-of-work-life issue is conceptualized as a social issue separate from what is perceived as a strictly economic issue—productivity. Separating these, however, tends to compound, rather than clarify the essential issue, which is the dynamic interaction between people and the tools of production.

The Challenge to Management

Enhanced white-collar productivity will clearly be the measure of the economic impact of office automation. Rather than viewing technology *per se* as the solution to the productivity crisis, however, management must find ways in which technology can enhance the human factor in productivity. New catalysts for productivity gains must come from within management itself in the form of an increased sensitivity to quality-of-work-life issues. Innovation and clear thinking, rather than the purchase of new machinery, will be the linchpin to increased productivity.

There is clearly no lack of "tools" for productivity improvement. But, as researchers at the American Productivity Center note, "There has been a paucity of information about how these diverse tools can be

TABLE 2-1. The Challenge to Management

Link Together

<i>The Automated Office</i>	<i>Quality of Work Life</i>
Multipurpose work stations	More job variety
Integrated processing	Greater autonomy
Electronic mail	Frequent feedback
Communicating word processors	Increased involvement and participation at every level
Intelligent copiers	Egalitarian management
Teleprocessing	Involvement in company as a whole
Teleconferencing	More recognition
Local area networks	More humanized environment
CPBXs	Reduction of routine tasks
Computer networks	
Integrated voice, data, video	

selectively used for supporting productivity enhancement related to opportunities for productivity improvement within a specific organizational setting at a particular time."¹⁵ This chapter will explore the possibilities that teleconferencing offers for increasing productivity through enhancing the quality of work life. Teleconferencing will be analyzed as a management tool that allows better management of:

- Information float: time, travel, and meetings
- Human resources
- Communications
- Planning

MANAGING INFORMATION FLOAT: TIME, TRAVEL, AND MEETINGS



Figure 2-4 Executives on airplane. (Courtesy: Shelly Katz from Black Star)

- Every day, approximately 20 million business meetings are held in the U.S.¹⁶
- Seventy-five percent of all business travel is for meetings.¹⁷

¹⁵Robert N. Lehrer, ed., *White Collar Productivity*. New York: McGraw-Hill, Inc., 1983, p. 5.

Various studies.

¹⁷David R. Fischell and Christopher Stockbridge "Going the Distance for Business Customers," *Record*, Bell Laboratories, Vol. 60, No. 10, December 1982, p. 278.

American businesses spend, conservatively, \$21 billion annually in corporate travel and related expenses,¹⁸ or, estimated by another source, as much as \$72 billion.¹⁹

Corporate travel expenses are climbing an average of 20 percent each year,²⁰ and U.S. companies increased their annual per-traveler costs by 20 percent over 1980, from \$12,380 to \$14,890, making per-traveler costs the second highest expense after salaries.²¹

Thirty-eight percent of all trips are for intracompany business. Almost half of all trips are to one location only.²²

Eighty percent of all meetings have a productive value of only 30 minutes, once travel to and from the meeting, small talk at the meeting, and other extraneous activities are controlled.²³

The process of collecting, organizing, analyzing, evaluating, and integrating information is a time-consuming, iterative process. Information generates new information. Information is gathered, evaluated, and a decision is made. The decision spawns the need for evaluation, which must, in turn, be integrated with existing information. Without proper management, information loses timeliness, relevance, and thus its potential as a valuable resource. "Information float"—the time it takes to complete information processing, decision making, and action implementing—is directly related to "financial float." Financial float refers to unused financial resources that are "on hold" while information is transferred back and forth. As Peter Drucker, a legendary figure in the world of management, has noted, "Information is the manager's main tool, indeed the manager's 'capital,' and it is he who must decide what information he needs and how to use it."²⁴

Many factors affect information float, from executive travel to the

¹⁸Steven Shaw, "Teleconferencing vs. \$21 B Annual U.S. Business Travel," *Electronics Business*, June 1981, p. 76.

¹⁹Runzheimer and Company, Inc., "1982-83 Survey and Analysis of Business Travel Policies and Costs," Rochester, WI, 1982.

²⁰Fischell and Stockbridge, *op. cit.*

²¹Runzheimer and Company, Inc., "1982-83 Survey and Analysis of Business Travel Policies and Costs," Rochester, WI, 1982.

²²Strategic Inc., "Electronic Conferencing Impact and Opportunities," Report No. 37, San Jose, CA, 1981.

²³Strategic Inc., "Electronic Conferencing Impact and Opportunities," Report No. 37, San Jose, CA, 1981.

²⁴Peter F. Drucker, "Managing the Information Explosion," *The Wall Street Journal*, April 10, 1980, p. 24, cols. 4-6.

way meetings are carried out. Analyzing these requires a close look at what is actually going on in the office during the business day.

How White-Collar Workers Spend Their Time

A Strategic Incorporated study discovered that the average white-collar worker spends over 50 percent of his or her time "communicating," a category that includes attending meetings, reporting on them, and talking on the telephone. Executives spend an average of 75 to 80 percent of their time communicating. According to an AT&T study, executives spend an average of 94 percent of their time in communication-related activity. Oral communication accounts for 69 percent of executives' time, with 53 spent in face-to-face meetings and 16 percent on the telephone.²⁵ Most studies, in fact, reveal that almost half of the typical manager's time is spent in meetings.

What goes on in meetings? A study by the Conference of European

TABLE 2-2. How White-Collar Workers Spend Their Time²⁶			
<i>Bell Northern Research, Inc.</i>		<i>Bolt, Beranek and Newman, Inc.</i>	
Meetings	59%	Meetings	40-70%
Unscheduled meetings	10%	Document generation	15-25%
Phone	6%	Document retrieval	10-20%
Travel	3%	Activity management	5-10%
Desk work	33%	Information transfer	5%
<i>Booz-Allen and Hamilton, Inc.</i>		<i>IBM/SRI International</i>	
Meetings (including phone)	46%	Meetings	30%
Reading	8%	Phone	14%
Document creation	3%	Travel	13%
Analysis	8%	Desk work	23%
Less productive activities	25%	Filing and retrieval	6%
		Clerical	10%
		Other	3%
<i>Technology Management</i>		<i>AT&T</i>	
Unscheduled meetings	20%	Meetings	53%
Scheduled meetings	16%	Telephone	16%
Writing	14%	Writing and mail	25%
Reading	11%	Problem solving and planning	3%
Telephoning	8%		
Other	21%		

Strategic Inc., "Electronic Conferencing Impact and Opportunities," Report No. 37, San Jose, CA, 1981.

Bell Northern Research Data from James H. Bair, covering 2.5 years, 691 people, 7 organizations. Bolt, Beranek and Newman, Inc., Cambridge, MA, data

Posts and Telecommunications (CEPT) found that about half of the business meetings studied were for information exchange and problem solving.²⁷ In those situations in which factual information is being exchanged in order to solve a problem, studies show that only about half of the person's time is actually spent communicating—sending or receiving information. Searching for information, making notes, and shuffling papers are the activities that take up the rest of the time. If the situation is one of negotiation or conflict requiring an exchange of opinions and argumentation, the person spends as much as 75 percent of his or her time actually communicating. Nonetheless, other non-communicating activities, such as information retrieval and document reading, still make up 25 percent of the person's time.²⁸

TABLE 2-3. Content of Meetings²⁹

<i>British Post Office</i>		<i>AT&T</i>	
Information seeking	49%	Sharing information	35%
Giving information to keep people in the picture	48%	Solving conflicts	20%
Problem solving	48%	Providing status	16%
Discussion of ideas	26%	Presenting reports	11%
Delegation of work	12%	Convincing	9%
Negotiation	11%	Negotiating	8%
Forming impressions of others	9%		
Policy decision making	8%		
Presentation of a report	8%		
Inspection of a fixed object	7%		
Conflict	4%		
Disciplinary interview	1%		

from 1980 report "Electronic Mail: The Messaging System Approach." Booz-Allen & Hamilton figures from Gerald Tellesen, based on a 1-year study of 300 people in each of 15 organizations. IBM/SRI data from Alexia Martin represents SRI International's syntheses of an IBM study of time usage in a single large manufacturing organization, 1979. Technology Management data from *Technology Management*, State of the Art Report Series 10, Number 8, Pergamon Infotech by B. Hubbard. AT&T data from "Managers' Time Spent Communicating," *Small Business Report*, October 1983, p. 11.

Conference of European Posts and Telecommunications (CEPT) study, cited by David Staelin, "Expanding Broadband Switched Communications Networks," *Satellite Communications*, January 1979, p. 27.

²⁷ Alphonse Chapanis, "Interactive Telecommunication: Some Findings from Laboratory Experiment," Department of Psychology, The Johns Hopkins University, Baltimore, MD, no date.

²⁹ Conference of European Posts and Telecommunications (CEPT) study, cited by David Staelin, *op. cit.*, p. 27. AT&T report cited in Huntley Miller, "Teleconferencing: As Easy to Use as the Telephone, As Natural As Face-to-Face Meetings," *ComputerWorld*.

Access to information and better use of time are factors that can significantly improve a manager's productivity. When managers have to spend approximately half of their time away from their desks in meetings that are ill-organized and time-consuming, this affects their productivity. Important meetings, on the other hand, must often be delayed due to the manager's busy schedule. The delay between the need to meet and the actual meeting is typically about one week and often as much as two weeks. Delayed decisions and missed opportunities that result can significantly affect the productivity of the entire organization.

Teleconferencing can improve dramatically the management of time, meetings, and information. Teleconferencing allows easier and quicker access to information. It enables the executive to reduce information float, and thus financial float, as well as to be more in control of the information process. A positive impact on the work environment and "management velocity"—the speed and effectiveness with which problems are resolved and decisions implemented—can be brought about with teleconferencing.

**The Teleconference:
A Substitute for Some Meetings**

Various studies have identified the percentage of meetings in which face-to-face contact can be successfully substituted with teleconferencing. Kollen and Garwood reported that 25 percent of meetings can be substituted with teleconferencing.³⁰ Pye and Williams found that 40 to 45 percent of meetings can be substituted effectively by audio and audiographic teleconferencing. Eight to 10 percent of meetings, they found, required video capabilities to be substitutable.³¹ A British Post Office study concluded that 60 percent of communications do not require face-to-face meetings and can be handled by voice communication only. British Post Office Laboratories found that at least 40 percent of today's fly-in business conferences could be held by telephone.³² AT&T's study concluded that 50 percent of travel meetings were substitutable with teleconferencing and, of these, 80 percent can be held by audio and audiographic means.³³

³⁰J. H. Kollen and J. Garwood, "Travel/Telecommunications Tradeoff: The Potential for Substitution Among Business Travelers," Bell Canada, Montreal, 1975.

Roger Pye and Ederyn Williams, "Teleconferencing: Is Video Valuable or Is Audio Adequate?" *Telecommunications Policy*, June 1977, pp. 235-236.

Thomas Jenkins, "Teleconferencing: How to Make It Work," *Word Processing and Information Systems*, 1982, p. 15.

³³AT&T, cited in Huntley Miller, "Teleconferencing: As Easy to Use as the Telephone, As Natural to Use as Face-to-Face Meeting," *ComputerWorld*.

**What Types of Meetings
Can Be Successfully Teleconferenced?**

Teleconferencing has been successfully substituted for just about every type of face-to-face meeting. The general areas that researchers have concluded are compatible with teleconferencing include:

- Information exchange.
- Opinion exchange—brainstorming.
- Cooperative problem solving and decision making.
- Individual task allocation.
- Resolution of minor problems.³⁴

Until recently, communication involving negotiation, conflict, or bargaining was thought to be inappropriate for teleconferencing. One study found, however, that both cooperative and conflictive issues are resolved nearly in the same amount of time in voice-only modes of communication as in face-to-face communication.³⁵ Another study, also reversing previous beliefs about teleconferencing, found that people *perceive* the benefits of teleconferencing to be greater in those tasks involving competition and conflict than in the more cooperative tasks. This latter study found that teleconferencing actually facilitates the negotiation process in a conflictual situation. The authors concluded:

The view that teleconferencing is always an inferior but cheaper substitute for some other way of doing business or gaining education should not be allowed to continue unchallenged.³⁶

These research findings were borne out by a successful United Airlines contract negotiation that linked nine locations with one-way video and two-way audio and supplemented these in advance by utilizing videotapes that educated the participants ahead of time about what to expect.

See Martin C. J. Elton, "Behavioral Aspects of Teleconferencing Systems," paper presented at the IGC Conference on the Promise of Multi-Media Teleconferencing, Andover, MA, October 30, 1979; Roger Pye and J. Springate, "Teleconferencing: The Meeting of the Future—Now," *Management Services in Government*, August 1978, pp. 136-139; Robert Johansen, Jaques Vallee, and Kathleen Spangler, *Electronic Meetings: Technical Alternatives and Social Choices*, Reading, MA, Addison-Wesley, 1980; B. G. Champness, "The Effectiveness and Impact of New Telecommunications Systems," Joint Unit for Planning Research, University College, London, England, 1979, pp. 141-191.

Alphonse Chapinis, *op. cit.*

J. A. Birrell and Ian Young, "Teleconferencing and Long-Term Meetings: Improving Group Decision-Making," The Economist Intelligence Unit, London, England, no date, p. 447.

**The Teleconference:
A Different Kind of Meeting**

A teleconference is not merely a substitute for a face-to-face meeting; it is a different way of communicating. Because the "place" where the teleconferenees meet is on-line, as opposed to the usual conference table with hierarchy and status implicitly ascribed to certain seating arrangements, communication is more straightforward, and candor of opinion is more likely to occur. The anonymity afforded by the technology allows participants to ignore the usual patterns of hierarchy and deference and get on with the task at hand.

Numerous studies, carefully executed over the past decade in both field and laboratory situations, have substantiated how teleconferenced meetings are different from face-to-face meetings:

- Meetings are shorter, as people tend to concentrate specifically on the task at hand.
- Meetings are more task-oriented.
- Meetings are better structured.
 - Meetings are more orderly, even though less hierarchically organized and less status-oriented.
- There is generally more equality of participation.
 - More opinion exchange occurs in teleconferences, and persuasion is more successful.
 - In a computer teleconference, there is more time for reflection and thought before the necessity for response and decision making.³⁷

TABLE 2-4. How (and Why) to Run a Meeting

It's estimated that the dollar cost of a manager's time, including overhead allotted to it, is around \$100 per hour. A meeting attended by ten managers for two hours thus costs the company \$2,000. Most expenditures of \$2,000—such as buying a copying machine or making a transatlantic trip—have to be approved in advance by senior people, yet a manager can call a meeting and commit \$2,000 worth of managerial resources on a whim. If that meeting is unnecessary or so poorly run that it achieves nothing, that's \$2,000 wasted.

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³⁷ For a summary of the findings of approximately the first decade of laboratory and field research on the social and psychological effects of teleconferencing, see Robert Johansen, Jaques Vallee, and Kathleen Spangler, *op. cit. Electronic Meetings: Technical Alternatives and Social Choices*. Reading, MA: Addison-Wesley Publishing Company, 1979, pp. 141-191.

**The Teleconference:
A Better Mode of Group Communication**

When the number of participants in a meeting increases, the meeting tends to become less effective. There is the problem of structuring the discussion and debate in such way as to get everyone to agree to one solution. Additionally, the greater the number of people, the less likely all members of the group will be able to participate verbally. Inevitably, a few "bullies" will tend to take over the floor, blocking the interactive process, annoying those who are less vocal, as well as stifling the intellectual energy of the group.

Recent research has cast doubt on the viability of large-group, face-to-face meetings as the best decision-making procedure. For certain tasks, the teleconference is actually a more successful form of communication than face-to-face meetings. Recognizing both the advantages and disadvantages of group decision making, research was undertaken by British researchers to test the hypothesis that teleconferencing can be used to overcome the difficulties associated with group decision making. The study was based on 1,000 man-hours of use of multipoint video teleconferencing technology by business and professional personnel in meetings that lasted anywhere from 40 minutes to 1 week. The research findings suggest that teleconferencing enhances group decision making in several different ways. For example, participants tended to be less dogmatic and more compromising in teleconferencing. This resulted in more opinion change in meetings and less coalition formation. It was also discovered that when compared to typical interaction in a face-to-face meeting, the participants in a teleconference holding a minority opinion were more easily persuaded to line up with the majority decision. Additionally, it was found that, in communication involving negotiation and bargaining, the group with the soundest case was more likely to win if the meeting was conducted via teleconferencing rather than through face-to-face interaction. The video-teleconferenced meeting was also perceived to be less threatening because participants at different locations could look at each other's faces on a video screen without the "threat" of direct eye contact. Participants also positively reported a heightened level of feedback from other members of the teleconference.³⁸

**Studies Document the
Effectiveness of Teleconferences**

Studies have found that teleconferences do not adversely affect the quality of communication. The results of one study, for example, note that:

- No measurable loss could be found in the communication process.

³⁸Birrell and Young, *op. cit.*, p. 442.

- Information exchange and idea generation were unaffected by the medium.
- Teleconferenced meetings and discussions involving the same people for periods between several hours and a working week show first that it is possible to sustain this type of interaction for longer than any previous research has shown.
- During teleconferences sustained over four days, meeting effectiveness and efficiency were maintained, and there was no measurable fall-off in attention or vigilance.³⁹

The University of Wisconsin-Extension Educational Telephone Network (ETN) carried out a test that compared a control group, a face-to-face group, and a group taught via ETN. The study found no significant differences in the mean scores of the face-to-face group and the ETN group. The scores of the groups that met face to face and those that met electronically were significantly higher than those of the control group that received no training.⁴⁰

Satellite Business Systems, in association with Booz-Allen & Hamilton and The National Opinion Research Center at the University of Chicago, carried out a study that closely examined large-corporation video teleconference users. The study, conducted during the second half of 1981, is the most comprehensive and carefully executed study to date. The study contained responses from users who spend at least 20 hours a month using either slow-scan video television or full-motion, on-premises video teleconferencing. The companies surveyed included Deere & Company, Exxon Research & Engineering Company, GTE, Hughes Aircraft Company, IBM, Liberty Mutual Insurance Company, M/A Com, Proctor & Gamble Company, Sperry Univac, and Aetna. The results of the study indicate that managers and executives feel positive about teleconferencing. The following results were reported:

- Three-fourths of the respondents reported that they experienced an increase in their *personal productivity*.
- One-half of the respondents reported increase in meeting effectiveness resulting from video teleconferencing; the other half was equally divided between no change and decrease.
- One-third of the respondents noted an improvement in the *quality of decisions*; one-half noted a decrease in the time to make decisions.
- One-third of the respondents noted an increase in *task orientation*

³⁹*Ibid.* pp. 442, 446.

⁴⁰Mavis Monson, *Bridging the Distance, An Instructional Guide to Teleconferencing*, Regents of the University of Wisconsin System, 1978, p. 60.

within a meeting; one-third reported an increase in cooperation among participants.

- One-half of the respondents said video teleconferencing increases the amount of *communication* among various parts of the organization.
- Three-fourths of the respondents noted a decrease in travel expense and the same percentage reported that they spent less time away from their offices.
- *Responsiveness* to market opportunities, the image of *corporate leadership* in the business community, and *competitive advantage* were also perceived to have increased.
- User satisfaction was high—90 percent of the users were "satisfied" or "very satisfied" with their overall use of video conferencing.
- Most liked: time and cost savings, accessibility, convenience, and effectiveness of video teleconferenced meetings.
- Least liked: various impediments to communications such as a perception of distance and lack of eye contact and complaints about graphics, still-frame images, and general technical difficulties. Nevertheless, 89 percent of respondents indicated they were satisfied or very satisfied with the experience.⁴¹

MANAGING HUMAN RESOURCES

The resources of an industrial society include raw materials, machines, and labor power. The resources of an information society include brain power, human talent, and flexibility in adopting new ideas. In order to maximize human talent and creativity, people's ideas must get out and be evaluated and implemented as quickly and as efficiently as possible. Traditional modes of idea generation and communication are simply not very efficient. One telecommunications researcher notes the following:

At present, the individual with an idea to be communicated in writing (perhaps a question, an instruction, a business letter, a paper, an article, or a book) must either convert that idea to symbols on paper or speak the idea to another. This person will then successively type or set it, reproduce or print it, file or warehouse it, mail or ship it, deliver or sell it, etc. Each of these steps involves interaction by the author with service workers to verify, correct, obtain approval, obtain signatures, etc. Each step involves time-consuming transportation of people and paper over physical distance. *As a production technique, this process is inefficient: the steps consume considerably more time than did the original thought process* or at least that part of it which

Kathleen J. Hansell, David Green, and Lutz Erbring, "A Report on a Survey of Teleconferencing Users, *E-ITV*, September 1982, pp. 70-75.

involved the devices we are considering. Furthermore, all the workers in this process require office space, to protect them from the elements, to house their tools, and, in a perceptual sense, to focus their expectations in a socio-economic organization.⁴²

Stockbridge, "Decentralizing Human Resources Through Telecommunications," *Telecommunications Policy*, December 1979, pp. 305-6, emphasis added.

Teleconferencing is a conserver of resources, including people's time and energy. Teleconferencing moves the idea, rather than the person or the paper. By eliminating paperwork and geographical distance, teleconferencing reduces the idea-to-decision cycle. Conversely, it creates the opportunity for functionally- and geographically-separated people to access directly the ideas of a few people, thereby opening up extensively the opportunity for upgrading skills and education. Teleconferencing thus holds the possibility for involvement of components of the national labor force that are now underutilized.

Decentralizing Resources

Teleconferencing eliminates duplication of management and administration at multiple sites. Research carried out at the University of Southern California regarding the effect of telecommunications on organizational decentralization concluded that most information-transfer functions can be "adapted to an intraorganizational telecommunications environment, using primarily conventional telephone channel bandwidths, provided suitable man-machine interfaces . . . are available."⁴³ By eliminating time-consuming transportation of people and paper over physical distance, teleconferencing displaces the distance between sites. With teleconferencing, management, administration, and training can be centralized in one location, for example, and research, manufacturing, distribution, and sales can be geographically dispersed. Decentralization of human resources allows organizations to reduce their staffs. Reduced employee turnover and training are other benefits of decentralization.

Although some managers feel diminished confidence in decisions made using various telecommunications systems as compared to their confidence in decisions reached after face-to-face meetings, researchers have concluded that the quality of decisions are the same in both cases. The optimum management use of teleconferencing in a decentralized organization is through occasional face-to-face meetings to renew confidence and confirm perceptions of attitudes. An important element in the managerial use of teleconferencing is the availability of some form of graphic-display capability so that data, curves, line drawings, and the like, can be transmitted.⁴⁴

Knowledge Workers

Today, "knowledge workers" comprise the majority of the labor force in the United States and other post-industrial societies. Knowl-

⁴³ Jack M. Nilles, "Telecommunications and Organizational Decentralization," IEEE Transactions on Communications, October 1975, p. 1143.

"Ibid.

edge workers are those persons whose jobs involve planning, creativity, innovation, and decision making. Their product is often an intangible one, and thus their productivity is difficult to measure. Due to the increased significance of "information production" for the U.S. economy, however, the characteristics of the knowledge worker have been closely examined. Research in the social sciences and human behavior, Zelko notes, has illustrated the need and the positive impact of applying human considerations to business management:

As a result of their increased knowledge, education, and dignity, men are requiring recognition and participation for their own sakes; and they have made management realize that it must respond to this, must use their knowledge for successful operations. Men are demanding recognition as individuals, recognition of their positions, and increased participation and interaction as group members.⁵

Studies have found that knowledge workers are more motivated by a meaningful, gratifying job than they are by purely monetary incentives. A recent study, for example, surveyed 3,000 white-collar workers, aged 25-35, earning \$25,000-\$40,000, and reported that only 27 percent said that money was their chief work incentive. Fifty-three percent stated that "recognition" of their abilities and performance was their principal incentive. Sixty-five percent noted that "putting their education and experience to use" was important to them. Fifty-eight percent stated they would like to share some of the routine of their jobs. Over half complained that they are given little opportunity to use their own initiative.⁴⁶

The "production rate" of knowledge workers is a complex interaction of intelligence, creativity, and environmental factors. Studies show that environmental factors can be positively influenced through techniques that keep open the lines of communication within an organization and that allow the knowledge worker a sense of participation in the overall goals of an organization. Although the knowledge worker tends to be viewed as a silent generator of ideas, a study undertaken for the American Management Association emphasizes:

It is a rare knowledge worker who functions best alone. In fact, observations lead to the conclusion that *most knowledge workers perform best in concert with others*. These collaborations range from interactions with peer groups to membership in internal company service organizations to cooperative relationships with external resources such as suppliers, customers, and con-

Harold P. Zelko, *The Business Conference: Leadership and Participation*. New York: McGraw-Hill, 1969, p. 9.

⁴⁶*D&B Report*, Sept./Oct., 1983.

Gregarman, *op. cit.*, p. 12, emphasis added.

The positive effect on productivity of group decision making over individual decision making is well-documented.⁴⁸ Advantages include the availability of a greater range of experience than that held by any one individual, a more diverse set of intellectual approaches and capabilities, and a greater tendency to subject ideas to scrutiny and debate. The positive effects of group interaction in the decision-making process include the following:

- Creative approaches to the task are more likely to be found, as are more creative solutions.
- There is more constructive criticism, thus decreasing the likelihood of loopholes and future problems.
- The commitment of the group to resolving the task at hand is greater.
- Implementation of the decision is facilitated when personnel from different parts of the organization communicate to each other their needs, as well as understand and participate in the decision-making process.

Knowledge workers, because of higher education and more awareness, tend to adapt well to group settings. An organization should therefore maximize the knowledge worker's productivity by creating the conditions whereby he or she can maximize group interaction. These include:

- Decision-making involvement
- Participative management
- Interactive communications

These are precisely the "work conditions" that teleconferencing makes possible. Teleconferencing allows the knowledge worker to have ongoing communication with other experts in his or her field, often not feasible if, within one organization, there is only one person working in the area of specialty. The ability to interact with professional and technical peers, as well as the recognition that is gained in the process, are factors that strongly influence the productivity of knowledge workers. Additionally, teleconferencing supports the knowledge worker by creating conditions that encourage:

- Teamwork both within the organization and with other organizations involved in similar endeavors.

⁴⁸ See, for example, B. P. Indik, B. S., Georgopoulos, and S. E. Seashore, "Subordinate Relationships and Performance," *Personnel Psychology*, 1961, 14, pp. 337-374.

- Work assignments that are diverse, varied, and challenging enough to expand skills, abilities, and knowledge.
- A workplace ambiance where the employee enjoys a feeling of belonging and being a meaningful part of the whole organization.
- A social climate that encourages openness, a sense of community, freedom from prejudice, and personal equality irrespective of status in the organization.
- Quick information access and frequent feedback.

Upgrading Skills of Individuals

Management and labor alike are increasingly aware that traditional skills do not meet the demands of the information-age market. "How can I learn more about what's happening in my field?" is an oft-heard query with implications that affect organizational productivity.

With the globalization of business and concomitant exportation of jobs, one approach to unemployment in the U.S. market is the "retooling" or reskilling of American labor. Because the United States' best and most competitive product is information, American labor should ensure its expertise worldwide in the information industry. This calls for changing and updating skills at every level of production, from the level of manufacturing hardware and producing software to that of managing the information industry.

When the need for upgrading skills is recognized, but a corporation cannot afford to have either its top executives or middle managers absent from their ongoing duties, teleconferencing is a way of bringing the classroom to the workplace. For example, top executives are now enrolling at the Western Behavioral Sciences Institute and are studying strategic management issues via computer teleconferencing. After an initial in-person, eight-day seminar in California, they return to their own desks and jobs, but they continue to study for two years via computer teleconferencing. During the two-year course of study, the ongoing teleconference is interspersed with in-person seminars.

Another successful attempt to bring the classroom to the workers took place in Schaumburg, Illinois, where middle managers at Motorola's Communications Division took a course entitled "Human Factors in Engineering," offered by Northwestern University's Technological Institute. The course took place via slow-scan video teleconferencing. Classes were held in the employee test center at Schaumburg during the noon hour, three days a week.

At AT&T Long Lines, teleconferencing is being utilized to deliver training simultaneously to managers located at three different locales. The teleconferencing technologies used include an audio teleconferenc-

ing terminal and audiographic support in the form of an electronic blackboard. Slides and videotapes are also used to supplement the instructor's lectures. Courses offered include "Business Problems and Financial Strategies," "Stockholder Management," "Introduction to Teleprocessing," and "Advanced Telemarketing."⁴⁹

It is interesting to note that knowledge of teleconferencing *per se* is today viewed as a valued management skill. Additionally, teleconferencing is recognized as a training medium that results in greater quantity and quality executive/trainer time available for productive, creative development, in lieu of time now spent in multiple presentations of the same material. It eliminates nonproductive time wasted by key company personnel in traveling to and from traditional learning centers. Opportunity costs that accrue to a company if an employee is absent from his or her job can also be eliminated. Additionally, by neutralizing the disintegration/reintegration factors that inevitably result if an employee is absent from the workplace, productivity increases. Perhaps most important in terms of continuing education and training, teleconferencing can make a wider range of both technical and academic expertise available in order to broaden and strengthen course content.

MANAGING COMMUNICATIONS

Organizational structure—the social relationships and patterns of interaction among people in an organization—can either facilitate or impede goals of effectiveness, efficiency, and productivity. The organization's communication infrastructure—formal and informal patterns of communication—can be a handicap rather than an asset, blocking timely and correct decision making. If companies become "top-heavy" and "muscle-bound," they cannot respond to uncertainty or crisis. With hierarchies, entrenched self-interests, and outdated procedures, a signal from the marketplace travels slowly up the chain of command. The company finds itself responding to market conditions that have already changed or disappeared. The hierarchical structure of the organization itself impedes rapid communication and mitigates against cooperation among the various parts of the organization. Fixed channels of command, narrowly defined channels of communication, and set job descriptions typically mean that power flows from the top down and relationships are fixed accordingly: everybody does what he or she is told. This can lead to a situation as rigidified and nonresponsive as a well-known economist describes:

⁴⁹Lisel A. Fahl, "Telctraining in the Corporate Environment," paper presented at the International Teleconferencing Seminar," December 1982.

There is a great deal of evidence that almost all organizational structures tend to produce false images in the decision-maker, and that the larger and more authoritarian the organization, the better the chance that its *top decision-makers will be operating in purely imaginary worlds.*⁵⁰



"Well, to begin, I'm sure this little box needs no introduction."

Creating Communications Flexibility

The advantage of teleconferencing is that it allows an organization to decentralize the information flow and make interaction among its different parts easier. Organizational productivity is enhanced if the interdependency among functional units is made clear to the parties involved. This would include interdependency among administration, finance, operations, R&D, and employee relations, for example, as well as between headquarters and the field. It is crucial for the individual to understand his or her functions and what he or she needs from others to accomplish goals and objectives. This leads, in turn, to quicker and better-informed decision making.

Teleconferencing's principal contribution, in this respect, is that it provides the communication infrastructure that can enhance the quality of work life and lead to greater productivity. Once communication is opened up and allowed to cross functionally separate units of the organization, there is, on one hand, a greater understanding by all

Kenneth A. Boulding, "The Economics of Knowledge and the Knowledge of Economics," *American Economic Review*, 16:2 (May 1966): 1-13, emphasis added.

parties of each function's role and the interdependency among them and, on the other, less concern with an individual's function *per se* and his or her status. Rather than people being concerned with protecting their individual prerogatives or playing assigned "inferior" roles, a team spirit develops and people are motivated by the task itself. This was illustrated when the EMISARI computer teleconferencing system was utilized during the wage-freeze crisis:

On the third week about 30 of the lower-grade regional people were ordered to join a conference at a designated time and enter a fake name for themselves. The first comment in the conference was an invitation to express any problems they were having. That conference went on for three furious hours of typing and sufficiently broke the ice so that grade levels of individuals began quickly to disappear and *the operation and atmosphere became that of a group dealing with a common problem*, where each had his or her contributions to make and his or her roles to perform.⁵¹

Similarly, when the General Conferencing System, a computer-teleconferencing system, was operationalized by the Director of the Non-Medical Use of Drugs (NMUD) to link together their field offices that were geographically dispersed in Canada, the results of the increased communication (over 2,000 messages passed among the NMUD offices in the three-month period) were reported as follows:

- The separate provincial organizations became a more unified single national organization.
- The regions felt more informed about what was happening in other regions.
- There was a new openness to discussion of fundamental issues, especially between the national office (oriented toward research) and the operational field offices in the provinces.
- Morale was improved.⁵²

Management Flexibility

Teleconferencing allows people within an organization to "move" freely from one project to another, rather than adhere strictly to functional duties such as managing *per se* or engineering *per se*. When people are oriented toward a project rather than simply doing what they are

⁵¹ Starr Roxanne Hiltz and Murray Turoff, *The Network Nation: Human Communication via Computer*. Reading, MA: Addison-Wesley Publishing Company, Inc., 1978, p. 63, emphasis added.

⁵²

Ibid., p.
69.



"Come in, Frank. I've been eager to communicate downward to you."

told, there is greater flexibility to respond to both changes in the market and demands internal to the organization. Peter Drucker notes the variety of different ways in which new communication technology can have positive effects on organizational structure:

It will enable you to *use human capacities as building blocks* to arrange in any sequence you want. It gives you a design of freedom, which in turn will have very great impact on your strategic decisions—not by centralizing or decentralizing, but by enabling you to use communications with freedom, to use them situationally.⁵³

Drucker also suggests that, with the greater degree of flexibility afforded by new communications technology, the scope and impact of decisions is greater. The capacity to structure communication lets the manager "forget communications and focus on . . . business," Drucker believes, and he offers the following as an example:

If you want to have a staff meeting in your office every Monday morning at 9 o'clock, from 64 locations, you can do it. You may also want to have three engineers, in three different places, sitting with electronic-light pens and drawing, playing it through on a computer, and you can do that, too.⁵⁴

Interview with Peter F. Drucker, "Better Communications: What It Means to Management," Satellite Business Systems, McLean, VA, no date, p. 2., emphasis added.

⁵⁴*Ibid.*, p. 7.

Teleconferencing provides the means by which communication can be regularized throughout the organization, whether through audio teleconferencing, electronic mail, computer, or video teleconferencing. Regularity of communication ensures:

- Timely input and feedback of information.
- Compressed decision-making time.
- A quick crisis reaction capability.

The manager can either act in the traditional decision-maker role or become involved in activities normally not within his or her realm. The latter would include, for example, researching options available for resource allocation, and collecting, analyzing, and disseminating information to persons working on special projects. Managers usually view these as mutually exclusive tasks and delegate them to separate individuals. Teleconferencing allows the manager the ability to "move about" and participate in a number of different activities in a number of different ways without incurring opportunity costs to the organization and personal energy costs to himself or herself. Teleconferencing systems also make possible flexible management via use of the quality circle. Often quality circles are one-project oriented and the personnel involved are spread about the organization. With teleconferencing, everybody can communicate on a regular basis as new information is added to the project.

MANAGING THE PLANNING PROCESS

"Planning starts out," Peter Drucker has noted, "... with the trends of yesterday and projects them into the future—using a different 'mix' perhaps, but with very much the same elements and the same configuration. This is no longer going to work. The most probable assumption in a period of turbulence is the unique event which changes the configuration—and unique events cannot, by definition, be 'planned.'" Planning, then, must be built into the organizational structure. The procedures for arriving at, as well as implementing, decisions must be clearly established even though, of course, the content of the problem and the nature of the decision cannot be planned.

The concept of strategic planning emerged in the early 1960s and was quickly incorporated as a function of top management. Strategic planners were faced with the difficult task of meshing their plans with the realities confronting operating management. It became incumbent upon management to link together in a realistic way the "planners" and

the "doers." This presupposed a capability to think through the complexity of not only the whole planning process but also the context in which policy formation and implementation takes place. Strategic planning, in other words, presupposes strategic thinking. As Robert McAndrews, executive director of the Western Behavioral Sciences Institute, notes:

Strategic thinking requires an awareness of the larger context within which planning and decision-making occurs, an appreciation of the historical dimensions of a problem, an ability to take the long view in investigating policy issues, a realization of systems relationships within and beyond one's organizational boundaries, a commitment to confront the value and ethical implications in planning and decision-making, and an appreciation for paradoxical and counter-conventional ideas.⁵⁵

Problems that arise at the inception of the policy process are generally carried over and affect the implementation of the policy, as McAndrews suggests:

For at least a decade top executives have recognized two major problems with the planning process in their organizations: a lack of or ineffective implementation of the plans, and the ability of even the most complete and sophisticated plans to respond adequately to uncertainty.⁵

When an organization is concerned with issues such as acquisition, divestment, new product development, and market expansion, long-term strategic planning is a necessity. Decision making necessitates clear thinking regarding such "generic" issues as: short- versus long-term strategy, pay out versus reinvestment, and staff versus line policy concerns. Added to these concerns are the variables that affect information processing: (1) the degree of uncertainty concerning the task, (2) the number of elements—department, specialities, and so forth—relevant to decision making, and (3) the degree of interdependence among the elements necessary for decision making.

Adaptive Planning

Teleconferencing facilitates and supports each step of the policy-planning process: (1) definition of the problem, (2) decision making and policy formulation, (3) implementation, and (4) evaluation. Formu-

McAndrews, "Strategic . . . Planning, Management, Thinking,"
The School of Management and Strategic Studies, Report, Vol. 1., No. 2. La Jolla,
CA: Western Behavioral Sciences Institute, 1982, p. 3.

⁵⁶*Ibid.*, p. 3.

lation and definition of what constitutes the problem requires that the richest possible picture of the problem situation be constructed, including consideration of: (1) as many different perspectives as possible, (2) the important variables, and (3) the relationship among the variables. This is especially true in the "soft" areas of information processing, as some experts have noted:

The "soft" problems of large-scale modeling involve a variety of actors-social, political, and attitudinal as well as economic and technical. The nature and interrelationships of these variables are changing and uncertain. The difficulty of the problems themselves is reflected in the difficulty of the problem formulation process. *Communication, admitting multiple perspectives on multiple variables, becomes even more essential.*⁵⁷

The techniques useful in defining "soft" problem areas have been summarized by Linstone. They cluster into two processes, those which focus on the scanning, search, generation, or identification of problem dimensions; and those that are concerned with structuring and patterning, for example, exploring and defining the relevant patterns and relationships among components.⁵⁸ Computer teleconferencing structures communication and extends the time factor necessary to accomplish the task by allowing the conference to go on electronically for whatever time period is required. Information can be gathered, and subgroups can easily be formed to concentrate on specific aspects of the project. Participants are encouraged to engage in an ongoing dialogue and analysis of the project, without interruptions from each other or the need to vie for scarce time. Consensus is easily arrived at through polling and vote taking.

Participants in a project may be likely to be in functionally separate parts of the organization and may not reside in the same geographic location. The use of a teleconferencing system allows convenient and frequent communication among geographically distant problem solvers. It provides the opportunity to explore a greater variety of viewpoints on problems than might ordinarily be expressed because of time and geographical constraints. With computer teleconferencing, better-thought-out viewpoints and more precise arguments than in an ordinary face-to-face session are possible. Computer teleconferencing also encourages the use of specific, already designed techniques for searching

⁵⁷ John Tydeman, Hubert Lijsinski, and Sara Spang, "An Interactive Computer-Based Approach to Aid Groups Problem Formation," Institute for the Future, Menlo Park, CA, January 1980, p. 14, emphasis added.

⁵⁸ Linstone, H. A., et al., *The Use of Structural Modeling for Technology Assessment*, Vols. 1 & 2, Portland (Oregon) State University, Report to National Science Foundation, February 1978.

out and generating problem definitions and for structuring and patterning problem areas.

The flexibility that teleconferencing offers to managers can be illustrated by the notion of "adaptive planning." Research suggests that the value of planning to managers is their participation in the planning *process*, and not in their carrying out plans that are handed to them. Adaptive planning, according to one expert, is

not the plan but the *learning planning community*—*experts* and layman together. The process creates the conditions for learning to learn, affirms the overriding significance of shared ideals, and reduces the need for planning as a separate specialist organizational activity.⁵⁹

One type of computer teleconferencing enables just such a "learning planning community." The HUB system, "a prototype for the management system of the future," is a computer-based group communications system that is organized to promote communication through structured group interaction, the display of information, and storage of information. It includes the PLANET teleconferencing system, which

. . . gives both model users and model builders the opportunity to discuss and mutually define problems before a model is actually constructed. The program workspace allows modelers to run modeling programs, access data bases, run other types of programs such as structuring modeling packages, comment on these program runs as they occur, and show them to the other participants. The document workspace permits the groups to document essential assumptions as they are defined. And the shared visual space is intended to provide visual tools to assist in conceptualizing a problem. A transcript recording of the entire conference is always stored in the HUB system and available to any participant.⁶⁰

Computer teleconferencing can provide the infrastructure necessary to undergrid and support the planning process. Electronic mail quickly informs the decision maker of changes throughout the organization and of specific changes external to the business that may be affecting, say, a subsidiary located in a remote part of the world. The decision maker can access the computer in order to filter through, aggregate, and determine the statistical relevance of data. Key personnel can also be accessed. Additionally, computer teleconferencing can be an invaluable aid in implementing policy. Because it allows many people to participate in the decision-making process, including those who would not normally

⁵⁹F. E. Emery, *et al.*, *Futures We're In*, Center for Continuing Education, ANU, 1974.

⁶⁰John Tydeman *et al.*, *op. cit.*, p. 8.

take part, it ensures a greater commitment to the outcome. Thus, a coherent and thorough implementation of the policy is more likely to occur and more likely to be incorporated into other overlapping policy areas.⁶¹

**The Teleconference:
A Decision Support System**

Data systems, models, and human-to-human communications comprise the necessary ingredients of a decision support structure. Carefully controlled testing of the role of computer teleconferencing in decision-making processes has been carried out by Turoff and Hiltz under the auspices of the New Jersey Institute of Technology. Decision-making processes in three types of situations were compared and analyzed: (1) face-to-face meetings, (2) nonstructured computer teleconferences, and (3) structured computer teleconferences. A major finding was that the same quality of decision can be reached in a computer teleconference as in a face-to-face conference. The researchers noted that "this is counter-intuitive to the subjective expertise of most managers when they first hear of this technology."⁶²

Despite the capacity of computer teleconferencing to attain as qualitative an end result as a face-to-face meeting, there are differences in the styles of each. Comparisons were made between unstructured computer teleconferences (in which exchanges of text took place) and face-to-face meetings. It was found that face-to-face meetings are more likely to generate a dominant individual and they are more likely to reach a higher consensus level. Actually, these two factors interact, the dominant individual being partly responsible for the higher level of consensus. Additionally, in a face-to-face meeting, more types of communication are likely to occur. Conversely, the unstructured computer teleconference allows more options to surface, as well as more and different types of information to be considered.

When the computer teleconference is structured, however, the ability of the group to reach a decision improved over the face-to-face meeting. Structuring included two factors: a leader who focused discussion, suggested specific ranking changes, promoted consensus, and summarized progress, and used the computer to compile, analyze, and give feedback to the group on the distribution of the rank orderings

⁶¹ See Starr Roxanne Hiltz, "The Impact of a Computerized Conferencing System on the Productivity of Scientific Research Communities," *Behavior and Information Technology*, 1982, Vol. 1, No. 2, pp. 185-195.

⁶² Murray Turoff and Starr Roxanne Hiltz, "Computer Support for Group Versus Individual Decisions," submitted to *IEEE Transactions on Communications in the Automated Office*, March 15, 1981. Revised July 1981.

at various points in time. These two factors had a statistically significant positive effect on the ability of a group to reach a consensus. The quality of the decision was also improved. It was found, however, that if two structures were simultaneously employed they tended to conflict with one another. The conclusion reached was that small groups responded better to a human leader and larger groups to computer feedback.

The researchers felt that computer teleconferencing was especially beneficial in certain types of problem solving. These they categorized as the nonbusiness-as-usual, nonproduction-oriented decision-making situations. They suggested, in fact, the need for a parallel decision-making structure, one that is outside the regular flow of business and that can solve specific problems, often crises, that arise and that the usual top-down, authoritative decision-making structure obstructs rather than facilitates. Because a greater amount of lateral communication is possible when an organization uses computer teleconferencing, this makes possible a type of communication that is more democratic in style and thus keeps open all the potential sources for insight into problem solving.

Noting that too often there is an overemphasis on quantification in the problem-solving process, the researchers felt that computer teleconferencing allowed the necessary space and time for subjective evaluation of the information along with consideration of statistical information. The *relevance* of facts and observations that have a bearing on decision making, they felt, must be weighed analytically. This is best carried out in a group setting rather than individually. Unlike other decision support structures, computer teleconferencing enables a group of people to communicate with one another in a structured way in order to analyze and make decisions about the raw data.

New Tools for Management

Teleconferencing's contributions to increased white-collar productivity can be summarized as creating the conditions noted at the beginning of the chapter that improve the quality of work life:

- Work assignments that are diverse, varied, and challenging enough to expand skills, abilities and knowledge.
- Programs to prevent skill obsolescence and to provide normal facilities for self-renewal and learning on the job, to keep the employee in pace with the organization.
- Work conditions that let people get involved with other people when carrying out their tasks and that have a positive effect on self-esteem and motivation.

- A climate that encourages openness, a sense of community, freedom from prejudice, and personal equality irrespective of rank in the hierarchy.
- An organization that encourages teamwork and group cooperation within and across organizational units.
- A workplace ambiance where the employee enjoys a feeling of belonging and being a meaningful part of the whole organization.

Teleconferencing makes available to management a new set of tools that can be used to upgrade the quality of work life that, in turn, has a positive effect on productivity. Teleconferencing makes it possible to:

- Broaden and synchronize communication.
 - Encourage communication to cross different units that are functionally separated parts of the organization and enable communication to bridge the gap that often exists between top-level management and system planners.
 - Allow a greater variety of viewpoints to be explored and enable expertise to be used creatively.
 - Increase scope and impact of decisions so that the organization can move into worldwide communications, research, production, and distribution.
 - Facilitate teamwork both within the organization and with other organizations involved in similar endeavors.
 - Improve and expedite the flow of information so that, for example, an organization can respond quickly to business opportunities and customer problems.
 - Improve quality of work life by allowing for greater participation, autonomy, and feedback.
 - Provide the opportunity to all employees to upgrade their individual skills through on-line training.
- Have shorter, better organized, and more effective meetings.
 - Introduce flexible management techniques that incorporate situational freedom by allowing personnel to be organized according to the needs of a particular project.
 - Centralize some functions, such as manufacturing and budgeting, and decentralize others, such as design, retail, and research.
 - Manage information so that the time intervals in between information processing, decision making, and action implementing can be reduced.

Rationalize the planning process by making problem definition easier, for example, and allowing a project to be tracked from inception to implementation.

Make available a wide range of expertise to broaden policy content, thus making policy more likely to be able to be implemented.

Provide an effective decision support system.

Provide a "place" where the planning community can meet, regardless of each individual's location.

Provide the design and modeling techniques that structure communications.

3

INTRODUCING AND INTEGRATING TELECONFERENCING INTO AN ORGANIZATION

INTRODUCTION

How can teleconferencing be successfully introduced into an organization? A noted expert on the role and impact of information in the U.S. economy suggests that the following steps should be taken in order to take advantage of the opportunities to invest profitably in new information technologies:

- Establish a fundamental policy of searching for such opportunities, evaluating them by rational cost-benefit criteria, and investing in them whenever an adequate rate of return is demonstrated.
- Create at a senior level a unified line management responsible for managing office systems, office equipment, electronic data processing, and telecommunication on this basis.
- Acquire the necessary analytical capability to do this well, including a capacity for retrospective evaluation to check on the profitability of the information technology investment, thereby institutionalizing a powerful learning process.¹

¹Michael Tyler, "Telecommunications and Productivity: The Need and the Opportunity," Mitchell L. Moss, ed., *Telecommunications and Productivity*, based

This chapter includes an in-depth discussion of all aspects of introducing and integrating teleconferencing into an organization, including answers to the following questions:

- Should our organization take a lead in testing and developing teleconferencing systems or should we wait for "proof" from other organizations' experiences?
- Where do we start?
- What are the experiences of other organizations?
- Will people respond positively to the idea of teleconferencing?
- How do we assess our needs?
- Should we hire outside consultants?
 - Once we get the teleconferencing system, how do we get people to use it?
- How do we determine if the teleconferencing system is successful?

SETTING THE CONTEXT

Many organizations, including hospitals, universities, and corporations, have already incorporated teleconferencing services into their organizations and dedicated rooms to teleconferencing use (see the following chart on those organizations that have made major videoconferencing investments). Their experience suggests that the two principal determinants of successfully introducing teleconferencing into an organization are (1) careful consideration of people's needs and attitudes during every phase of the process and (2) commitment of top-level management to the project. Consideration of these human factors translates into asking some "hard" questions about "intangibles," questions such as, "Whose interests are really served by teleconferencing?" and "Whose jobs are made more difficult?" Answering such questions at the outset of the project ensures that they are not posed later as criticisms.

People First

People are the principal determinants of the success or failure of a teleconferencing system. Time, interest, and money spent at the out-

on the International Conference Sponsored by the Center for Science and Technology Policy, Graduate School of Public Administration, New York University, January 29-30, 1980. Reading, MA: Addison-Wesley Publishing Company, Inc., 1981. p. 46.

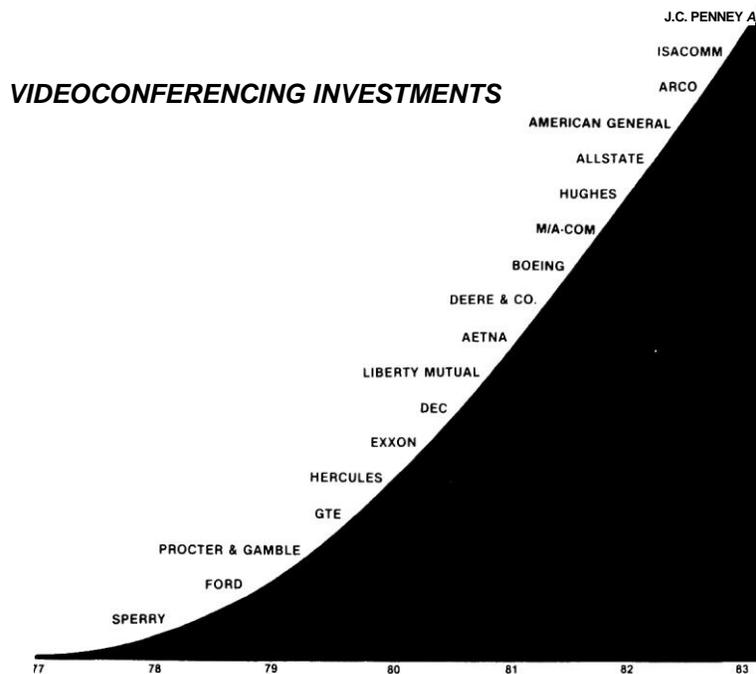


Figure 3-1 Videoconferencing investments. (Source: Green/Hansell, Satellite Business Systems)

set identifying people's expectations, experiences, and needs ensures that the teleconferencing system will be both useful and used. As one observer has noted,

The office, after all, is a people-oriented place. One of its major functions is service; it is the hub of an organization, and therefore operates as a communications center. This function revolves inextricably around people, and *any technological solutions must consider the intricate sets of relationships that have been established*. Human factors will ultimately determine the success or failure of implementing advanced office information systems.²

Teleconferencing is best thought of as a new service and resource available to people. As a service, teleconferencing should make an individual's ongoing tasks easier. It should offer an appealing alternative to more traditional ways of carrying out meetings. When people start choosing to use the new service because it makes their jobs easier, then organizational goals such as reduced travel costs and greater productivity can

²Dale Kutnick, "Office Automation: The Human Dimension," *Telecommunications*, September 1979, p. 80.

be successfully met. If teleconferencing is not introduced and promoted as a new service/resource and is, instead, simply mandated as a money-saving device, then many factors will impede its successful implementation. Professor Markus of the Sloan School of Management notes:

You can't ignore the human factor. You have to look at how the system will interact with the people who use it. Also, you have to look at the value and cost to the users, who benefits and whose jobs will be made more difficult as a result.³

What are the prevailing attitudes? Management should clearly perceive attitudes and expectations of potential users and have a precise idea of how teleconferencing can complement an individual's as well as the organization's goals.

Who Benefits by Teleconferencing?

When a new technology is introduced, its benefits are extolled to those who are *perceived* to need it most. Because the development of teleconferencing has, for the most part, been technology- rather than user-driven, manufacturers have been prominent in asserting who "needs" teleconferencing. They are prone to claim that managers and executives "need" teleconferencing to substitute for face-to-face meetings. They are also prone to claim that the best use of teleconferencing is for high-level managerial meetings. However, not all people need teleconferencing; teleconferencing cannot replace face-to-face meetings, and, as often as not, teleconferencing is most useful, and most used, at the production level, as the following example suggests.

Honeywell's top management, with few exceptions, are not regular users. "I think, basically, that their communication styles don't lend themselves to audio," Whiting observes. Among the "troops," however, teleconferencing is a popular way to conduct problem-solving sessions, staff meetings, or information meetings.⁴

Who, then, benefits and whose interests are served by teleconferencing? A realistic approach to answering this question is to step back for a moment and consider the obvious: an individual's interests do not necessarily parallel that of his or her organization. While the introduction of teleconferencing may have obvious advantages for a company, it

Quoted in David Stamps, "Firms Cautioned: Be Aware of MIS Impact on Users," *MIS Week*, December 17, 1980, p. 36.

"Honeywell's 'Least Package Approach,'" *Telcoms*, Vol. V, No. 1, January 1982, p. 5.

does not necessarily equate with a particular individual's interests. After all, who wants to give up such perks as travel, time away from the routine of a job, visits with friends and relatives, status associated with travel, and last, but not least, direct face-to-face contact with business associates? Many business trips are justified on the basis of conducting business, but they also include other itineraries such as meeting with friends and dining out. Additionally, as the table on page 78 indicates, the business trip usually includes more than the meeting or convention *per se*.

The concern that management might chafe at the idea of not being able to travel as frequently with the introduction of teleconferencing is therefore a real possibility and should be addressed. Peter Drucker, one of the inventors of American management thought, offers an insight regarding this issue that displays his expertise in the field. He argues that the first priority of managers themselves is to do their jobs and to do them well, not to travel:

You ought to talk to those division general managers. They run 60-million, 100-million, 200-million dollar businesses. They're bitter not just because of those frequent trips back East to the home office. But their real priority is to run those very competitive businesses they are managing, not to help the big boss back East run the overall business. They think this is gross mismanagement and they're right.⁵

People also wonder if, by using teleconferencing, they will lose "the personal touch" in communications. A personal touch in communications, however, does not equate with physical presence. Humaneness, rather than having someone in sight and within reach, is the key issue. Emotions and concern can be transmitted through the content of a message. Other factors should also be considered. Increasingly the participation of employees in a decision-making process and allowing the message to be received by them first-hand are ways that the manager can extend the personal touch. Those who would not normally be included in a conference, due to travel costs and lack of time, can often-times be a part of a teleconference. Stated otherwise, if there is no communication at all, there can be *no* personal touch. In this light, teleconferencing should be seen as an opportunity for increased personal communications. Additionally, users report that there is a democratizing effect in teleconferences. This means that persons involved in a teleconference tend to pay less attention to status of the participants and can therefore "get closer" psychologically to one another. For the recipients, those who would not normally be extended the opportunity

⁵ Peter F. Drucker, *Better Communications: What It Means to Management*. McLean, VA: Satellite Business Systems publication, no date, p. 6.

TABLE 3-1 Annual Frequency of Travel by Purpose

Trip Purpose	Percentage of Staff Who Report Traveling for This Purpose	Number of Trips per Year Made by Those Who Report Traveling for This Purpose	Number of Trips per Respondent	Implied Percentage of Total Trips
Attend convention	58%	3.2	1.9	7%
Attend training program	37	3.1	1.1	4
See vendors	18	9.7	1.7	6
See customers	36	21.8	7.8	28
Meet businesspeople in other organizations	41	9.1	3.7	13
Inspect local operations	34	13.6	4.6	17
See peers or subordinates	37	10.5	3.9	14
See supervisors in organization	28	6.4	1.8	7
Other	7	13.8	1.0	4
TOTAL	94%*	---	27.6	100%

From a survey of 9,619 business travelers by Bell Canada,

*617 people did not answer this question.

Source: Richard Harkness, *Technology Assessment of Telecommunications/Transportation Interactions*, Final Report, Vol. 2. Springfield, VA: U.S. Department of Commerce, National Technical Information Services, 1977, p. A-20.

to participate and communicate, these factors are certainly "personal touches."

Many people, especially high-level executives, nonetheless depend a great deal upon personal contact in the transaction of their business and are prone to carrying out business in this fashion as the following chart indicates:

TABLE 3-2 Average Number of Trips per Year by Level of Management

	Number of Respondents (N = 8,619)	Group as Share of Respondents	Average Number of Trips Taken per Year
President	1,053	11.6	35.6
Vice-President	790	8.7	38.3
Professional	270	3.0	26.2
Sales	101	1.1	62.5
Other	126	1.4	35.6
Upper Management	2,371	26.0	32.0
Middle Management	2,838	31.2	25.1
Lower Management	946	10.4	23.4
Nonmanagement	607	6.7	18.2
All	9,102		29.2
Average number of trips taken per year for surveyed population =			29.2

Source: R. C. Harkness, *Technology Assessment of Telecommunications/Transportation Interaction*, Vol. 2. Prepared for the National Science Foundation by the Stanford Research Institute, Menlo Park, CA, May 1977, p. A-21.

Moreover, sociologists have found that the higher a person goes in the hierarchy of an organization, the more important become the person-determined relative to the role determined, aspects of interaction. The *need* for face-to-face contact that is crucial to many business negotiations simply cannot be replaced by teleconferencing. Teleconferencing cannot provide the eye contact and the handshake that are basic, and often key, elements of a face-to-face meeting. It cannot provide the same type of *camaraderie*. Teleconferencing, in short, enhances rather than replaces traditional modes of communication.

The introduction of teleconferencing can also realistically be perceived by people as posing a career threat to them. If someone thinks that teleconferencing will upset the established lines of communication and the existing power structure within the organization, then he or she might look askance at the idea of teleconferencing. The introduction of new technology often makes people wonder if the "social

contract" is being surreptitiously changed. People typically fear what they do not know or understand. They fear that "this new-fangled" technology will bring with it a new set of rules that will upset the established lines of authority and communication. They fear that they will lose status and control and, as a result, fail in carrying out their responsibilities. Not surprisingly, such fears tend to be expressed in terms that aim to preserve the *status quo*: "This project demands that I go there in person and spend a lot of time convincing him," or "The new technology is depersonalizing, and it will mean that our sales won't have that personal touch." Such attitudes are real, but not necessarily realistic. That is, they reflect the distorted information that abounds in the promotion of any new technology. They cannot be overcome until a clear understanding and working knowledge of the technology is attained.

An individual may also be threatened by the introduction of teleconferencing because it presents a new set of demands: new techniques to be learned, preparation of graphics and scripts in advance of meetings, and a change of presentation style.⁶ When concern over the possibility of equipment failure, misoperation, and inadequate mastery of the media are added to all the other factors, it is not too surprising that some people have trepidations about teleconferencing. When they are given the opportunity to express their legitimate concerns, acquire the correct information, train in the use of the teleconferencing equipment, and develop the necessary skills, as well as see teleconferencing as a chance to consider specific personal and organizational benefits, however, they begin to understand teleconferencing for what it is: a new communications tool that can benefit them personally and professionally.

These notions are evidenced by a one-year study by Rockwell International and AT&T on the role of teleconferencing in the office of the future. According to Dr. Joseph Robertson, the director of advanced systems at Rockwell's Information Systems Center:

We were trying to see what we could do to get people to use teleconferencing. So, there was some testing of hardware, but it was predominantly psychology—finding out what we could do to motivate, to educate, to induce people to use simple teleconferencing. The result is, we can do anything, and it works.... All you have to do is lead the horse to water—show people that it's saving time and money, and beneficial results generally occur. You must sustain the use of teleconferencing through senior management endorsement, use and support. But, once it gets started, it becomes a self-fulfilling prophecy.⁷

⁶ Glen Southworth, "Does Teleconferencing Threaten Workers?" *Telcoms*, October 1982, p. 2, and discussions between Glen Southworth and Kathleen Kelleher, October 1982.

⁷ "Rockwell Completes Research," *Telcoms*, Vol. V, No. 2, Feb./Mar. 1982, P. 2.

TABLE 3-3 Teleconferencing Can Mean Different Things

	Positive	Negative
Individual Perceptions	<ol style="list-style-type: none"> 1. More personal and family time. 2. Less travel risk and fatigue. 	<ol style="list-style-type: none"> 1. Less travel and associated fringe benefits (including vacations, "expense account" living, visits with friends, etc.). Less status (as travel connotes status).
Career Concerns	<ol style="list-style-type: none"> 1. Teleconferencing "know-how" a valued skill. 2. Increased peer consultation and networking made possible. 3. Quicker and better informed decision making. 4. Conservation of personal energy that translates into productivity. 	<ol style="list-style-type: none"> 1. Loss of influences associated with face-to-face meetings. 2. Need to learn new technology and change one's style to fit the medium. 3. Perceived threat of teleconferencing to established lines of communication. 4. Fear of technology failure and consequent loss of "face."
Organizational Interests	<ol style="list-style-type: none"> 1. Productivity increases as a result of time savings, decision quality, and cost savings. 2. Decrease in opportunity costs that accrue to company if employees absent. 3. Improvement of company image as a "forward-looking" firm, corporate visibility. 4. Move from a reactionary mode to a pro-actionary, anticipatory one. 5. Creative options for new meeting formats. 	<ol style="list-style-type: none"> 1. Cost of teleconferencing system. 2. Teleconferencing is a different and sometimes more complex way of carrying out business that necessitates prior planning and design. 3. Training dollars and resources must be devoted to teaching personnel to use equipment effectively.

Involvement of Management

Teleconferencing is an investment in the operation and performance of an organization. It is important that leadership be involved in its planning and use. If top-level management clearly sees the benefits of teleconferencing and is visibly involved in teleconferencing, this sets the context for other users. There is a general consensus, in fact, that teleconferencing cannot be introduced successfully into an organization

without the support of high-level management. As Virginia Ostendorf, a training consultant, warns:

Be aware that all the planning possible will not succeed without a commitment to teleconferencing by top management. Both as a user and an advocate, the chief executive officer or president can assure either success or failure of the system.⁸

How does management become convinced that teleconferencing is a good idea? Experience suggests a number of ways. In some cases, teleconferencing has caught the fancy of forward-looking management based directly upon its own merits. In other cases, the key to sparking management's interest has been their competitor's use of teleconferencing. More frequently, however, teleconferencing becomes a good idea after someone in the organization becomes convinced of the advantages of teleconferencing and makes an irrefutable case to upper-level management.

The case for teleconferencing can be posed to management in the following ways:

- Frequent communication among remote sites is hampered by the mail or by time-consuming, costly, and/or difficult travel.
- There are problems in the flow of information, internally among staff personnel and/or publicly with respect to customers, association members, and so forth.
- There is a need for communication across functional lines.
- There is a need for meetings to include more people, happen more frequently, be better organized and of shorter duration.

Vague ideas about inefficiency and delay in an organization should be crystallized in the form of specific questions:

- How can we reduce travel and not lose contact with sales personnel in the field?
- If we decide to cut back on the travel budget, which trips could be avoided?
- How can we market our product with a limited budget?
- How can we train our people when we do not have the funds to fly them to headquarters?

Virginia A. Ostendorf, "Planning for Teleconferencing Implementation," a paper presented at the URISA 1982 Annual Conference on Urban and Regional Information Systems Association, August 1982, p. 3.

Posing specific questions with implied answers suggests that there is a solution: teleconferencing!

The "clincher" in convincing people that teleconferencing is a good idea is a good demonstration. Because the idea of teleconferencing is not always easy to grasp,, it needs to be concretized, that is, linked to teleconferencing technology through direct, "hands-on" experience. This experience is worth a thousand words and can be easily arranged. The following include some of the different types of options available:

- Workshops and seminars sponsored by vendors and users:
 - "Introduction to Teleconferencing": Sponsored by Business Communications Review, this two-day seminar, which is held periodically throughout the nation, introduces the new user to the business case for teleconferencing as well as providing an opportunity to learn about the different teleconferencing technologies.
 - "Teleconferencing": The Future of Business Meetings: Sponsored by Pergamon Infotech, this seminar is held in London, England, and emphasizes the case for teleconferencing internationally.
- Demonstration of dedicated teleconferencing facilities:
 - American Satellite Company (ASC) has a dedicated teleconference room in Rockville, Maryland, in which equipment options such as large- versus small-screen projection are demonstrated.
 - Satellite Business Systems has a dedicated video teleconferencing room in McLean, Virginia, which potential users can "try out."
 - Picturephone Meeting Service can be seen and tested in any one of the public rooms in several cities across the nation.
- In-house seminars
 - "In-House Teleconferencing Seminar": Sponsored by Cross Information Company, this one- or two-day seminar is designed to introduce teleconferencing concepts and technology to management and staff at their own place of work.

The advantage of a workshop or seminar is that the person attending has an opportunity to make contact with a broad range of vendors and users. The advantage of an in-house seminar is that many people in the organization, as opposed to one or two, have the opportunity to find out together about teleconferencing. This provides the opportunity for future users to brainstorm about applications for the organization as well as applications that will make their own individual jobs easier. The



Figure 3-2 American Satellite Company has a dedicated teleconference room in Rockville, Maryland. (Courtesy of American Satellite Company)

effect is that the idea of teleconferencing "sells itself." Finally, the costs of organizing an in-house seminar can actually be less than sending one or two representatives to a seminar, especially if the representatives have to travel outside the city and, upon return, spend a great deal of time trying to pass on the information that they acquired.

PROJECT INITIATION

Once management is convinced of the merits of the idea of teleconferencing, the next step is to get specific. Actual communications needs should be pinned down, specific goals stated, projected costs calculated, and determination of "who is going to do what" carried out. It is wise to appoint a committee to be responsible for the overall coordination of the project: definition of the project's goals; analysis of the communications inventory; and the design, implementation, maintenance, and evaluation of the teleconferencing system. When choosing people to serve on this committee, expertise of available personnel should be considered together with the social and political realities of the organization. Another crucial factor is that this committee have fiscal authority for the entire project, as this committee, ideally, will oversee the entire project, from initial research through selection of equipment and its integration with users' needs.

Expert Advice

Implementation of a teleconferencing system need not be a difficult or time-consuming exercise. Consultants and suppliers can be

called upon to assist in the planning and implementation of a teleconferencing system. Experience suggests, in fact, that this step should be skipped only at great peril. In this quickly changing field, few managers have the expertise to "do it themselves" successfully. The planning, engineering, and implementation of a teleconferencing system can be a complex process requiring expertise and experience in some or all of the following areas:

- Audio engineering/acoustical analysis.
- Telephone and satellite networks.
- Computers.
- Video compression techniques and television production.
- Human factors, executive interviewing.
- Ability to cost-justify a teleconferencing system.
- Equipment specification.
- Room design.

Given the range of expertise and experience necessary, it does not make sense to be penny-wise and pound-foolish. Allocating 5 percent of a projected budget for expert and objective consultation obviously makes sense.

Requests for information and proposals can be sent out to consultants. The request should clearly state the organization's present and future goals. These might be stated in terms of increasing the reach of the organization to, say, a greater number of students or business clientele, extending the organization's reach overseas, fostering a better public image of the organization, and so forth. It is the job of the consultant to propose specific, detailed plans for a teleconferencing system that will enable the organization to meet its goals. Experience suggests that it is neither wise to withhold information nor to provide the solutions that are being sought. The consultant should be provided the information he or she needs to draw up a specific plan of action. If consultants are told what solutions are being sought, this can force them into an approach with which they may be unfamiliar. In other words, the desired approach should be mutually-agreed-upon and not forced.

Generally, consultants should be knowledgeable about the different types of teleconferencing, and they should use teleconferencing in their own work. They should also be able to offer a broad product mix, with more options than could be offered by a manufacturer's representative. Consultants should, additionally, be experienced in the specific types of applications that are needed by the organization.

The responsibilities of the consultant include writing and guaranteeing a report for management. The report should offer feasible alternatives and detail projected costs as well as the potential for short- and long-term return on investment. Where applicable, the consultant is also responsible for designing and specifying equipment systems and facilities. He or she should also arrange and coordinate a specific application of teleconferencing that demonstrates the utility of the teleconferencing system. The following chart demonstrates one consultant organization's systems approach to introducing teleconferencing into an organization.

Initial Interviews

The initial interviews are an excellent "first cut" at determining the organization's communication needs. One-on-one informal interviews of a variety of personnel should be carried out by an objective interviewer, ideally a person who is not an employee of the organization and who is experienced in interviewing. Selected for being interviewed should be those people whose duties and interests are representative of the different functional areas of the organization. Generally speaking, both facts and feelings should be culled out of these interviews. The interviewer should determine potential user groups, learn how they do business, and ascertain their perceived communications needs. More specifically, *objective* information should be gathered about the following:

- Informal lines of communication, for example, how potential users actually communicate with one another (as opposed to what the flow chart depicts).
- Meetings: frequency; typical formats, objectives and patterns of interaction; how they are typically convened, chaired, and attended.
- Travel: frequency; typical destinations; whether it is intra- or extra-organizational, domestic or international, and so forth.

The interviewer should also be able to elicit *subjective* information from those being interviewed, that is, people's perceptions and feelings about, for example, the kinds of meetings that they think should occur but do not. An important purpose of these one-on-one interviews, in fact, is to be able to gather enough subjective information from which to draw up a relevant questionnaire that will subsequently be used in the communications inventory. The following kinds of subjective information should be elicited:

- Do people think that communication is effective at the present? Why and why not? What would they like to see changed? Do they

THE CONFERNET SYSTEMS APPROACH

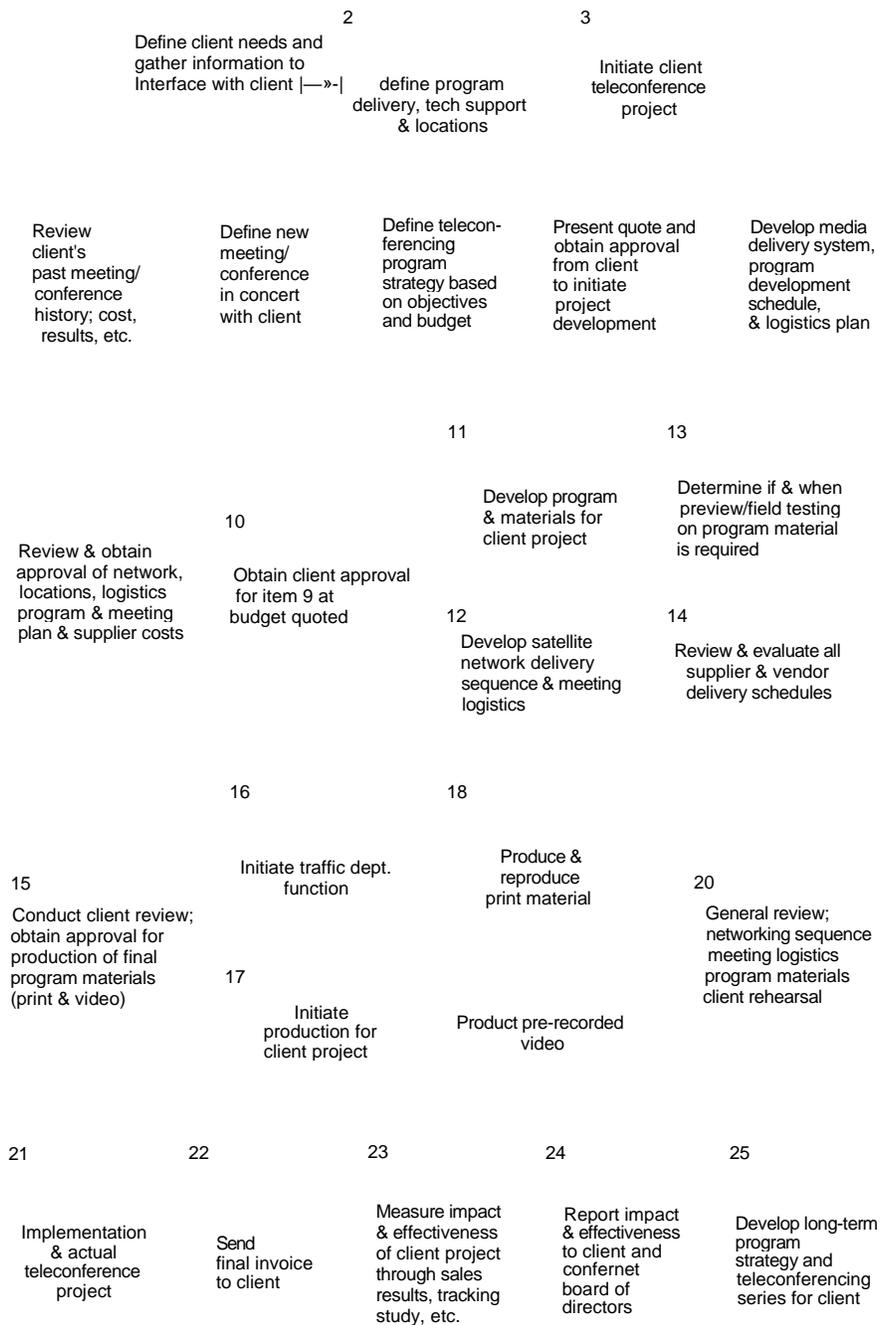


Figure 3-3 The ConferNet System Approach. (Courtesy: ConferNet International, Inc.)

ConferNet

perceive themselves and others as open to improving or changing their communication skills and patterns?

- What type of organization and "organizational style" do people think characterize their workplace? What are some of the typical mores of the organization (for example, deference according to status, nature of participation in projects, quality of interaction among peers, and the like)? How do people feel about the necessity for and quality of face-to-face interaction?
- What are people's overall attitudes and feelings about technological innovation and change? Office automation? Telecommunications in general and teleconferencing in particular?
- What types of projects would people like to be able to carry out with a teleconferencing system if they had one available? What types of features would they like to see included in the system?

Another purpose of these interviews is to ascertain people's familiarity with teleconferencing and whether or not teleconferencing would be received positively. The initial interviews can, in fact, be used to introduce the notion of teleconferencing in a nonthreatening manner. The benefits of teleconferencing can be discussed with potential users in such a way that they perceive personal advantages to them when they use teleconferencing to carry out their own duties and projects. The interviewer should, in fact, be prepared to suggest applications that are tailored to different individuals' specific needs. Finally, the interviewer should not expect complete understanding from potential users. What is most important is that those interviewed feel that they have had ample opportunity to express their needs and hopes and that their input will be important in determining the makeup of the teleconferencing system. The data gathered, even though acquired informally and aimed at discerning perceptions and informal lines of communication, should be as specific and accurate as possible about the number and types of meetings that take place in the organization, the incidence of travel, and the number of people involved as well as the nature of their involvement, because this information will form the basis of the report to management and the proposed business plan.

Business Plan

Goals of productivity, efficiency, quality of work life, better communication, and/or reduced travel should be established early on and as precisely and explicitly as possible. A *written* business plan should be submitted, discussed, evaluated, and reevaluated as necessary. The

written plan is important for both short-term decision making and long-term planning. The written report should:

- State the goals of the organization as specifically as possible.
 - Clarify exactly how the teleconferencing system will help accomplish the organization's goals.
- Detail projected costs and cost-justify the teleconferencing project.
 - Include budgets for personnel, equipment, operations, and maintenance.
 - Establish methods for measuring improvements in communication, reduced travel, and the like.

Agreement should be reached at the outset of the project on what is going to constitute "success" or "failure" of the teleconferencing project. Success can be specified in monetary, travel, communications, and/or management effectiveness terms. It can be determined through attitudinal surveys, random interviews, or by keeping track of when and how the equipment is used. Whatever the measure and the method, it should be mutually agreed upon at the outset of the project.

TABLE 3-4 Cost-Justifying Teleconferencing

Suppose your survey indicates an average of four people traveling from one site to the other for each meeting in an average of 1.5 automobiles. There are no other travel expenses and you reimburse the owner-driver at 20¢ a mile. For each meeting, travel costs are 200 (miles round trip) times 1.5 (automobiles) times .20 (cents a mile) or \$60.

Often the volume of meetings between corporate sites bears an inverse relationship to the distance between those sites. If your pilot program connected locations that were 1000 miles apart, the savings in travel costs could be many times this \$60 per meeting for each person, but one of your reasons for selecting these locations was probably the heavy volume of interaction between them.

Suppose your research indicates an average of 40 meetings a week between these sites, in several functional areas. (This volume of meetings between nearby corporate facilities is low, in my experience.) Teleconferences tend to be more efficient than face-to-face meetings, so the average meeting length might be no more than 90 minutes. Even running your system nine hours a day, 45 hours a week, could still accommodate only six such meetings a day or 30 of the 40 meetings a week.

In your business case, establish that the data indicate a greater potential for electronic meetings between these sites than one system can handle. Set 30 meetings a week (45 hours a week) as the achievable system goal. (People will come in early or stay a little late rather than drive 200 miles for a meeting.) Because management responds well to conservative projections, base your payback analysis on 20 meetings a week.

Your savings in travel costs will be \$60 (per meeting) times 20 (meetings a week) times 50 (weeks a year) or \$60,000 a year. This pilot program will allow you to evaluate the feasibility of installing similar equipment at more

TABLE 3-4 Cost-Justifying Teleconferencing (Cont.)

remote sites in the future. If this system allows your people to communicate effectively with a facility 100 miles away, there is no reason to expect it to be less effective for communication with Japan, Sydney or the Near East, where the savings in travel costs will be extremely valuable. With sites that are more than a few hundred miles apart, some corporations can save several times the cost of the teleconferencing system in less than a year.

Let's consider the savings in management time. Suppose the 200-mile round trip between selected sites represents four hours of travel time. This is an average of four hours lost per trip by each engineer, manager or other professional who must travel between these sites for meetings. Put a dollar figure on the average hourly costs of a manager's time. For example, an accepted figure for a corporate engineer's per-hour cost is \$50. Whatever figure you use, make certain it is one that will be acknowledged by management as reasonable.

We established that the meetings these people travel to attend run 90 minutes on average. So with a round trip of four hours for each 1.5 meeting hours, that's 2.6 hours traveling for each hour spent in a meeting. The value of this lost time is $2.6 \times \$50 = \130 per person per meeting hour.

For each meeting hour there will be a savings of \$130 for each of four people or \$520 per hour. When you establish a value for the savings per hour, show a chart of the yearly savings that different levels of room use will generate. For example, 20 hours of system use a week is conservative, yet it's worth \$520,000 in a year. Your projected estimate of 20 meetings (90 minutes each) or 30 of system use a week could yield \$780,000 in savings. This is more than enough to pay for the very best in teleconferencing facilities.

Just because you find good return-on-investment justification, don't stop looking. For example, the survey also might disclose that most of the people who travel to these meetings were interested in one or two of the items on the agenda. Teleconferencing could allow them to attend only portions of the meetings.

In a 90-minute meeting with four participants who travel to a remote site to take part, they could spend $1.5 \times 4 = 6$ man-hours in that meeting. In a teleconference of the same length, one of the participants could spend 90 minutes and the others could spend 30 minutes each for a total of three hours. For each 90-minute meeting involving four people who travel, an additional three hours of management time can be saved with teleconferencing. The value is: $3 \times \$50 = \150 per (90-minute) meeting or \$100 an hour. Combining this with the \$520 savings gives us \$620 per-hour savings. Build a second chart showing this total savings under various system-volume loads.

Source: Robert Keiper, "What's Needed to Justify Corporate Teleconferencing," *The Office*, November 1982, pp. 48-50.

THE EVALUATION PROCESS

Managers often have *general* perceptions about "too much travel," "wasted management time," and so forth. Meaningful decisions regarding these issues, however, must be based on *specific* information. When an organization is planning to introduce teleconferencing, the following considerations should be kept in mind:

Uses and applications at all levels, from clerical to managerial, as well as those that cross organizational functions.

The total information and communications network, both internal and external.

Procedures and controls that will measure and evaluate teleconferencing and the impact it has on the organization.

Methods for Gathering Information

It is critical to assess as carefully as possible the needs of the users. They are the reason why the teleconferencing system is being installed. Various techniques can be employed to confirm the findings of the initial user survey and to identify more precisely the organization's formal and informal patterns of communications, attitudes of individuals, and communication flows across functions and hierarchies. These include:

- One-on-one interviews
- Cost-benefit justification
- Case studies

One-on-one interviews: Good managers, or interviewers, know how to get their employees to talk about their problems. This cannot occur in casual encounters. The ideal situation for this to take place is in a one-on-one interview that has been arranged in advance, scheduled to last at least one hour, and set up to take place in the employee's office. The interview should have as its main goal discerning the issues and problems that are paramount in the employee's mind rather than promoting the idea of teleconferencing. The purpose of these interviews is not to determine which teleconferencing systems people should feel should be implemented, but rather to gather as accurate a picture as possible of the meeting and communication patterns, as well as employees' satisfaction or dissatisfaction with the *modus operandi*. Employees should be encouraged to bring up potential problems, even if they are intuited and not yet tangible. The one-on-one interviews should be used, in short, to determine who will actually benefit by teleconferencing, who might be threatened, and whose jobs might be made more difficult. Addressing these issues at the outset will prevent them from arising later as intangible blocks and constraints to implementing the teleconferencing system.

Cost-justification model: A more empirical method for determining teleconferencing needs can also be employed. Richard Harkness and

Peter Burke, researchers with Satellite Business Systems, developed a method for estimating the potential demand within an organization for teleconferencing. Drawing upon the body of research conducted by the Communications Studies Group at the University of London between 1970 and 1975, Harkness and Burke established criteria to determine which meetings can be effectively substituted with teleconferencing. They then collected data about four major U.S. corporations by means of survey questionnaires. Over 4,000 validated questionnaires were filled out by business travelers and included information regarding different aspects of their travel and meeting schedules. The criteria for substituting teleconferencing for face-to-face meetings was then applied to the collected data. This allowed the researchers to be able to predict, with a degree of statistical accuracy, the demand for teleconferencing within an organization in terms of hours per year, given variations in the number of remote sites and the number of participants. The researchers then devised the Teleconferencing Cost Model for use after data collection and computations are complete. The Teleconferencing Cost Model produces a series of reports that include key demand and benefit totals, travel matrices, and meeting and trip statistics. Other factors that would have to be considered in conjunction with the general demand model would be the organization's particular policies and specific attitudes of management.⁹ (See box, "Cost-Justifying Teleconferencing.")

Case studies: A third approach is to draw upon the experiences of organizations that have had some years of experience with teleconferencing. Ian Young, a professional researcher and consultant who gained experience in implementing the audio teleconferencing systems for the British Civil Service, emphasizes that introducing teleconferencing into an organization is tantamount to introducing change into people's work habits. Assessing how work patterns have changed with the introduction of teleconferencing into some organizations can prove useful to other organizations that want to benefit by mistakes already made.

Based on a careful analysis of the introduction of teleconferencing into the British Civil Service, Young notes how, as is often the case with large organizations, the need for teleconferencing was related to a "crisis." In this case, it was the inability of the British government to be responsive to client needs, perceived as overcentralization of the government in London. Once the decision was made to decentralize and utilize teleconferencing, the problem became one of convincing people of the value of their own time. Lower-level staff personnel had to be made

⁹"Model Used to Predict Teleconferencing Demand," *Telcoms*, July 1982, P. 2.

aware of the value of their own time before they could assess their "need" for teleconferencing.¹⁰

Case studies should obviously be sought in which functions, clientele, organizational structure, and the like, parallel as closely as possible that of the organization attempting to assess its own communications needs. The advantage of case studies over other methodologies, as the above example illustrates, is that they turn up issues that cannot be perceived in advance and that would therefore probably not make their way into a communications inventory questionnaire or survey.

Communications Inventory

As communications is integral to an entire organization, not just the responsibility of the staff in charge of communications, a systems approach to analyzing communications should be followed. Communications represents the largest share of most organizations' budgets. Managers are usually astounded to learn the extent of time, money, and support resources that their organizations currently expend on meetings. When managers begin to appreciate the cost of communicating and the economical alternatives available to them, they will be better able to assess the relationship among costs, communication needs, productivity, and efficiency. An analysis of the communication patterns of an organization should prove beneficial whether or not teleconferencing is ultimately implemented.

A complete "audit" of communications would include analysis of the frequency and nature of communications with respect to:

Modes of Communication

- Voice
- Data
- Image
- Graphic

Modes of Transmission

- Private lines
- Public networks
- Private microwave links
- Cable television channels or local area networks
- Satellite channels and other new technologies

¹⁰Ian Young and Jim Birrell, "The Implementation of Teleconferencing: Some Lessons Learned," EIU Informatics monograph, The Economist Intelligence Unit, London, no date.

Rates of Transmission

- Low speed (less than 600 baud)
- Medium speed (1,200 to 9,000 baud)
- Wideband (over 19.2 baud)

Terminals

- Data
- Teletype
- Facsimile
- Word processing, computer, microcomputer
- Telephone

Switching

- PBXs
- Packet switching
- Front ends
- Message switching

*Data Line Configurations,
Types, Quantities*

- Analog, digital
- Private, switched
- Simplex, duplex, half-duplex
- Point-to-point, multi-point
- Synchronous, asynchronous

The Communication Network

- Internal
- Regional sites, subsidiaries, overseas branches
- Customers, audience, or membership
- Other business and professional connections

The Information Network

- Access to information
- Storage of information
- Transmission of information
- Information float

Who are the main users of x information?

- How is the information used?
- Where are the users located?
- Are the user's needs time-sensitive?
- What is the typical response time to x information?
- How much and how quickly must the information be moved?

The Meeting Matrix

- Time required to plan
- Types, numbers, and relative importance
- Need for and use of graphics
- Nature of interaction

The Travel Matrix

- Frequency
- Where to, distances
- Exact departure and return times
- Attitudes towards travel
- Opportunity costs of having people away from the office

Cost Analysis

- Telephone expenses
- Mailing costs
 - Travel expenses, including actual (not only budgeted) expenditures for automobile expenses (both local and remote); aircraft rentals, fares, baggage charges; entertainment, tips; hotel room, meals; public transportation, parking; telephone tolls; interest lost on travel advances and on prepaid deposits; unexplained expenses; cost of time spent on travel

Communication Analysis

In-depth analysis of the information that is gathered in the communications inventory can be even more complex than the process of gathering it. The first step is for the manager, consultant, or coordinating committee to determine the following for both present and future needs:

- Voice loads
- Data rates
 - Time profiles of use of equipment per day, month, year, seasonal changes

- Typical and emergency response times
- Traffic distribution across departments
- Typical network configurations
- Costs
- Site changes

It is not an easy matter to make judgments about what the present and future communications picture should look like. This is a matter of discerning when, how much, and in what way teleconferencing can be effectively used, as well as by whom and in what circumstances. It will require that people estimate their future communications needs and that the manager, consultant, or the coordinating committee *judge* whether, given the stated goals of the project, the estimates are realistic. In addition to the quantitative communications analysis, the relationship between the organization's management concepts and its communications goals should be considered. These relationships are outlined in their most general form by Harold P. Zelko as the following:

TABLE 3-5 The Relationship Between Management Concepts and Communication Goals

Today's Management Concepts

Leadership	~\	These concepts, directed toward the following <i>communication goals</i> , can help produce maximum achievement:
Teamwork		To instruct and inform
Recognition		To achieve understanding
Participation		To consult and listen
Permissiveness	y	To motivate and persuade
Planning and control		To solve problems
Consultation		To make decisions
Delegation		To provide participation
Decision making		To develop teamwork and a sense of group goals
Counseling		
Development of the right climate	y	

Source: Harold P. Zelko, *The Business Conference: Leadership and Participation*. New York: McGraw-Hill, Inc., 1969, p. 11.

More specifically, the following types of qualitative issues and questions should be carefully considered:

- What is the desired image of the organization?
- What is the philosophy and style of the organization? Is it one in

which there is a relaxed, "shirt-sleeve" approach that results in friendly work sessions? Or, is it a contentious atmosphere with many opposing viewpoints?

- What is the context in which the organization acts? Who is the audience (clientele, customers)? What is the position of the company in the market?
- What is the preferred social atmosphere of the organization? How much opportunity for interaction should be provided? What is the optimum method of communication for people with same/different jobs and status in the organization?
- What is the preferred management style of the organization? How much should a manager consult with others to obtain information, special knowledge, and judgments? How much external participation in management is desirable? How should teleconferencing networks be organized in order to keep a degree of authority and to give clear direction, delegation, and instruction?

Finally, the types of judgments required about the use of teleconferencing must ultimately be balanced with practical concerns, including time, money, the need for immediate decisions, and the responsibilities of the manager.

DESIGN FACTORS FOR A TELECONFERENCING SYSTEM

The analysis of the communications inventory together with the overall goals of the organization should establish the desired communications milieu and network. The following information must also be gathered for the design of a teleconferencing system.

- How many locations are there (present/future) that need to be connected and what are the distances among them?
- Are the sites located in large or small communities, suburban or rural areas? Are there overseas sites?
- Are the premises owned or rented?
- If the premises are rented, can a satellite dish be installed?
- Can all selected locations support private rooms?
 - Will the teleconferencing system link specific, predetermined locations, or should it be widely accessible?

- Will there be permanent installations, or will portable equipment be more useful?
- How frequently will the system be used?
- What switching capability is required?
- What level of transmission quality will be acceptable?
- What are the budget limitations at present?
- What degree of security is required?
 - What type(s) of graphics exchange are deemed necessary; for example, is full-motion video required or will slow-scan television suffice?
- How many participants will usually be at each location?
 - What meeting format is typically used? Events, presentations, lectures, cross-functional meetings, peer-group meetings for information exchange and idea generation?
 - What type of facilities are most appropriate for the various communications needs: executive, management, or portable?
- How will the requirements change across time?

The design strategy for a small organization will obviously be quite different from that of a large or complex organization with extensive communications needs. Designing a teleconferencing system for a university is also quite different from designing one for a local chain of stores. The users' specific needs should always be the primary consideration.

COST RECOMMENDATIONS

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The business report will have to be made more specific and detailed once the communications inventory is completed and the design factors have been specified. The presentation should include financial analyses comparing present and proposed systems. Financial factors that should be revised and updated include:

- Projected equipment expenses.
- Estimated development expense.
- Return on investment.
- Payback period.
- Inflation factors.
- Length of project development.

EQUIPMENT SELECTION

Once the site evaluation has been completed, selection of the appropriate equipment is a matter of matching communications patterns to teleconferencing technologies. Thought should be given to maximizing aspects of the technology that will eliminate some of the traditional constraints to good communications, as Birrell and Young suggest.

We need to be designing teleconferencing systems which will be an aid to the meeting process, at times cutting across conventional meeting habits where they are unproductive. Too often teleconference design has been motivated by the desire to replicate the face-to-face meeting. We should be considering more deeply whether the face-to-face model is really so very valid.¹¹

Selection of the appropriate technology can be ensured by taking the appropriate steps. These include some or all of the following:

Test a teleconferencing system. Changes can be quite expensive once a large working network is installed. Small-scale pilot trials that are carefully monitored and evaluated are recommended. Teleconferencing can be introduced with less risk on an experimental basis. It can be tied to one project, and the results can be clearly demonstrated. This takes the burden of success or failure off the shoulders of the person whose idea it was to introduce teleconferencing. A pilot project also gives users a chance to allay fears that stem from misinformation or lack of information about teleconferencing.

If the pilot project is to be worthwhile, there must be a meaningful commitment to it from management. The commitment must be in terms of time, as people need time to learn new skills; resources, as staff needs to know that the success or failure of the pilot project does not equate with the success of their own jobs; and follow-up analysis, including open discussion among all potential users.

Choose design according to needs. Because communication is a process and not an event, the user should consider how teleconferencing can aid in the overall communication process across time. Consideration should be given to the best combination of technologies across time and across different types of projects.

Users' needs should determine network design and equipment selection. Costs should be considered only after users' needs are clearly specified. Users' needs change across time, and therefore flexibility in

¹¹*Ibid.*, p. 447.

changing or enhancing the system at some future point should be a paramount consideration. The design should establish the quantity and location of all facilities and ports, the network structure, the voice, video, and data transmission networks, and how the equipment will interface with other office automation equipment and services.

Work with a systems integrator. There are numerous components on the market. They vary considerably in terms of cost, quality, and capabilities. The challenge is to determine how the technology can be adapted to best fit the needs of the organization. Deciding which is the best system is a matter of matching present and future communication needs with the overall goals of the organization. An experienced systems integrator can eliminate a lot of chance and error in the complex process of matching communications needs with appropriate equipment and room design, but only, of course, if his or her "track record" is good. Before selecting a systems integrator:

- Speak to his or her clients: Does the teleconferencing system satisfy the communications needs? Did the systems integrator offer them feasible alternatives in room design and equipment selection? Did the work proceed according to schedule? Were there cost overruns? Was the systems integrator prompt in paying the vendors?
- Look at the finished teleconferencing rooms: Do they seem appropriate for the working style of the organization? Are they professionally finished or do they appear slipshod?
- If possible, use one of the teleconferencing rooms: Are they easy to use? Is there any problem with audio transmission?

The location of teleconferencing sites, for example, domestic or foreign, metropolitan or rural, and the distances among them have an impact on transmission and accessibility. A systems integrator can be especially useful in providing information and advice about transmission media and codecs. (Transmission is moving the signal from one point to another; codecs compress the signal bandwidth so that lower and less costly bandwidth is required for transmission.)

Because there is (at present) no compatibility among codec vendors, an experienced systems integrator can provide invaluable advice about selecting codecs. Factors in codec selection include:

- Transmission speeds
- Transmission protocols
- The installed base
 - of manufacturers
 - of particular model

- Ability to upgrade/modularity
- Motion-handling capabilities
- Graphics transmission impact
- Encryption/security options

If an organization plans to connect domestic sites with overseas sites, there are further considerations that require expert advice. Foreign countries maintain stricter controls over transmission. Typically, the foreign government owns all transmission facilities, and the government must approve all equipment. The only way of minimizing error here is to consult with someone who has actually dealt with the foreign country in question.

Choose a first-class audio system. Wilkens and Plenge, German researchers, carried out a carefully controlled study in which two studios were prepared, and audio connections and moving-picture-supported audio conferences were examined in trials. Sound connections were varied with respect to number of channels and bandwidth/transmission processes. Picture conferences were varied with respect to sound connection, transmission bandwidth, number of channels, and type of representations. The researchers concluded that "good sound transmission is more important for better identification and communication than expensive picture transmission."¹² Their findings support the general wisdom that audio equipment should be the best.

Take an evolutionary approach. The most appropriate technology for the organization's various needs across time should be purchased. Initially, a superb audio system should be acquired. Additional components and other teleconferencing equipment can be added as needed and as the budget allows.

The consultant should provide a list of equipment that can be added on in the future and note:

- Its compatibility with initial equipment.
- How it can be merged with other automated office equipment.
- Future applications.

There have been dramatic reductions in storage, data, and transmission costs. Initial equipment purchase should be planned as an information processing system that includes computing, data processing, word processing, and communications.

¹²H. Wilkens and G. Plenge, "Teleconference Design: A Technical Approach to Satisfaction," *Telecommunications Policy*, September 1981, pp. 216-225.

PROJECT IMPLEMENTATION

The measure of success of the teleconferencing system is repeated use of it. This can be ensured by promoting the system, training people to use it properly, and carrying out an ongoing evaluation about how it is being used.

Promote teleconferencing. Once the technology is selected and before construction of the teleconferencing room is completed, the teleconferencing system should be introduced and promoted to users. Promotion should be handled in the same manner as introducing a new product. Help should be sought from the graphics and marketing departments in order to package the new system. A good promotional device is to give the teleconferencing system an identity by naming it. Then posters can be made and the system promoted in company magazines and newspapers. Posters and other promotional devices should include telephone numbers for further information.

The best promotion of teleconferencing is word of mouth. For this reason, it is important that the first users or advocates are well-respected, visible members of the organization. Who within the organization should play the advocacy role? The best advocate is the chief executive officer (CEO). It is a good idea to make a video in which the CEO expresses his or her support of the teleconferencing system and then use this video as an introduction to all training sessions. In addition to the CEO, the first users will have a long-term impact on how



Figure 3-4 A poster promoting teleconferencing: "On second thought, maybe we should have done a teleconference."

the system is perceived and used by the user "culture community." Persons who are respected, open, personable, and who have a specific project in mind should be chosen. The best advocates generally are *not* those people in the organization in charge of telecommunications. Their expertise is in a technical area, not in promoting a new idea. Unless people are chosen who can be strong advocates and devote time to creating a positive user community, the success of the initial teleconferencing effort will be put in jeopardy. Enthusiastic and gregarious people are the best ones to diffuse the concept of teleconferencing throughout the organization.

Other promotional devices include:

- Notices clipped onto airplane tickets of those traveling to meetings.
- Posters.
- Notices on bulletin boards.
- Demonstrations of the equipment.
 - Interviews with individuals to discuss how one of their meetings could be teleconferenced and how this would be done.
- Incentives and reinforcements.

In promoting teleconferencing, there should be less emphasis on replacement of meetings than on how teleconferencing can facilitate individual tasks. The publicity should focus on how typical meetings can be teleconferenced. New applications of teleconferencing should be written up and circulated for all to read about and possibly incorporate into their own jobs.

Teleconferencing systems need continual maintenance support from the organization. Organizations should make the commitment to provide the necessary resources that ensure that the teleconferencing system continues functioning. Resources include a staff that can provide advice, train new users, help organize teleconferences, as well as equipment that is accessible, maintained, and dependable.

Train users. Teleconference training is not merely learning how to operate machinery. If someone does not understand how to operate the machinery, however, that person will not gain the confidence to go on and use teleconferencing to its fullest extent. The goal is to make people feel comfortable so that they can carry out meetings in much the same way they always have (and even improve communication effectiveness). Using teleconferencing equipment should seem as natural as using the telephone. Training should be carried out on-line, and not attempted in advance of the system being established. Virginia Ostendorf, a training consultant, notes:

People are eager to talk about teleconferencing; they are less eager to experience it. If you train in advance, the subject matter is totally theoretical. However, if you use the training class as a positive teleconferencing experience, you will show the students by example and they will experience the challenge of non-visual or limited visual communication.¹³

Training people leads to widespread user acceptance. Time and money spent on a training program will be recouped by higher and broader utilization of teleconferencing in the organization. People become successful users, leading successful teleconferences much more quickly than they would without training. Additionally, a study by Satellite Business Systems found that the trained users were those most likely to report the greatest gains in productivity and efficiency.¹⁴

The best training leaders do not focus on the technology *per se*, but rather emphasize that teleconferencing is a process of communication that can enhance just about any task that involves communication. People chosen as the training leaders should be sensitive to new users' experiences, give credence to everything that they say, and also understand that people's negative attitudes and concerns stem not only from misinformation and lack of information, but also from pragmatic and realistic perceptions of how their offices actually work (and don't work). The training leader should:

- Provide a "safe" environment so that potential users can speak openly about their fears, lack of information, misinformation, and ask any questions that may occur to them.
- Give people the opportunity to discuss all their perceptions, past experiences, and knowledge of teleconferencing.
- Give people an opportunity to brainstorm, letting them initiate a discussion of how they think teleconferencing could be incorporated into different projects specific to the organization.
- Pay close attention to comments of persons who are learning to teleconference in order to ascertain exactly how teleconferencing is applicable in their organizations. Problem areas should be analyzed in greater depth: by project type, personnel, and the like, and specifics should be discussed.
- Discuss the advantages of teleconferencing from the user's perspective. Include an analysis of what he or she could gain personally as well as professionally and how teleconferencing could be used for a certain type of project in which he or she is generally involved.

Virginia A. Ostendorf, *op. cit.*, p. 3.

¹⁴Kathleen J. Hansell and David Green, "Train Users if You Want Them to Return," *Telcoms*, Nov./Dec. 1982, p. 2.

- Be realistic. Discuss disadvantages too. Let the user have enough information so that he or she can judge accordingly.
- Use case studies that are analogous, relevant, and easily compared to the user's profession and role in the organization. Demonstrate how teleconferencing has been used effectively in one situation with which the user is very familiar. Separate out the different advantages of teleconferencing, for example, increased project coordination or quicker decision making, and show how this has facilitated others who are in the same role or profession.
- Educate users about technology. Familiarize them with each piece of equipment and how they are linked together so that they will know exactly what to do and will feel completely confident during a teleconference.
- Teach backup steps so that users will know what to do in case of technology failure and know how to continue carrying out a conference with lessened capabilities, for example, audio only.

A variety of training resources can be provided for each step of the learning process.

For Getting Started on the System

- Teletraining workshops.
- "How to" booklets.
- Audio and video cassettes that "talk" the user through each step.

*For Explaining the Way
the Overall System Operates*

- Manufacturers' booklets.
- The organization's adaptation of manufacturers' guidelines.

For Applying the System to User Needs

- One-to-one discussions with trained staff.
- Booklets that contain relevant case studies.

There is no substitute for "hands-on" experience. Initially, people see the new technology as a gadget or toy. To become familiar with the teleconferencing system, it is a good idea to "play" with the system, easy enough as the technology is usually self-explanatory or "user friendly." People will quickly discover how this new "toy" can be best put to use for their own needs.

The success or failure of a teleconference is directly related to people's ability to communicate effectively. After the introductory

period of training when people are getting familiar with the nuts and bolts of the new equipment, there should be provided to users an opportunity to improve upon their communication styles. Through practice, feedback, and self-evaluation, users can learn to become effective communicators, a necessary ingredient of all successful teleconferences. Training in communication effectiveness should focus on the following types of issues:

- Verbal communication: rate of speech, clarity of expression, intonation and volume of speech. These can be improved upon significantly through practice in front of a group or by using tapes.
- Nonverbal communication: eye contact, body language, facial gestures, effective (versus distracting) body movements. These can be analyzed and improved upon by using video tapes.
- Interactive communication: asking leading questions, using active listening techniques, learning to summarize what others say, and so forth.
- Overall assessment of communication style: Does it build confidence? Does it seem straightforward? Does it connote enthusiasm?

Simulations and games should be provided so that the teleconferencing medium can be learned as an interactive communications process, and not as a push-the-button technical feat. Teleconferences among workshop participants should be carried out so that they can get the sense of an actual teleconference. Participants should evaluate themselves and each other in a friendly environment.

Evaluate and audit teleconferencing. Evaluation should be ongoing from the outset. Ultimate success depends upon a good starting base, one that is established early. When the basepoint is known, change can be easily measured and evaluated. User surveys, *ad hoc* committees, and informal conversations are useful methods to determine:

- How do people perceive and adjust to teleconferencing?
- How is communication affected?
 - How does teleconferencing affect the duration and organization of meetings?
- Who uses it?
- How do they use it?
- Can other people be brought into the process?

Analysis of the information gathered should lead to the redesign of work and information flow so as to incorporate not only new technology but new approaches to communications. After the information/communication evaluation, the organization should:

- Scrutinize routine administrative tasks to ascertain which communications procedures can be teleconferenced.
- Develop methods for new management of techniques via the teleconferencing system.
- Encourage users to draw upon their expertise to design innovative teleconferencing applications.
- Create new networks, both internal and external.
 - Take a flexible, creative approach to decision making by establishing cross-hierarchical teleconferences.
- Start experiments in information management.
 - Set aside one project and illustrate how teleconferencing can be used in any one of a number of creative ways, for example, as a decision support structure, as a means of monitoring a project, and as a way to keep people in touch between meetings.

Teleconferencing usually makes people more aware of their own communication styles as well as the typical patterns of communication in their organizations. Once people become sensitized to the interactive nature of teleconferencing and the interactive nature of *effective* communication, two things can happen: (1) the flow of communication in the organization will improve significantly or (2) people will become frustrated because they are now aware of how communication in the organization is blocked by barriers built into the structure of the organization itself.

CONCLUSION

The process of choosing and implementing a teleconferencing system leads to a greater awareness of the formal and informal patterns of communication in an organization. Constraints to effective communication become more pronounced as the organization takes inventory. It should be remembered that teleconferencing is not a panacea for organizational inefficiency. Productivity gains come only as a result of redesign of social organization to maximize the use of new technology. Given this

caveat, it is safe to say that careful consideration of the following issues will ensure that teleconferencing is successfully introduced and repeatedly used:

- People's needs should be considered first, last, and always because the crucial issues are human, not technical.
- A teleconferencing system is most successfully implemented if it is considered to be a new service, rather than new equipment.
- Involvement and support of top-level management from the outset of the project increases significantly the likelihood of success of the teleconferencing system.
- Objective expertise should be sought.
 - Expectations of potential users, for example, their perceptions of status and travel, must be carefully considered at every stage of the process, from initial planning to system design.
 - Interested parties should participate in a teleconferencing seminar or workshop beforehand, gain some "hands-on" experience, carry out a pilot project.
 - Design of the teleconferencing system should reflect actual needs of users.
 - Regardless of which type of teleconferencing system is chosen, the audio transmission should be of the highest quality.
 - Take an evolutionary approach. The most appropriate mix of technologies should be purchased for the organization's needs across time.

4

A GUIDE TO SUCCESSFUL TELECONFERENCES

INTRODUCTION

A successful teleconference can save money and create time by bringing together the right people with the right information at the right time. Without integrating guidelines for conducting a good meeting, however, a teleconference cannot increase efficiency or productivity. This is best illustrated by an example.

Some time ago, top managers in Control Data Corporation (CDC) mandated a corporation-wide 10 percent cut in travel budgets. They inaugurated a 24-port bridge developed especially for their needs and began to use the bridging service extensively. In the first quarter of 1981, the bridging service conducted about 750 teleconferences. In assessing their use of audio teleconferencing, CDC management reported the overall success of the technical aspects of audio teleconferencing but noted that there were problems with how to hold effective meetings:

One of the areas where we see the biggest deficiency is in lack of organization, how to conduct a meeting. We need to do a more thorough job in training people not only how to use the equipment, but how to conduct meetings with teleconferencing.¹

¹ "Control Data Copes with Travel Budget Costs," *Telcoms*, Feb./Mar. 1982, pp. 4-5.

The strategies that are discussed in depth in this chapter that should be kept in mind when organizing a teleconference include the following:

- Plan ahead.
 - Match communication needs, meeting format, and teleconferencing technology.
 - Be creative with the program, varying program format (interviews, speeches, and so forth) and production techniques (cutaways, special effects, graphics, and the like).
- Emphasize importance of good communication skills.
 - Create a shared electronic space with a common purpose, visuals and documents.
 - Communicate the information by presenting it well, using graphics whenever possible.
 - Encourage interaction among teleconference participants: motivate them to speak up and interact with participants located at other sites.
 - Have a clearly defined agenda and a strong chairperson who will stick to it.
 - Consider each site a separate meeting with one person in charge of each site.
 - Ensure that the teleconferencing room is a conducive environment, free from noise and distraction.

ASKING THE RIGHT QUESTIONS AT THE OUTSET

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What makes some meetings more effective and productive than others? The most successful meetings are designed from the outset to maximize communication. Maximizing communication in a teleconference means that the following should be carefully matched:

- Purpose of the meeting.
- The audience.
- Format of the meeting.
- Characteristics of the technology.

#### **What Is the Purpose of This (Electronic) Meeting?**

People meet in order to communicate. To "have a good meeting" generally means to have good communication. Good communication means delivering the message in such a way that it (1) makes sense and

(2) people receive it well. Good communication, in other words, is made up of both logical and emotional aspects. With these considerations in mind, Harold Zelko, in his book *The Business Conference: Leadership and Participation*,<sup>2</sup> a work that can serve as a useful guide for organizing and conducting teleconferences, argues that the goals of a conference are best envisioned as "communications objectives." In other words, the accomplishment of a specific task, such as the boss making a decision about how to allocate funds, should be considered together with the need of the boss' managers to participate in the decision-making process. People have a "need" to participate and be recognized. In this case, it is especially important to include in the decision-making process the people responsible for implementing the decision. Zelko illustrates how logical goals and human needs are intertwined and cannot be separately considered:

**TABLE 4-1 The Relationship Between Logical and Human Needs and Communication Objectives**

| Logical Needs                     | Human Needs          | Communication Objectives     |
|-----------------------------------|----------------------|------------------------------|
| Consultation, to seek:            | Recognition          | Exchange of information      |
| Knowledge                         | Individual emergence | Achievement of understanding |
| Information                       | Participation        | Exchange of opinions         |
| Experiences                       | Interaction          | Location of problems         |
| Judgments                         | Information          | Analysis of problems         |
| Teamwork                          |                      | Solution of problems         |
| Coordination                      |                      | Decision making              |
| Communication in the organization |                      | Motivation and persuasion    |
|                                   |                      | Development of teamwork      |
|                                   |                      | Setting of group goals       |
|                                   |                      | Provision for participation  |

Source: Harold P. Zelko, *The Business Conference: Leadership and Participation*. New York: McGraw-Hill, Inc., 1969, p. 24.

Before making decisions about anything else—format, technology, logistics, facilities, and financing—the following questions should be answered as precisely as possible:

- What are the communications objectives of this teleconference?
- How can the topic(s) be defined?
  - What is the nature of the information to be presented, for example, factual, technical, conflictual?
- How can the topic(s) be clearly presented?

<sup>2</sup> Harold P. Zelko, *The Business Conference: Leadership and Participation*. New York: McGraw-Hill, Inc., 1969, p. 24.

### **Who Is the Audience?**

The participants should be analyzed as a group. This information helps determine the best choice of meeting format and the appropriate technology to use in order to teleconference effectively.

- Number of people participating.
- Nature of the audience:
  - Homogenous? Interested? Cooperative?
  - What are people's attitudes toward the topic?
  - How intensely do people feel about the topic? Have "sides" already developed?
  - Which participants are most likely to contribute ideas, solutions?
- Roles of participants:
  - Chairperson
  - Site facilitators
  - Participants
  - Special "star" guests
  - Technical experts
- The technical experience level of the audience: How tolerant are they of technical problems?
- People's schedules, time zones, and the length of time they will be able to participate.
- Types of locales where participants are during the teleconference:
  - Individual offices
  - Hotels
  - Television studio
- Number of people participating at each site.

By analyzing individual members of the audience (their interests, allegiances, position in the organization, and so forth), the teleconference chairperson can gain a sense before the teleconference of how people might participate, as well as gather information to use by way of introducing the individual participants.

### **Where Is Everybody and How Will They Be Connected?**

The geographic distribution and clustering of participants will practically determine the way in which the participants are linked

electronically. There are three ways in which the electronic configuration can be set up:

1. Bar-point-to-point/one-to-one: In this configuration, two sites are interconnected. Each is both a production and receive site. Many people can cluster at each site and use microphones and loudspeakers to enable them to participate effectively. This configuration lends itself well to daily meetings, spur-of-the-moment meetings, crisis management, briefings, and the like.

BAR FORMATION

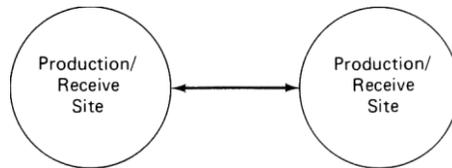


Figure 4-1

2. Star—point-to-multipoint and multipoint-to-point/one to many and many to one: In this configuration, three or more sites are participating in the teleconference. All the sites feed into one site, but they are not connected to one another (except through the connecting site). In the

STAR FORMATION

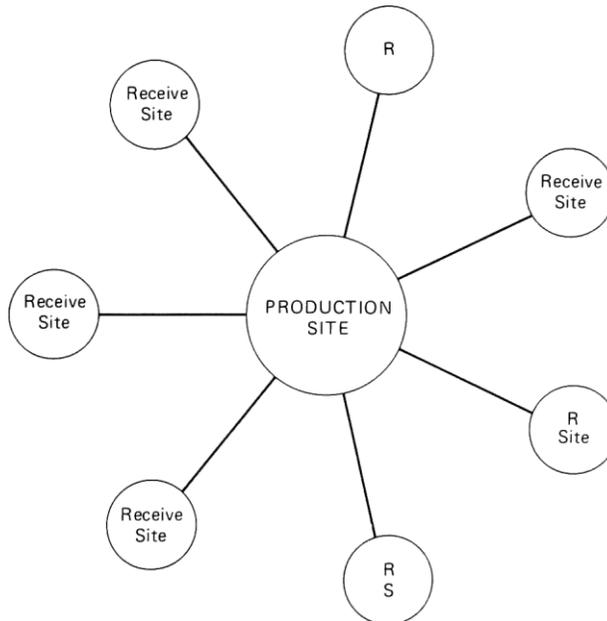


Figure 4-2

point-to-multipoint configuration, one site is the point of origin or the production site, and it broadcasts to the other sites. This format is typically used for lectures and presentations to large audiences that are geographically dispersed. Conventions, annual meetings, and educational events lend themselves well to this configuration. The multipoint-to-point format is typically for data collection or, when discussed in conjunction with point-to-multipoint, simply refers to the feedback that the receive sites are sending into the main site.

3. Net-multipoint interconnection/many-to-many: In this configuration three or more sites communicate directly with one another. This configuration lends itself well to conferences, especially ones where people are widely geographically dispersed and need to be in touch with one another about several different matters.

NET FORMATION

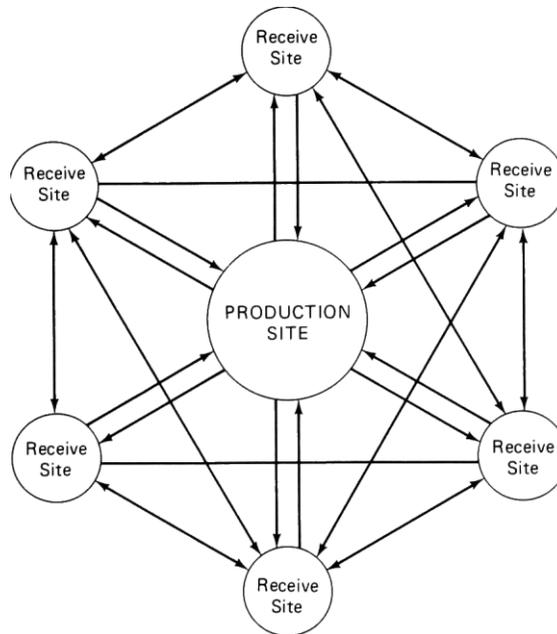


Figure 4-3

### WHAT IS THE BEST FORMAT?

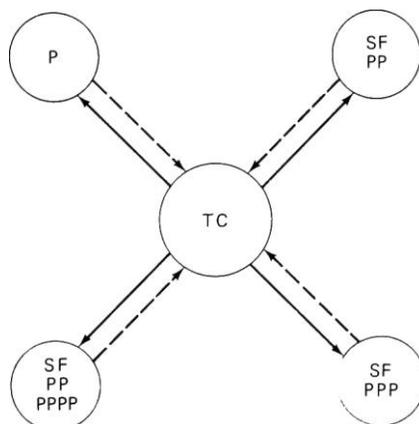
Choosing the appropriate format for optimal communications is a matter of being conscious of the probable pattern of communication given the information gathered about the audience. The size of the group, for example, is related to how much individuals in the group can and will participate and the type of interaction that is possible. The

nature of the group also affects the pattern of interaction. If the group is friendly and homogenous, for example, a format that allows equality of participation is most likely to be the most productive and effective. If a group is heterogenous and likely to be argumentative, on the other hand, the pattern of communication can be structured from the outset to make it proceed as smoothly as possible by, for example, appointing a strong chairperson. The following questions should be asked before the format is selected:

- Is it preferable to have the majority of the information flow out from the chairperson to participants at remote sites or vice versa?
- Is it necessary/desirable to elicit comments from each of the participating sites?
- How important is it that each participant have the opportunity to speak?
- How will discussion be handled between the main sites and receive sites?

The various types of teleconferencing formats can be depicted most simply in the following charts:

BROADCAST/PRESENTATION FORMAT



TC Teleconference Chairperson  
 SF Site Facilitator  
 P Participant

Figure 4-4

**Broadcast/Presentation Format**

This type of teleconference format allows information and communication to flow outward, for the most part, from one person to

many persons who are located at two or more sites. It is the best format for disseminating information when one person has more knowledge and expertise than others. The verbal interaction is typically in the form of presentation/questions and answers. Visuals are usually uni-directional, projected out to the audience. Because presentations without breaks quickly tire the audience and lose its interest, this format optimally relies heavily upon visuals. A presentation can also be broken up and made more interesting by polling the audience, raising questions, and presenting case studies.

PANEL FORMAT

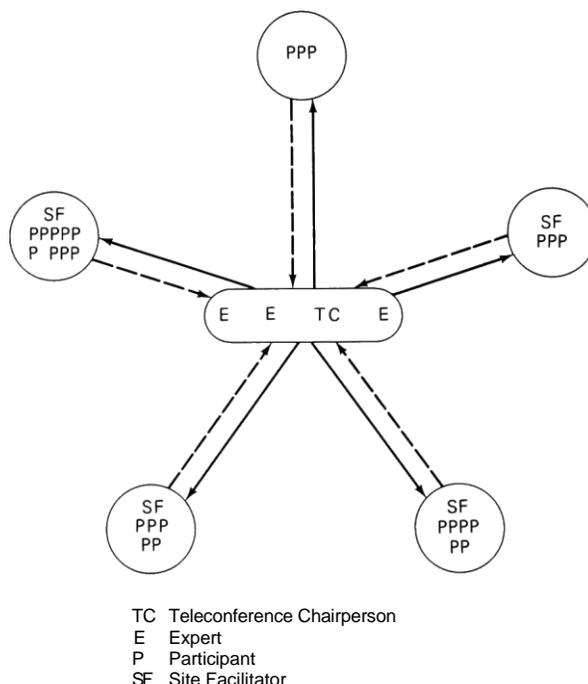


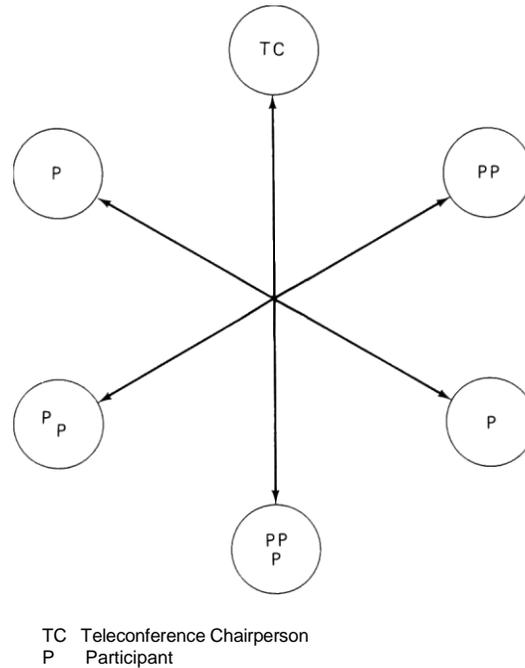
Figure 4-5

Panel Format

This teleconferencing format allows for a great deal of interaction among the people located at one site, as in a regular conference, while letting people who are located at the remote sites observe and participate to the extent that they would like to or find necessary. The chairperson plays a crucial role by moderating the panel discussion and ensuring that participants at the remote sites understand clearly what is transpiring. It is incumbent upon the chairperson to find ways of including remote participants in the teleconference by, for example, raising questions

and eliciting responses. Each panel member should limit his or her presentation and provide an opportunity for audience interaction with the material presented. Site facilitators should encourage remote participants to add their own expertise to the discussion.

#### ROUND - TABLE DISCUSSION FORMAT



**Figure 4-6**

#### Round-Table Discussion Format

This format allows for maximum interaction among the participants. The information/communication flow is toward everyone. This format works best when everyone, or nearly everyone, knows one another. The principal responsibility of the chairperson is to draw up a good agenda. When the number of participants and participating sites is small, the agenda guides discussion. As the number of participants increases, the chairperson plays a greater role in moderating discussion and designating speaker turns.

#### Interview Format

In this format, the major information/communication flow is between two people. Other participants "overhear" and/or "watch" the interaction and thus benefit from the (usually specialized) discussion

INTERVIEW FORMAT

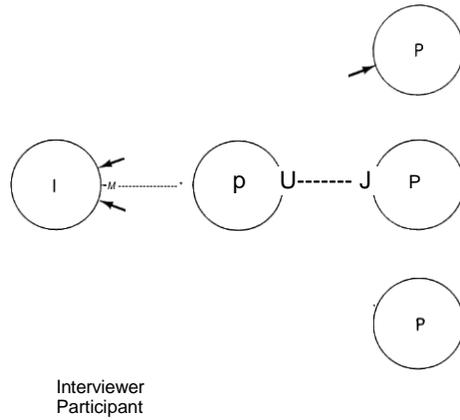


Figure 4-7

taking place. This format is apparently rigid, but actually encourages a great deal of interaction among all the participants. The specialized discussion between the two major participants generates specific comments, questions, and responses from other participants. Nonetheless, the discussion tends to revert back to the original topic and discussants. As a result, this format is excellent for accomplishing a good deal of work in a relatively short period of time.

EMBEDDED TELECONFERENCE

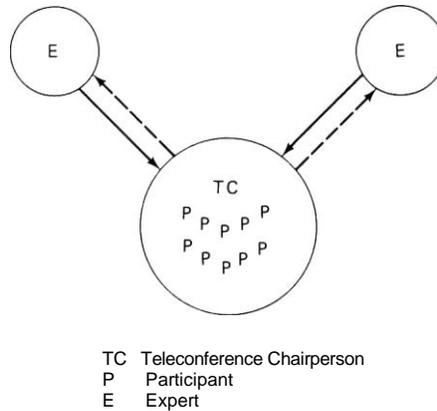


Figure 4-8

Embedded Teleconference

This format is actually a subset of all of the others already discussed. It is separated out in order to highlight the particular advantages of tele-

conferencing. Using this format, a group of people typically travel to one place, as they would in a regular conference. The major flow of information/communication is among them. During the conference, they utilize teleconferencing to draw upon the expertise of someone who is remotely located. This person may be called upon, for example, to provide technical information at a particular stage in the conference deliberation.

MULTITOPIC FORMAT

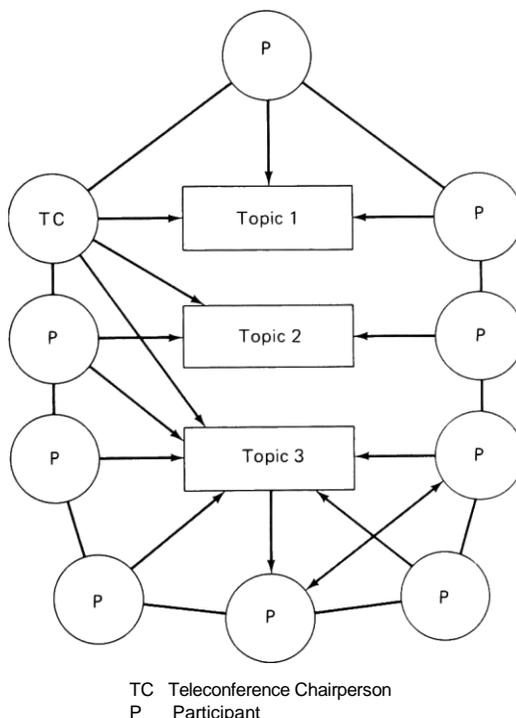


Figure 4-9

Multitopic Format

This format is feasible only with computer teleconferencing. The information/communication flow in this format is, for the most part, from the individual participants to particular topic areas. The participants contribute to one or more topics, and, according to an agreed-upon plan, the information of each topic area is available to those having access to it. For example, one computer teleconference may have three topic areas: the main conference topic area, the meta-conference discussion area (a discussion about the conference itself),

and on-line "help." The teleconference chairperson and site facilitators may have input/output access to all topic areas, while the participants have both input/output access to the main conference topic area and on-line "help," but can only input to the meta-conference. Each of the topics may also be substantive aspects of one general topic, with the teleconference chairperson and directing committee having the capabilities to screen all participant on-line comments and decide upon the appropriate topic areas into which they should be channeled. In this way, the major information/communication flow is structured according to some prior agreed-upon plan, and a great deal of work can be efficiently accomplished. This format also allows for "private" one-to-one interaction among participants, as well as committee-type interactions made up of subgroups of the larger group.

Once the appropriate format has been determined, the characteristics of different technologies should be considered—that is, what can and cannot be done with each of the different types of teleconferencing media.

## **CHARACTERISTICS OF TELECONFERENCING TECHNOLOGY**

The electronic medium should be carefully selected so that it presents no hindrance or psychological threat. People "forget" about the equipment only after they have learned all about it and the protocols for using it. Each medium encourages a certain type of communication. It is up to the user to determine exactly what must be communicated and the medium best suited to relay the message. Users must learn the characteristics, advantages, and disadvantages of each teleconferencing technology, on one hand, and the opportunities for creative communication that each electronic medium offers, on the other.

Once acknowledging the differences among the media, it is important to get beyond the idea that technology *per se* hinders effective communication. As suggested in Chapter 2, there is a substantial body of research that indicates that communication via electronic media can be more effective in some situations than traditional face-to-face communication.

**TABLE 4-2 Audio Teleconferencing**

Audio teleconferencing is as available as the telephone. An audio teleconference can be easily arranged with someone located either down the street or on the other side of the world. Because there are almost one million speakerphones already installed, arranging an audio teleconference with groups located elsewhere is becoming easier and more commonplace.

You can "arrive" at an audio teleconference almost instantaneously from anywhere there is a telephone.

Audio teleconferencing is inexpensive compared to the costs for either travel or other means for teleconferencing.

Pre-meeting packets that are mailed to participants, including participant list, agenda, graphics, memos, and so forth, provide a common visual frame of reference.

A great deal of training is unnecessary to audio teleconference effectively.

Participants can be relatively anonymous.

Vocal characteristics (volume, speed, inflection), vocabulary, syntax, as well as pauses and silences, have a magnified impact on the communication exchange.

Active listening must be indicated verbally.

Greetings, introductions, and farewells must be verbally incorporated into the teleconference itself; otherwise, it is not clear who is actually participating.

Visual cues, such as eye messages and body language, can neither be sent nor received.

Long audio teleconferences can be tiring.

First-time users tend to have low expectations about the effectiveness of decision making arrived at in audio teleconferencing. If good meeting protocols are not integrated into the teleconference, users can view audio teleconferencing as impersonal, resulting in a lack of cooperation among participants.

**TABLE 4-3 Audiographic Teleconferencing**

Audiographic teleconferencing affords visual enhancement of audio teleconferences through a variety of ways: facsimile, interaction electromechanical drawing devices, and interactive slow-scan television systems.

A visual awareness of the participants and the room ambiance at other sites can be established, creating a greater sense of shared space than with audio teleconferencing.

Audiographic teleconferencing allows graphic information to be transmitted in real time, concurrently with voice transmission.

Audiographic teleconferencing is often effective at the "working level" when, for example, engineers need to see designs, doctors need to see X rays, and repair technicians need to see broken equipment at remote sites.

Some types of audiographic teleconferencing, for example, slow-scan television, can sometimes catch and transmit an awkward aspect of movement or expression, as the image that is transmitted is much like a candid photo.

Graphics must be carefully prepared according to the demands and constraints of the medium.

#### TABLE 4-4 Video Teleconferencing

- Video teleconferencing affords immediate and simultaneous delivery of audio-visual information.
- With video teleconferencing, there is a great deal of message control because the audience is provided direct and simultaneous access to the source of information.
- Video teleconferencing provides high exposure for a new product, an association leader, or a political candidate.
- Video teleconferencing imparts the intensity and emotionality of the message.
- Video teleconference participants can see each others' reactions to ideas.
- Video teleconferencing can impart a sense of one-to-one participation.
  - Video teleconferencing is best in those situations dealing with complex tangible objects and in those requiring visual feedback for an idea.
  - A great deal of advance planning and preparation is required for a video teleconference.
  - High capital investment is necessary in order to video teleconference effectively. It can be cost-justifiable, however, for large groups in multiple locations.
  - There is a significant range of visual and auditory meeting cues available, including eye messages, body language, and voice intonation. However, these are sometimes distorted by the medium.
  - There is not the same opportunity for anonymity as with other teleconferencing media.
  - There is a marked susceptibility to the "Hollywood Syndrome," that is, taking the entertainment medium as the standard for self-expression.
  - The participant has the opportunity to create an active relationship with the video image and need not be a passive viewer.
  - Voice-activated video requires special attention to extraneous verbalizations, including casual comments, throat clearing, and sneezes.
  - Room and transmission requirements for video teleconferencing are generally complex and expensive. There is not the same flexibility in switching among the sites as there is in other forms of teleconferencing.

**TABLE 4-5 Computer Teleconferencing**

- Information is sent electronically and received at the remote site instantaneously.
- Messages can be sent and received at any time.
- There is access to the system, the data base, and other participants' input from any location where there is a telephone.
- The computer teleconference is asynchronous, meaning that the teleconference is ongoing and the teleconference members participate at different times at their own convenience. Messages are sent and received at the individual's convenience.
- The teleconference is independent of time zones and personal schedules. This means that teleconference participants are "always available" for the meeting.
- There is a complete record of all messages and interactions. These can be accessed and printed out whenever desired.
- There is more efficient access to files, as the information can be searched and retrieved automatically.
- When giving someone information, it is unnecessary to interrupt him or her. The message is sent electronically, and it is stored until the recipient has the time to read it.
- Because files are electronic, paperwork is reduced, files cannot be misplaced or lost, and information is delivered independent of weather, holidays, and so forth.
- Costs of labor, mail, and photocopying are reduced.
- The computer teleconference uses computer software that structures and coordinates "many-to-many" communications, making it easier, for example, for a large group of people to reach a decision.
- Computer teleconferencing systems are generally "user friendly" and offer on-line assistance.
- Messages can be separately "addressed" to individuals and/or functional groups.
- The usual meeting cues, such as voice quality and tone, eye messages, and body language, can neither be sent nor received. The keyboard is the only outlet for expression, making it especially challenging to communicate the nuances and subtleties of the message.
- Participants have equal access to "the floor" and have the opportunity to participate without regard to their status.
- Participant anonymity is more possible in this teleconferencing medium than in any other.

## BEST MATCHES

The objectives of the meeting and the optimum communication flow among meeting participants should determine which technology is selected. For cross-functional working sessions between designers and engineers, for example, enhanced audiographic teleconferencing is often the appropriate technology choice. These are generally information exchanges, and often the crucial information is graphic. The options available for interactive graphic transmission are numerous. The organization's specific needs, for example, the need for three-dimensional (over two-dimensional) graphics, can be met with a slow-scan television system and not an electronic blackboard or telewriter. Audio-based, word-based, and slow-scan television systems are effectively used by engineers, loan officers, and others dealing with decisions about machines, blueprints, computer programs, and loan evaluations.

Other situations necessitate a different type of teleconferencing system. For negotiations, which often rely upon a sense of presence of all parties, full-motion video teleconferencing is the appropriate choice. Whenever there is a sense of "we-they" that must be overcome, as in negotiations, it is important that subtleties in facial expression be captured by the communications medium. Full-motion video teleconferencing captures and conveys more fully than any other teleconferencing medium the "between-the-lines" emotional message, such as the speaker's sincerity, earnestness, or commitment.

The following chart suggests how communications objectives, format, and teleconferencing technologies can be matched for best applications.

## OUTLINE FOR A SUCCESSFUL TELECONFERENCE

A teleconference, like any conference, is comprised of some or all of the following components:

- Determination of the purpose of the meeting.
- Project announcement and scheduling.
- Social interaction.
- Research.
- Exchange and analysis of information.
- Writing of a report.
- Ratification of the report.

| Type of Event/Meeting                                                                                                    | Teleconferencing System                                             | Communication/Electronic Format                                                                        | Communications Objectives                                                                                                                                                                                               | Applications                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Special event/ad hoc productions<br>Public forum                                                                         | One-way video, two-way audio return                                 | One-to-many/some-to-many<br>Star configuration/point-to-multipoint<br>Presentation or panel format     | Motivate people<br>Persuade people<br>Make visible people, products<br>Promulgate new policies, laws<br>Report findings<br>Achieve understanding<br>Broadcast information                                               | Board meetings<br>Annual reports<br>New product announcements<br>New policy announcements<br>Production forecasts<br>Press conferences<br>Press conferences<br>Religious programs<br>Political fundraisers<br>Charity fundraisers<br>Stockholders' meetings<br>Public hearings |
| Executive meetings                                                                                                       | Two-way video with two-way audio                                    | Some-to-some<br>Bar configuration (typically) / point-to-point<br>Round-table discussion format        | Exchange opinions and information<br>Locate and analyze problems<br>Make decisions<br>Develop teamwork<br>Set group goals<br>Provide for participation<br>Schedule meetings, events<br>Negotiate                        | Pre-conference meetings<br>Crisis management<br>Brainstorming sessions<br>Administrative meetings<br>Management and staff meetings<br>Budget and finance meetings<br>Committee meetings<br>Planning sessions<br>Training seminars<br>Reviews<br>Updates<br>Briefings           |
| "Shirt-sleeve" meetings                                                                                                  | Audio<br>Audio plus graphics<br>Audio plus slow-scan TV<br>Computer | Some-to-some<br>Network configuration/<br>multipoint interconnection/<br>Round-table discussion format |                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                |
| Large-group conferences<br>Ongoing conferences<br>Long-term conferences<br>Multiple-topic conferences<br>Electronic mail | Computer                                                            | Many-to-many<br>Network configuration/multi-point interconnection<br>Multi-topic format                | Exchange information on an ongoing basis<br>Involve many people in a project<br>Develop teamwork<br>Make decisions<br>Discuss more than one issue<br>Send "private" messages to individuals during course of conference | Strategic planning<br>Instruction and training<br>Report writing<br>Project implementation<br>Project tracking<br>Daily mail, messages<br>Field communication<br>Repair order entries<br>Scheduling                                                                            |
| Interviews<br>"One-on-one" meetings                                                                                      | Audio<br>Audio plus slow-scan TV                                    | One-to-one<br>Bar configuration/point-to-point<br>Interview format                                     | Get to know people<br>Exchange opinions<br>Persuade individuals                                                                                                                                                         | Employment interviews<br>Personnel interviews<br>Meeting with constituents<br>Counseling session                                                                                                                                                                               |
| Consultations<br>Technical Reports<br>"Production-level"                                                                 | Audio<br>Audio plus graphics<br>Audio plus slow-scan TV             | Some-to-one<br>Bar configuration/point-to-point<br>Embedded format                                     | Bring in expertise<br>Exchange technical information^                                                                                                                                                                   | Medical diagnosis<br>Medical consultation<br>Architectural design<br>Engineering design                                                                                                                                                                                        |

Figure 4-10 Matching objectives, format, and technology for best applications.

- Announcement of the outcome.
- Follow-up of the meeting.

Each type of communication has a form that is best suited to it. Some functions cannot be substituted with teleconferencing, some are interchangeable, and others can be accomplished only through teleconferencing. The following example suggests how teleconferencing can be effectively combined with more traditional forms of communication to achieve a successful "meeting of minds."

A long-term project is conceived that will involve several persons from different and geographically dispersed organizations. Letters are sent out that describe the project and request participation. An audio teleconference facilitates the scheduling and agenda setting for the project. An initial face-to-face meeting takes place in which the participants are given the opportunity to get to know each other and establish who is best suited to carry out the different portions of the project. This initial meeting also makes it easier for the participants to know "who is out there" and how best to address particular issues with the other teleconference members when they return to their own organizations and begin the second part of the project that is carried out by means of computer teleconferencing. During the computer teleconference, slow-scan video is used effectively to keep people in touch visually with one another and to transmit schematics and other visual information. Audiographic support is also utilized to exchange printed material among the teleconference participants. At the end of the teleconference, the results are publicized to the nonparticipants of the various different organizations through a full-motion video teleconference. A final follow-up of the project is a written report, as well as a certificate and letter of thanks to each of the participants, which is sent to them in the mail.

#### **Initial Planning**

Most successful meetings are prepared well in advance. As with any conference, the better planned it is, the more productive it will be for all concerned. Good groundwork is the key to successful teleconferences. Clear definitions of the program and objectives at the outset of the teleconference form the parameters and structure of the teleconference. Ignoring careful planning means that the teleconference may fail to achieve its objectives. A prediscussion of key items is important in deciding how to approach the problem, filter out minor issues, and determine the best strategy for discussion during the teleconference. This can be done successfully by means of an informal teleconference. Small, informal audio and computer teleconferences can be used to plan larger, more complex teleconferences.

*Before the Teleconference*

- Determine the purpose of the teleconference: The purpose of the meeting should be stated in one clear, concise sentence. For example: The purpose of this teleconference is to introduce teleconferencing to people in our organization.
  1. Develop the agenda. Given the objective(s), what will need to be covered in the teleconference? What is the best order of discussion of topics?
  2. Arrange for short reports from public relations, advertising, marketing.
  3. Note suggested courses of action, including the possibility of holding a video teleconference to demonstrate the viability of teleconferencing.
  4. Carry out polling regarding each suggested course of action in order to arrive at a consensus.
- Determine who should participate.
  1. Key personnel
  2. Consultants
  3. Technicians
- Draw up an on-line agenda
  - 15 Time allocated for informal on-line chatting prior to the teleconference.
  - :00 Welcome and introduction by chairperson
  - :02 Statement of objectives
  - :03 Review of agenda
  - :05 Agenda item #1
  - :20 Agenda item #2
  - :35 Agenda item #3
  - :50 Summary and close of teleconference
  - :55 Conference concluded
  - :60+ Time allocated for informal, on-line wrap-up discussion.
- Assign roles
  1. The chairperson
  2. The facilitator(s). (If several remote locations are to be included, it is a good idea to have a facilitator at each site.)
  3. The speakers
- Establish the time and place of the teleconference.

### *Announcement of Teleconference*

- Notify the participants well in advance of the following:
  1. Name of moderator
  2. Day
  3. Date
  4. Time, noting any differences in time zones
  5. Teleconference phone number issued by the bridge connection
  6. The subject of the teleconference
  7. The agenda
  8. Preparation required of the participant
    9. List of participants
    10. Advance material
- Send out agenda, objectives, and the questions that ideally will be answered in the teleconference. The agenda should be specific enough so that people will know what to expect in the teleconference. A statement of objectives will let people know how to best make their own contributions to the teleconference.
- Send out viewgraphs, charts, slides, and the like. These should be numbered in the order in which they will be presented. Each one should contain a clear, straightforward message. They should have large type.
- Encourage people to send in their individual contributions, especially any visual aids that they plan to use.

### *Setting Up the Site*

- Select a room that is as free from noise as possible.
- Schedule the teleconference room.
  - Check equipment; determine if supplemental equipment is necessary.
  - Use furniture that allows people to see each other and interact. A round table or half-circle table works best to promote discussion. If all the teleconference members are at one table, there will be more participation.

### **Rehearsal**

If a rehearsal is deemed necessary, the facilitator can set up a rehearsal for the teleconference. A simulated teleconference lets people see how the entire process occurs. The facilitator should help people

understand how they will be involved, both individually and as a group. A dry run that includes going through the viewgraphs and giving people the opportunity to see or listen to themselves often helps allay fears. Also, the facilitator can set up a system of nonverbal signals for teleconference participants that they can use during the teleconference without disrupting it.

#### *Immediately Before the Teleconference*

- The chairperson and the facilitator should arrive at the site at least 30 minutes ahead of the starting time.
- The telephone connections should be established. If necessary, redial to get a better connection.
- Check the room.
  - Have the bridge connected about 15 minutes before the teleconference. This gives people the opportunity to chat informally before the teleconference begins.

#### *During the Teleconference*

- Vary the presentation style and format.
- If possible, visuals should be used to emphasize speakers' points.
  - Encourage participants to use their own ingenuity and creativity in their presentations, especially in their use of graphics.
  - Change speakers. Different voices hold the attention of listeners. It is a good idea to poll participants or ask different people to take over portions of the meeting.
  - Avoid having anyone talk continuously for more than five minutes without the visual support of written material, slides, slow-scan television.
- Do not be afraid of silences. Silence often gets people's attention.
  - If using a switched-loss audio system, everyone should pause frequently when speaking in order to allow it to operate and not clip the speech.
  - The teleconference schedule should be strictly followed. This is especially important in video teleconferences, where satellite time and rental of dedicated facilities are quite expensive.

#### *After the Teleconference*

- If the audio bridge is left up, then people can socialize for about 15 minutes or so, much as they would in the corridor after a regular conference, for example, chatting, comparing notes and impressions.

- Confirm in writing decisions that were reached during the teleconference.
- Summarize the meeting, evaluate it, publicize it.
- Follow through on the decisions made.
- Monitor the project by keeping in touch with people.

## ROLES AND FUNCTIONS OF TELECONFERENCE PARTICIPANTS

In order to arrange "meetings of minds" instead of mere gatherings of people, it is important to select the right people to organize and chair the meeting. In a teleconference, the leaders include the chairperson and the site facilitators.

The effective meeting leader is well-liked and respected by group members, shows courteousness toward them and sincere interest in their ideas and opinions. In addition to having an open-minded and fair attitude, the meeting leader is able to demonstrate concretely his or her impartiality and tactfulness by being receptive to suggestions and constructive criticism. This person is also able to inspire the group to explore complex issues while simultaneously having the ability to see the obvious and not introduce complicated plans and ideas when a short-cut is possible. Additionally, an effective leader is able to skillfully handle digressions and bring the discussion back into focus. This calls for a proper perspective on the topic being discussed, as well as a good sense of timing.

Above all, the effective meeting leader anticipates problems and plans ahead. He or she can state from the outset the exact purpose of the meeting and then plan all the necessary steps to achieve it: an agenda is developed beforehand, and all the subjects are broken down into their simplest constituents. The leader also ensures that the agenda is circulated with sufficient time for people to read it before the meeting, but not so far in advance that they will have forgotten its objectives when the time to meet arrives. This ensures that everyone is addressing the same issues and that solutions to the problem are focused, realistic, and understood by all.

In a teleconference, the chairperson is responsible for drawing up an agenda that ensures interaction among the participating sites. This includes using different techniques that will elicit interaction such as prearranged questions and answers, polling techniques and case studies that are particularly relevant to each participating site. The chairperson plays an especially important role in keeping the discussion moving along because first-time participants are usually hesitant to speak up.

**TABLE 4-6 Meeting Effectively—Some Common Problems**

- Multiheaded animal syndrome: Everybody going off in different directions at the same time.
- Confusion between process and content: Are we talking about *how* to discuss the topic or *what* topic to discuss?
- Traffic problem: Difficulty in leaping into the conversational flow and getting a chance to participate.
- Unclear roles and responsibilities: Who is supposed to be doing what?
  - Manipulation by group leader: Rubber-stamp meetings and abuse of process power to achieve personal objectives.
- Data overload: Having to hold on to too many ideas in your head at one time.
- Repetition and wheelspinning: Going over the same old ideas again and again.
  - Win/Lose approaches to decision making: Partial solutions, compromises, polarization, and low commitment.
  - Confused objectives and expectations: Why did you call the meeting and what is the group supposed to be doing?
  - Unresolved questions of power and authority: Do we have the power to make this decision?
- Problem avoidance: "Everything's fine;" "There are no problems around here."
  - General negativity and lack of challenge: "There is nothing we can do about it, so why try?"
  - Communication problems: Not listening to or understanding what others are saying, or making faulty assumptions.

*Source:* Michael Doyle and David Straus, "Meeting Effectively . . . Some Common Problems," *How to Make Meetings Work: The New Interaction Method*. New York: Wyden Books, 1976, pp. 83-84.

Additionally, the chairperson is responsible for letting all the participants know "who's who" and "who's where," that is, for clearly introducing participants at the beginning of the teleconference and establishing who is located at the different sites. The following points form a useful guide for the teleconference chairperson, site facilitator, and participant.

#### *The Teleconference Chairperson*

- Present the principal topic at the beginning, ensuring everyone's optimal attention.
- Specify topics, points of discussion, and assignments. It is important in situations without immediate verbal feedback, for example, in a computer teleconference, to be clear about exactly what is expected of teleconference participants.
- Have readily available:
  - Agenda
  - List of participants with their affiliations

Clock or watch

Graphic and printed material

- Make the initial introductions of the local participants and ask the facilitator at the remote site(s) to introduce other participants.
- Give a preview and an overview of the topics on the agenda after the introductions. This should take about ten minutes. At the end of the teleconference, the chairperson should review the main conclusions that were reached.
- Keep opening remarks fairly brief. Experience suggests that the longer a chairperson talks at the opening of a meeting, the more passive the audience becomes and the less likely they are to contribute their own thoughts to the discussion.
- Project an image of each teleconferencée when introducing him or her. This increases people's "social presence." Ideally, there should be color portraits that include the name, affiliation, and location of each person.
- Involve the participants in the decision-making process. When the decision emerges from the whole group, the energies of the group are more likely to be mobilized behind the activities decided upon.
- Keep a clear goal in mind. In this manner, contributions by teleconference participants can be assessed in an ongoing fashion, and the chairperson can state at any time how much progress has been made toward the goals of the meeting. Additionally, when the chairperson has specific meeting goals in mind, he or she can more easily determine if and how participants' comments are helpful in arriving at a decision. The chairperson can clarify participants' contributions, if necessary, by asking more pointed questions, noting hidden assumptions, or rephrasing statements.
- Emphasize, even exaggerate, social niceties and protocols, making up for the fact that participants often cannot see the chairperson or each other.
- Ensure that everyone shares the same visuals and/or documents.
- Prevent polarization of participants and moderate arguments.
  - For the benefit of people at remote sites, be cognizant of the need to verbalize what is happening during the meeting with respect to who is speaking, visuals, the progress of the meeting.
  - Allow approximately 15 minutes for each agenda item and keep the teleconference moving along according to the agenda.
  - Coordinate discussion. Establish a predetermined order for speaking for each part of the teleconference.

Encourage participation of teleconference members by asking for people's ideas, opinions, and expertise and by asking people how their contributions relate to the stated objectives of the teleconference.

Use polling and relevant case studies to elicit responses.

Make comments that relate to specific individuals or portions of the audience.

Ensure that people at remote locations are included in the discussion and feel free to speak up, ask questions, and add information.

Poll participants by name instead of directing questions to the general audience.

Assess audience reactions and report on them. Carefully ascertain whether or not teleconference participants concur with the decision, as it may be easier to misinterpret reactions in a teleconference than in a face-to-face meeting.

Interrupt as necessary in order to ask people to identify themselves when they speak.

Play a strong role and keep the meeting as focused as possible.

This is especially important in large-group meetings. The chairperson should draw out the members of a group, keeping their attention on essential issues so that decisions can be reached quickly.

Provoke and guide discussion. The chairperson should not lecture, but rather he or she should limit his or her participation to introductory remarks and to thought-provoking follow-up questions that serve to stimulate discussion.

Pose good questions. A chairperson can sharpen a group's thinking and help steer the discussion toward an effective solution by asking the right questions at vital points.

If differences of opinion and disagreement exist among individual teleconference participants, suggest that they resolve them "off line" when the meeting is over.

Summarize and conclude each item after it has been discussed in order to ensure that everyone understands what has been decided upon.

Summarize discussion, highlight principal ideas developed. Put the issue to a vote. After the vote, no further discussion is necessary (or should be allowed).

Give people the opportunity to chat informally before and after the teleconference.

Send a summary of major points, decisions, accomplishments of the teleconference in the mail to each participant.

### *The Site Facilitator*

- Hand out printed seminar material at the beginning of the teleconference.
- Carry out short, preliminary discussions with teleconference participants and become familiar with who they are and, if possible, what contributions they intend to make during the teleconference.
- Introduce participants at the remote sites, giving a little background information, and note the arrival and departures of teleconference participants.
- Pay attention to the quality of the audio and visuals and adjust the equipment as necessary. Generally, the facilitator is not the technician, but he or she should be familiar enough with the equipment to make necessary adjustments in sound levels and camera focus.
- Tactfully signal people that they need to talk more loudly, closer to the microphone, or whatever else may be necessary.
- Keep an eye on the audience for signs that they are confused about the content of the presentation or for signs that they need more explanation of the visuals or data and relate this to the chairperson.
- Carry out evaluations of the teleconference.

### *The Participant*

- Plan to participate. As with any conference, the participant should decide ahead of time where/when his or her comments might be most valuable.
- When introduced, each teleconference participant should address the group for approximately one minute, noting who he or she is and what issues he or she will speak about later. Along with a projected image of the participant, this helps the other teleconference members to recognize and differentiate the various speakers' voices.
- If scheduled as a speaker, the participant should ideally plan to speak 10 to 15 minutes and use graphic material to enhance the presentation.
- Ask questions. If one person is confused, assume that others are too and could benefit by questions.
- Address the other participants by name, talk with them directly, listen, respond. Take advantage of the enhanced communication (and "visibility") that the teleconferencing medium affords.

Interact! Participate! Whatever the participant does, he or she should not merely watch or listen as though the teleconference were TV or the radio.

## COMMUNICATING ELECTRONICALLY

A bad speech is usually attributed to the speaker. A bad teleconference, however, is usually attributed to the technology. In order to teleconference effectively, there is a need to get beyond the technology and let "natural" interaction take place. Getting "beyond" the technology, however, does not mean ignoring it. Rather it means that the message should be communicated effectively (in the traditional sense), as well as take into account the fact that participants are communicating electronically at a distance from one another.

Communicating electronically simply means being more conscious of the communication process itself. When the following steps are taken and people incorporate the suggested "teletips" that are included, they find that often their long-distance meetings are much more effective than their face-to-face meetings.

### Emphasize Good Communication Skills

The components of good communication are too often ignored. One advantage of introducing teleconferencing is that there is often a greater awareness and improvement of communication skills. A new mode of communication tends to make people more conscious of communication *per se*. In a teleconference, the challenge is not only to communicate well but also to communicate well at a distance via electronic technology. In order for a teleconference to be a success and achieve the meeting's objectives, a number of aspects should be given special attention. Most generally, because eye contact and body language are usually absent from a teleconference, ideas must be clearly stated rather than assumed, and communication must be precise, well-phrased, and suggestive as a result of subtle nuances in the voice. Additionally, in a teleconference, as in all communication, a sense of humor and lively presentation are called for. Moreover, no one should be "put off" by the limitations of the medium. This is, of course, easier said than done. If someone tells a joke and does not hear a response, he or she is likely to think it is a flop. That person should not freeze up and decide that jokes are *verboten*, when just the opposite is true!

### *Teletips*

- Speak up and deliver the message effectively:
  - Speak at a normal rate.
    - Intonate—emphasize with voice tone and pitch the key emphasis of the message.
    - Remember that gestures and facial expressions cannot be relied upon to get the message across. (Even in a video teleconference, gesticulating is unsatisfactory because it is often distorted by the technical medium.)
    - Use visuals to emphasize points. Remember to verbalize what is contained in the visuals for the benefit of those who cannot see them. Verbalize the item on the visual that is being addressed.
- At the beginning of the teleconference, identify yourself each time when you speak, for example, "This is Eliza Willis in Perrier, Iowa." As the call progresses, people come to recognize your voice.
- Use a person's name when addressing him or her. This makes it more personal and lets other teleconferees know exactly who is interacting.
- Address specific individuals, rather than addressing the whole audience. It is not advisable to ask questions directed at everyone (and no one), such as "Are there any questions?" This generally does not elicit much response. Or, it can lead to more than one person responding at the same time, resulting in voice clipping when one voice overrides the others.
- Ask questions by exception. For example, "Who has *not* received the information yet?"
- Speak naturally, neither too loudly nor too quietly, and remember to vary the pitch and volume of your voice.
- When you ask a question, wait at least 15 seconds for a reply. People need time to think a bit before responding.

#### **Create a Shared Space**

It is important to generate a sense of presence in a teleconference, to "humanize" the electronic space. If people do not speak or make an input, they do not seem to exist to the other teleconferees because they cannot be seen. The best way to create a shared space is to create a sense of common cause, oneness, shared feeling. If people can get a sense of the overall purpose of the teleconference, then they can assess how their own goals and expectations can mesh with the overall goals.

Reactions of the local group to visual cues or verbal asides that are not shared with remote participants can destroy the sense of a commonly

shared meeting, because the effect is to make people feel as though they are excluded. People feel left out when they hear whispering on the side. When they hear fingers drumming absentmindedly, they interpret it as impatience.

### *Teletips*

- Send a friendly welcome letter establishing initial rapport.
  - Set up an "electronic corridor": Arrange connections between sites with ample time before and after the teleconference so that people can chat.
  - Get people to laugh. When people share a joke, it creates a sense of unison.
  - Have a roll call at the beginning of the teleconference. The roll call at the beginning establishes the electronic meeting space by clarifying who is present. This is the "electronic handshake."
  - Keep local noise down! Whispers, drumming on the table, paper shuffling—all will be transmitted. Confidential "side" conversations are picked up and transmitted.
  - Give people the opportunity to know you and remember you by stating your name before you speak and acting as naturally as possible. Provide a picture of yourself with your name and affiliation to the chairperson before the meeting.
  - If you cannot see the individuals with whom you are speaking, mentally picture them and talk with them (and not "at" the loudspeaker).
  - Acknowledge that you are listening, that you heard or, in a computer teleconference, that you are "there." If being addressed, respond from time to time with a "yes," a "fine," or "I agree" so that, in the absence of visual cues, the speaker has the assurance that his or her message is being received.
  - Encourage off-line activity. If the teleconference includes a large number of people, the chairperson and site facilitators should encourage off-line activity, including informal discussion before and after the teleconference at each of the sites, letters from teleconferenees with suggestions, reactions, and other responses, and telephone conversations between the teleconferenees.

#### **Hold Attention of Teleconference Participants**

In order to avoid the "talkingheads syndrome" where a few people talk "at" everyone else without interacting with other participants, it is

essential to be creative. Be creative with the program: vary the format with interviews, polling and production techniques (cutaways, special effects, graphics, and so on).

#### *Teletips*

- Vary the presentation style and format.
  - Encourage participants to use their own ingenuity and creativity in their presentations.
  - Change speakers, voices. Different voices hold the attention of the listeners, so poll or ask different people to take over portions of the meeting.
  - Avoid having anyone talk continuously for more than five minutes without the visual support of written material, slides, slow-scan television.
- Do not be afraid of silences. Silence often gets people's attention.
- Encourage people to use graphic material.
  - Use variation in the voice. Nuances in the voice underscore the points being made.

#### **Plan for Interaction**

Communication essentially means interaction, and the key creative aspect of a teleconference is the capability to interact. Piatt notes:

Etymologically, "communing" means "sharing *with* one another." Nevertheless, it is easy to think of many kinds of supposed communication we have today which are not sharing *with* us, but at us. We speak of our "communications media," but the kind of television in which somebody out there has organized a program, and is throwing it at me, the kind in which I can't talk back or have my side represented, this is not communication. In some ways, it is more like ex-communication."<sup>3</sup>

Because people are used to watching TV and listening to the radio, they are not usually oriented to *interactive* information exchange via electronic means. A "perceptual shift" among the participants must take place. The presenter and the teleconferees should be asked to take more responsibility for creating interaction than they would in a regular conference. The most effective speakers in a teleconference, for example, do not merely ask, "Are there any questions?" Rather, they "beg the

<sup>3</sup>John Piatt, *Perception and Change*, p. Ill, quoted in Andrew Feenberg, "Moderating an Educational Teleconference," Murray Turoff and M. Heimerdinger, eds., *Educational Teleconferencing*. Norwood, NJ: Ablex Publishing, in press.

question": They inculcate within the audience enough interest in the topic so that people are motivated to respond verbally. A dialogue between people is thus quickly established despite the technology or, rather, despite people's myths and misconceptions about the technology.

A premium should be placed on individuals' participating and interacting in a teleconference. The more involved people are, the more they will be open to new ideas. Active participation generates fresh thinking, new approaches, and creative solutions. Participation and interaction also affect understanding, learning, and influencing. The more people actively participate, the more they will understand the problem and the greater will be their level of commitment to the solution. In fact, the success or failure of a meeting is often perceived by people in terms of the extent to which they have participated. If someone has not had the opportunity to speak during a meeting, that person is likely to rate the meeting a failure even if everyone else thought the meeting was a success.

Participation options and strategies should be carefully thought through in advance. In order to hold the attention of participants and to involve them in meaningful ways, each agenda module should be structured to maximize the interactive nature of the teleconference medium. Interaction, in short, is too important to be left to chance. It should be carefully planned in advance.

#### *Teletips*

- Ask for input when sending out the agenda. Raise specific questions ahead of time that you want answered in the teleconference. This gives people a chance to think about how they will participate.
- Gain as much knowledge as possible about participants beforehand. Teleconferences are most successful if at least two or more participants at each location have previously met face to face. If possible, therefore, have a face-to-face meeting before the teleconference.
- Instead of leaving interaction to the last part of the teleconference, during the "question and answer" period, integrate questions, reactions, and responses into the presentation. Ask questions about the material that you are presenting. Get people to respond to what you are saying.
- Pause frequently when speaking or after answering a question. This gives people in the audience a chance to interrupt with their questions and comments—especially important in an audio teleconference when the speaker cannot see the people in the audience indicate that they want to speak.
- Overcome the tendency to talk without a break. When a speaker cannot see the audience's reaction, there is a tendency to repeatedly

explain the point. Interrupt yourself. Pause. If there is no response, raise questions about your own material.

- Do not talk too long without asking your audience, "Is this clear?" "Does that make sense?" and similar questions.
- Carefully plan and arrange part of the interaction with someone at a remote site. This interaction will act as a model for others to emulate. Most likely it will set off a chain reaction, and others will begin to interact in a similar fashion.
- Ask some individuals to take responsibility for leading discussion in certain subject areas.
- Ask "leading" questions at the end of the conference. This gives people at remote sites a focus for post-teleconference discussion.

#### **Help People Visualize the Message**

In a teleconference, it is not enough to state the information. It must be communicated—presented well, brought to life. Without visuals and with only a loudspeaker to look at, teleconferees quickly tune out the speaker. Enhancing the verbal message means providing the teleconferees with sources other than audio to receive the message. The speaker should use viewgraphs, slides, and the like, to enhance what he or she is saying and to bring to the remote teleconferees a visual image of his or her message so that its point can be better absorbed and remembered by the audience. Printed material, such as an agenda outline and a seminar notebook are also useful. Video tapes that have been produced and directed with the same level of sophistication as a television show can be used more effectively to communicate the advantages and disadvantages of a new product than one person could ever hope to do alone.

#### *TELETIPS*

- In the speech or lecture, provide teleconference participants with visual images of what you are saying.
- Some repetition, especially when there are no visual clues, helps participants picture important concepts.
- If a point is especially important, verbally suggest its importance by asking people to note it, write it down, underscore it, and so forth. This is especially important in the absence of eye contact or visual cues. Verbalize what it is that you are doing. For example, if you are illustrating a chart, say, "On chart number three, I would like to point out the steps to effective teleconferencing." Verbally "underline" key points that you are making by saying,

for example, "This is the last important point that I want to bring up today."

- Refer to the visual aids by number so that people at remote sites are sure they are looking at the right slide, photo, or other graphic material.
- Mention people by name when referring to their input into the meeting. This is especially important when there are no visual clues that let the speaker see nods of approval or frowns of disagreement.

In the following section, several case studies are presented in such a way as to show how different communication objectives of various organizations have been matched with different teleconferencing technologies. Comments of organizers and participants are included so that the reader can gain a sense of how people typically react to teleconferencing.

## SUCCESSFUL APPLICATIONS OF TELECONFERENCING TECHNOLOGIES

TABLE 4-7

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization           | 3M, a diversified manufacturer of more than 45 major product lines and the 51st largest U.S. industrial corporation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Objective              | To introduce a major new marketing and sales concept to sales managers nationwide, simultaneously, without the time and travel costs of assembling in a central location.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| T/C System/<br>Format  | Full-motion video teleconferencing: one-way video, two-way audio; point-to-multipoint; presentation with questions and answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Participants/<br>Sites | Broadcast from Dallas, Texas, to 12 other cities. Twenty executives and 65 field sales managers from Texas and five surrounding states met at Dallas' Centre Plaza Holiday Inn. Groups ranging in size from 15 to 95 sales managers met at 3M's headquarters in St. Paul and at 11 Holiday Inn hotels in Atlanta, Boston, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, San Francisco, and Washington D.C. Company general managers, marketing directors and marketing operations managers gathered in a second St. Paul headquarters location to view the telecast portions of the meeting. Holiday Inn hotels were selected for the meeting sites because they offered not only meeting facilities but also a video network already in place. |
| Transmission           | Four TV cameras covered the Dallas meeting where the signal originated and where the uplink was made to Western Union's Westar III satellite. Transponder signals were received by Western Union in New Jersey and cabled to RCA for their uplink to Satcom I, which beamed it to the 12 remote meeting locations.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

For audio, 3M rented conference bridge time and telephone line interfaces from the Darome Connection, based in Danbury, Connecticut. One conference call provided program audio, with the ability to boost or equalize sound, tone down ambient noise, and delay audio a quarter second to synchronize with the television picture. A second conference call served as an intercom, giving the audiovisual crew in Dallas communication with all points in order to coordinate the broadcast portion of the meeting.

Comments

Called the "Cooperating for Growth" program, this was most significant selling strategy change that 3M had introduced since the late 1940s. Lewis Lehr, chairman and chief executive officer, and John Pitblado, president for U.S. Operations, spoke to sales management people and fielded questions from the 12 locations by means of a two-way telephone hook-up. Pitblado noted, "In the past, each sales representative has been asked to concentrate on solving customer problems in a particular product specialty. That's no longer enough. Now 3M representatives should go further ... be alert to every kind of customer problem that we can possibly solve . . . and to relay the problem or opportunity to a central 3M source. The appropriate specialist will be assigned to help. Customers and the sales force will see 3M in a new light—as an exceptionally diversified resource for problem solving in many sectors of business, industry, and the home." Through these introductory meetings for the "Cooperating for Growth" program, 3M executive management met with nearly 8,000 sales managers, sales supervisors, representatives, and branch operations personnel by teleconference or in person.

*Source: Communication News, July 1982, p. 40.*

TABLE 4-8

|                        |                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization           | The Hospital for Special Surgery in New York City sponsored by Orthopaedic Division of Johnson & Johnson.                                                                                                                                                                                                                                                                               |
| Objective              | To introduce a new surgical procedure as part of a continuing medical education program.                                                                                                                                                                                                                                                                                                |
| T/C System/<br>Format  | Full-motion video teleconferencing: one-way video, two-way audio; point-to-multipoint; panel and question-and-answer session that comprised one-third of the three-hour presentation.                                                                                                                                                                                                   |
| Participants/<br>Sites | The program reached some 2,000 physicians and surgeons, from 50 to 100 at each of the 35 remote locations.                                                                                                                                                                                                                                                                              |
| Transmission           | The continuing medical education presentation originated in the studios of PTV station WNEW, and was sent out over Westar IV to 26 PTV stations and 10 hotel meeting sites, as well as the Johnson & Johnson corporate headquarters in New Jersey. One site received the program via AT&T telephone lines; the rest used mobile downlinks provided by VideoStar Connections of Atlanta. |
| Comments               | The program was titled "New Advances in Total Hip Replacement" and featured a panel of six prominent orthopedic surgeons, plus videotape inserts and slides. Highlight of the presentation was a 20-minute, edited film that provided participants with a close-up look at a surgical procedure involving a new hip prosthesis developed by the panel members.                          |

Source: "Conferencing by Satellite—A Selection of Case Studies," *E-ITV*, August 1982.

TABLE 4-9

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization           | Merrill Lynch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Objective              | To inform investors about the 1981 Tax Act.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| T/C System/<br>Format  | Full-motion video teleconferencing: one-way video, two-way audio; point-to-multipoint; two seminars with three question-and-answer sessions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Participants/<br>Sites | The program reached 17,000 of the firm's clients located at hotels in 30 cities, and went to another 5 million home viewers via pickup by 350 cable systems. The hotel audiences received it from one of two satellites and, depending on audience size (2,000 attended in both Los Angeles and New York), viewed the proceedings on one or two large-screen TVs and/or 19" monitors that were positioned around the walls of the meeting room. The seminar included preproduced "informercials" that focused on such investments as All Savers, IRAs, and Mini-bonds. Following each segment, Merrill Lynch experts discussed investment opportunities, risks, and the important factors clients should consider before investing. |
| Transmission           | The signal from the origination facilities at Merrill Lynch in New York City went via microwave to an uplink in New Jersey.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

Source: "Conference by Satellite—A Selection of Case Studies," *E-ITV*, August 1982.

TABLE 4-10

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization           | Allied Van Lines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Objective              | To introduce a new marketing program in a carefully controlled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| T/C System<br>Format   | Full-motion video teleconferencing. One-way video, two-way audio; point-to-multipoint; presentation followed by question-and-answer session.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Participants/<br>Sites | The program was broadcast to more than 1,700 Allied agents and sales managers assembled at 34 metropolitan areas throughout the country.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Transmission           | The teleconference originated from the studios of WTTW-TV, Chicago's public television station. It was the first videoconference originating from WTTW. The signal was distributed from Chicago via satellite to the 34 receiving points. Following the presentations by the Allied principals, the audience in the 34 locations directed questions to the speakers. Telephone operators were on hand throughout the presentations to accept questions that were answered and discussed later in the afternoon. Allied's chairman, president, and three vice-presidents appeared in a relaxed, living-room setting to answer questions and exchange comments and ideas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Comments               | Coordinated by Allied and WTTW personnel, the production resembled a television program, complete with sets, introductory segments, and music. According to producer Paul Rocklin, "People everywhere are very comfortable with the television medium. The Allied audience could relate easily to this familiar style of presentation." Patrick Shea, director of advertising and sales promotion for Allied, pointed out some of the cost-efficient benefits of videoconferencing: "Everyone involved saves travel costs and the attendant expenses of out-of-town meetings such as hotels, meals, and entertainment. And each agency can afford to send more employees to the meetings." Equally important, he added, are the time-saving aspects of the videoconference. "With 34 locations this year—seven more than the first videoconference—those attending weren't away from their business for more than a day." Shea also noted that a videoconferencing can effectively convey the immediacy of the issues being addressed. In this case, Allied presented major new marketing strategies and a sales incentive program. "When everyone throughout the country hears the same message at the same time from the same person, the message carries an equal force to everyone." Before videoconferencing, Allied agents and sales managers attended regional meetings, and the information had to be delivered by different personnel at the various sites. In preparation for the videoconference there was a rehearsal, taking approximately two hours per person. Each speaker was coached in voice projection, facial expression, and how to relate to the camera and teleprompter. Rehearsal involved speech critique, a run-through in front of the camera, a playback of the videotape for analysis and a repeat performance. |

Source: *Communication News*, August 1982, p. 33.

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TABLE 4-11

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization          | Cobe Laboratories, a manufacturer of high technology medical equipment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Objectives            | To routinize communication: connect geographically-dispersed branch offices, carry out interactive communication between home office and field personnel; establish long-term team-developed projects requiring frequent communication; optimize the rapidly-changing marketing process that requires immediate and constant feedback and sales; and carry out frequent employee-training sessions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| T/C System/<br>Format | Audio teleconference; multipoint interconnection; round-table discussion format.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Transmission          | Each Monday at 2:00 P.M., the five regional sales managers of Cobe's cardiovascular division hold an audio teleconference via a specially-designed meet-me conference bridge operated by Kellogg Teleconferencing Service, a bridge that has been customized on-site by Communication Equipment Contracting Co. (CEAC) at Kellogg's location in Littleton, Colorado.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Comments:             | "Teleconferencing has brought us closer together," said Victoria Strohmeier, marketing communication manager. "Before we started it, the district and regional sales managers got together infrequently, maybe once a year." "Our main objective is not to replace in-person travel because we seldom need to be face-to-face," said Poole, national sales manager. "We do need to talk about our problems promptly, as they arise, and telephone conferencing enables us to do this. It eliminates voluminous personal phone calls in handling urgent and emergency situations." It is especially helpful," said Carol Lacky, cardiovascular marketing administrator, "to have an established day and time for the teleconference." The inventory and distribution of medical equipment, such as the extra-corporeal life-support system, require both long-term planning and emergency control. If there are urgent needs or complications, the telephone conference call—because it is at a scheduled time—allows a stressful situation or emergency to be treated with a degree of routineness and therefore facilitates carefully-controlled efficiency. The managers gained immediate benefits from the teleconferences and find new uses each week. "The managers find out about the availability of equipment, any schedule delays, the whereabouts of key people, suggested policy changes, ideas on handling bottlenecks and any technical difficulties with equipment," said Poole. "We can get suggestions on methods of service, likely sales prospects, announcements of training seminars, and customer feedback." |

Source: Tom Jenkins, "Teleconferencing Is Good Medicine for a National Medical Company," *Telephony*, December 6, 1982, pp. 30-32, 138.

TABLE 4-12

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization           | Government of Ontario, Canada.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Objective              | To increase communication between government offices scattered over a wide geographical area; to reduce travel and decrease fuel consumption. Recognizing that it consumes about 3.5 billion litres of petroleum-based fuel each year, the government of Ontario created the Task Force in 1980 as part of its Transportation Energy Management Program (TEMP) to promote the uses of audio and video teleconferencing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| T/C System/<br>Format  | Audio and full-motion video teleconferencing; multipoint inter-connection; information seminars, public information sessions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Participants/<br>Sites | Most ministries with active responsibilities for program delivery in Northwestern Ontario regularly use the teleconferencing networks. These include, among others, Environment, Northern Affairs, Government Services, and Natural Resources. Four locations in the provinces are equipped for full-motion video (Toronto, Thunder Bay, Sudbury, and Oshawa). In addition to video, extensive use is made of audio teleconferencing both with a private bridge and Speakerphones or Conference 2000 units and with dedicated CNCP "broadband" audio networks. Three ministries have installed CNCP dedicated audio networks linking between five and seven locations.                                                                                                                                                                                                                                                                               |
| Evaluation             | The full-motion video facilities were installed at a cost of approximately \$25,000 per location and are available for use by all ministries. Equipping each board room on the dedicated CNCP network involved an initial capital outlay of approximately \$3,000 per site and a monthly rental of \$225 per location, with typical toll charges among five locations being \$52 per hour. In comparison, using the government bridge and the government's intercity network, the toll charges for a five-location conference call would be as low as \$25 an hour. A Conference 2000 unit costs \$1500 to buy or approximately \$50/month to lease. Evaluations of the 18-month initial test period of the CNCP broadband audio system at the Ministry of Transportation and Communications revealed that 461 return trips involving 2,068 hours of travel time were replaced with a final savings calculated at \$50,000 and 42,000 litres of oil. |
| Comments               | "In a ministry such as Northern Affairs, where staff are geographically dispersed from Kenora to Toronto, regular teleconferences help make everyone feel part of the team," said Julie Ruppel, coordinator of documentation services. Ron Gotts, former regional director of the Ministry of the Environment (MOE) noted that there are additional benefits to not having to catch the "red-eye special" from Thunder Bay to Toronto: "With teleconferencing these trips are less frequent, perhaps only once a month. While this is important from the point of view of government constraints, from a personal point of view it's a godsend." Neeru Biswas, supervisor, Systems Development,                                                                                                                                                                                                                                                      |

Telecommunication Services Branch of the Ministries of Government Services, noted, "The system is used for business meetings as well as for the delivery of special services. The Clark Institute of Psychiatry in Toronto, for instance, conducts interviews between doctors and patients regularly using video conferencing."

Sources: "Audio Teleconferencing: The Only Way to Go Proponents Say" and "The Teleconference Option," (*topical*, June 1983, April 1984), *The Problem Solver*, The Ontario Government, April 1981, March 1982, June 1983.

Figure 4-11 "It's the only way to fly." (Courtesy: TEMP Teleconferencing Task Force, Government of Ontario, Canada)



TABLE 4-13

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization       | Department of Pediatrics, Mount Zion Hospital and Medical Center, San Francisco.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Objective          | To allay maternal anxiety and to assist in the attachment and bonding of mothers to their sick infants who are remotely-located at intensive care centers (ICN).                                                                                                                                                                                                                                                                                                                                                                                                                               |
| T/C System Format  | Audio plus slow-scan video television; point-to-point, question-and-answer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Participants/Sites | Seven mothers who were hospitalized for extended periods after delivery at various hospitals were able to communicate with the staff of the ICN where their infants were located.                                                                                                                                                                                                                                                                                                                                                                                                              |
| Transmission       | A portable slow-scan video television was made available to Mount Zion Hospital and Medical Center by Colorado Video, Inc. The system was easy to use and could be operated by nursery or obstetrical personnel at either institution. At the mother's request, the receiving unit was wheeled into her room and plugged into the phone jack. A telephone call made by her to the ICN staff alerted the staff to initiate transmission. A mobile unit was brought within the vicinity of the infant's bed, and a video picture of the infant was transmitted for as long as the mother wished. |



Figure 4-12 Slow-scan television picks up image of sick infant who is located in an intensive care center. (Courtesy: Mount Zion Hospital and Medical Center, San Francisco.)

**Comments** When questioned during the initial slow-scan television transmission, all study mothers expressed an appreciation of the SSTV system. They were relieved at being able to see their infants, claiming that their imagined view of the infant's condition was much worse than reality. All seven mothers mimicked a similar pattern when viewing their infants, requesting to see closeup views of the hands and feet as well as facial views in an almost exploratory manner. Many also talked spontaneously to their infants even though they were viewing a video image of the child. For one mother, the SSTV provided her only contact with her child before the infant expired.

*Source: "Videophone Use Improves Maternal Interest in Transported Infants," Critical Care Medicine, Vol. 11, No. 8, pp. 656-6.*



**Figure 4-13** Mother views her sick infant via slow-scan video television. (Courtesy: Mount Zion Hospital and Medical Center, San Francisco.)

**TABLE 4-14**

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organizations      | University of Hawaii and NASA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Objective          | To bring into the classroom a well-known, but busy, NASA scientist.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| T/C System Format  | Audio plus slow-scan video television; point-to-point; embedded teleconference.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Participants/Sites | Dr. David Swift, a sociologist at the University of Hawaii, slow-scan video teleconferenced into his "Sociology of Exploration" class a well-known NASA scientist. The scientist remained in his office at NASA's Jet Propulsion Lab at Ames Research Center.                                                                                                                                                                                                                                                                                                                                                    |
| Transmission       | A portable SSTV pack was made available by Colorado Video, Inc., to the University of Hawaii. The portable SSTV pack was air-freighted from Hawaii to the NASA scientist before the planned audiographic teleconference.                                                                                                                                                                                                                                                                                                                                                                                         |
| Comments           | At the predesignated time, Dr. Swift put through the long-distance call to the NASA scientist. The expert was immediately "in the classroom," addressing the students, answering their questions, and responding to their ideas—in short, interacting with them. The result? There was no "brain drain," i.e., the scientist's limited time and intellectual energy were not exhausted in travel; and the students were afforded the opportunity to converse directly with a nationally-acclaimed scientist. SSTV thus made possible both a conservation and dissemination of scarce knowledge at the same time. |

*Source:* Interview of Glen Southworth, Colorado Video, Inc., by Kathleen Kelleher, October 1982.



**Figure 4-14** Slow-scan video teleconferences can take place anywhere with this portable equipment. (*Courtesy:* Colorado Video, Inc.)

TABLE 4-15

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization      | Copper County Intermediate School District, Hancock, Michigan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Objective         | To identify and meet the needs of students and teachers located in the Western Upper Peninsula of Michigan, an area of 20,000 square miles with a sparsely-settled population of 300,000 people.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| T/C System Format | Audio plus slow-scan television; presentation with question and answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Comments          | Long distances and heavy snow conditions were overcome by using SSTV, which made instruction in music, upper-elementary math, and dental hygiene available to students. John Kirscher, project director, noted, "It worked. It was very effective and very cost-effective," emphasizing that his assessment was based on a careful monitoring of the project through design controls and control groups built into the study plan. The success of the program, Kirscher felt, could be attributed to the medium of SSTV, with its economy of production and its ability to serve specific, local needs, without having to appeal to a large audience to justify regular TV's high production costs. Kirscher and other staff members polled teachers in order to identify their needs. "Teachers were always involved," he noted, "but they chose the type and level of involvement." Programs were developed with the aid of "teacher-producers," and the approach taken was a comprehensive one: in addition to offering instruction not otherwise available for students, it provided in-service teacher training that Kirscher felt was particularly successful because it was based on what teachers said they needed. The SSTV system was linked to cable TV to "extend the reach" of the programming and allow teachers to do the majority of their course work at home. |

*Source:* Telephone interview of Kirscher by Kathleen Kelleher, October 1982.

TABLE 4-16

|                    |                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization       | California State University (CSU).                                                                                                                                                                         |
| Objective          | To supplement the ITFS (Instructional Television Fixed Service) cable broadcast system by sending information back to the main educational site.                                                           |
| T/C System Format  | Audio plus slow-scan television multipoint-to-point; presentation with question-and-answer sessions.                                                                                                       |
| Participants/Sites | CSU at Davis and CSU at Chico make available instruction in 14 cities, covering 25% of California's land mass.                                                                                             |
| Transmission       | Instruction goes out via cable from the main campus site to the student population, and then the SSTV system video teleconferences the images of the students and their work back to the educational site. |
| Comments           | Royd Weintraub, director of the Instructional Media Center, California State University at Chico, pointed out how Cal State                                                                                |

at Chico and Cal State at Davis are electronically linked together, allowing six community colleges to share facilities and expenses. Four different places of learning are provided, all having dial-up access to libraries available electronically through the College Library System, Inc., and all libraries in the school system through the on-line catalog provided by the Ohio College Library System. These are: the home, the neighborhood (elementary school, hospital), the community college (where the instructors and students occasionally meet in person), and the workplace (Hewlett Packard, for instance, offers their workers regular California State University courses at the industrial plant). Weintraub felt that the "wired university" is particularly well-suited for continuing education programs for people already in their careers, older people, those who are isolated, and especially those who are disabled. Because the "wired university" is not an extension, but rather an integral part of the regular instructional program, California state at Chico can offer bachelors and graduate degrees wholly through cable- and SSTV-produced courses, including degrees in their Para-Legal Program, Social Science Program, and Department of Education. Weintraub felt that the fact that the university does not have the resources to invest in program production is ultimately not a hindrance to the educational process. The interactive aspect of SSTV, and not a glossy production format, he felt, is the crux of the system: "People can simply converse," he noted. "I think that interaction is the ticket. If and when we have more funds, we can devote more to production. But the main thing is that this system lets people interact."

*Source:* Telephone interview of Royd Weintraub by Kathleen Kelleher, October 1982.

TABLE 4-17

|                    |                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization       | University of Toronto.                                                                                                                                                                                                                                                                                                |
| Objective          | To provide medical consultation and teaching.                                                                                                                                                                                                                                                                         |
| T/C System Format  | Audio plus slow-scan television; point-to-point; panel, round-table discussion.                                                                                                                                                                                                                                       |
| Participants/Sites | Two hospitals in Toronto and one in Sioux Lookout, as well as five small communities (of 50 to 1,000 population), scattered throughout the Northwest Ontario, which are nearly impossible to reach in the wintertime and generally have only health stations administered by nurses or volunteers.                    |
| Comments           | Since May 1978, a slow-scan video teleconferencing has made possible, on a weekly basis, a medical educational program for doctors and nurses at the different sites. These consist of a 30-minute lecture followed by a discussion in which everyone interacts (made possible by a "meet me" audio bridge that links |

together the SSTV-equipped communities). Dr. Earl Dunn, a professor on the Faculty of Medicine at the University of Toronto and the person largely responsible for orchestrating the network, has noticed that SSTV is "extremely useful" for transmitting X rays: "Radiologists have no trouble interpreting the X rays transmitted via SSTV. In fact, with soft-tissue X rays, one can get an even better picture with SSTV due to its zoom capacity."

*Source:* Telephone interview of Dunn by Kathleen Kelleher, October 1982.

TABLE 4-18

|                        |                                                                                                                                                                                                                                                             |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization           | University of Wisconsin-Extension.                                                                                                                                                                                                                          |
| Objective              | Educational outreach.                                                                                                                                                                                                                                       |
| T/C System/<br>Format  | Audio plus slow-scan television; point-to-point; broadcast, panel, question-and-answer.                                                                                                                                                                     |
| Participants/<br>Sites | Students located at 27 sites throughout Wisconsin who are taking University of Wisconsin courses.                                                                                                                                                           |
| Comments               | "Students enjoy instantaneous graphics, the ability to see the instructor, and instantaneous interaction," noted Lome Parker, director of the Center for Interactive Studies. "Now the boundaries of the campus are the boundaries of the state," he added. |

*Source:* Telephone interview of Lome Parker by Kathleen Kelleher, October 1982.

TABLE 4-19

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization           | Center for Advanced Visual Studies, Massachusetts Institute of Technology.                                                                                                                                                                                                                                                                                                                                                                                                    |
| Objective              | To demonstrate basic scientific concepts and recent developments in science in a direct, "hands-on" manner to laypersons.                                                                                                                                                                                                                                                                                                                                                     |
| T/C System/<br>Format  | Various electronic means, including prerecorded videotape and live closed-circuit TV at a site that used video as a live feedback system, were employed to obtain images that were then transmitted from San Francisco to M.I.T. via slow-scan television, at which point the images were digitally processed, transformed, and augmented into an electronic collage. These electronic collages were then transmitted back to the site at the Exploratorium in San Francisco. |
| Participants/<br>Sites | Bernde Kracke, a research fellow at M.I.T., arranged an "interactive performance" between the Visible Language Workshop at M.I.T. and the Exploratorium in San Francisco. Visitors to                                                                                                                                                                                                                                                                                         |

the Exploratorium could participate in new forms of electronic communication.

Comments "It was a well-received two-hour performance," Kracke said. "The kids and adults interacted with the exhibits to understand in a playful way what scientific developments mean first-hand." Kracke, who teaches and carries out research in telecommunications, noted that "SSTV is attractive due to its availability and relative low cost." In contrast, "involvement with satellite is very expensive and necessitates that a lot of people be involved; plus there's always a limited period of time when it's available. It is a very luxurious tool." SSTV, he said, "is a very personal tool for teleconferencing. It doesn't involve a lot of people or companies."

Source: Interview of Bernd Kracke by Kathleen Kelleher, October 1982.



**Figure 4-15** SSTV media games: pictures from interactive slow-scan television performance between Exploratorium, San Francisco, and the Visible Language Workshop/Center for Advanced Visual Studies, M.I.T., Cambridge, Massachusetts. (Courtesy: Bernd Kracke)

TABLE 4-20

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization      | University of Dayton.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Objective         | To write a proposal for a contract on a deadline schedule from the contributions of a number of individuals who are geographically-scattered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| T/C System Format | Computer teleconference; multipoint interconnection; multi-topic conference.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Comments          | Joseph P. Matino of the University of Dayton used computer teleconferencing to write a proposal for an experiment in higher education. The experiment was designed by the Dayton Computer Science Department, carried out by the Engineering Department, evaluated in the School of Education and Sociology Department, and managed by Matino's Research Department. "I knew I would never get the eleven people involved together in the same room at once, let alone regularly," Matino said. He therefore decided to use the electronic mail system on the university's VAX computer. Matino put an outline of the proposal into a VAX file, then sent it as a message to relevant people in the various departments. Using the replies, he began writing drafts of the sections, incorporating the material sent in response to his messages. The others then commented on the drafts in separate files. Subsequent versions were dated and stored on-line so that they could be compared. "The proposal was really a joint effort," Matino explained. "Everyone on the team made significant contributions and interacted with everyone else. It wasn't as though we asked each person to write a portion of the proposal, then simply pasted the independently-written pieces together. We had the kind of objections, suggestions, and revisions which would have taken place in a conventional committee. The striking aspect of the activity is that we got it done so quickly. Each member was able to take part on his own schedule. For all practical purposes, we conducted a continuous, month-long committee meeting." Matino noted that he went into the experiment expecting it to work well and that the other members were highly-motivated to complete the project. "Computer teleconferencing cannot substitute for motivation," he recognized, "but it can provide a convenient means for collaboration among people who would otherwise find it difficult to meet and carry out joint activity. |

*Source:* Clifford Barney and Thomas B. Cross, "The Virtual Meeting." Reprinted from *Computer World*, 1982.

TABLE 4-21

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization           | Western Behavioral Sciences Institute (WBSI), La Jolla, California.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Objective              | To teach a specialized, two-year course.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| T/C System/<br>Format  | Computerized teleconference; multipoint interconnection;<br>multitopic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Participants/<br>Sites | Chief executive officers of universities, banks, etc., high-tech entrepreneurs, and corporate managers who, after attending an eight-day, in-person training session at the WBSI in La Jolla, California, return to their own desks, located at different sites all around the country.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Comments               | "The medium will do exactly what we want it to do. It will do a lot more than we expected," notes Robert McAndrews, Executive Director, School of Management and Strategic Studies, WBSI. The course focuses upon interpretive and strategic management processes, and it includes courses such as "Technology and the Idea of Progress," "Management Information Systems," and "Revolutionary Technologies." Once the members are trained in the use of the Electronic Information Exchange System (EIES) and armed with a simplified version of the EIES documentation compiled by Darrell Icenogle, Director of Educational Resources, the executives return to their desks in their own organizations or homes and begin their participation in the course. Equipped with terminals and accounts on the EIES teleconferencing system, participants carry out course work at their own convenience as well as take part in group discussions with the faculty and each other. There is no need for note taking, since material presented is always available on-line. The course is heavily moderated by WBSI faculty, a factor that Icenogle says is critical to its success. Participants respond favorably when the moderator indexes and summarizes teleconference items, and they usually then begin to make their own summaries of group discussions and offer them for evaluation by others. By creating a continuous record in machine-readable form, Icenogle says, the teleconference develops a kind of "weaving" of the members' ideas that adds a new dimension to what would otherwise have been a simple exchange of texts. Participants, "hunt-and-peck typists" for the most part, spend an average of 13 hours a month on-line. "The beauty of this program is that it allows executives to use their available time," notes Richard Farson, WBSI president. |

*Source:* Robert McAndrews, International Teleconferencing Seminar, Boulder, Colorado, December 7, 1982, and interviews by Kathleen Kelleher.

TABLE 4-22

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization      | Congress of the United States.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Objective         | To correspond with constituents.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| T/C System Format | Computer teleconference/electronic mail; multipoint-to-point.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Participant/Sites | Congressman James Coyne from the 8th District of Pennsylvania and his constituents.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Comments          | The system allows constituents to send electronic messages to the congressman's Washington office, and he can respond with messages to let "the folks back home" know that he's received the electronic letter and indicate what action he's taken on the request. "It's the best combination of the telephone and the letter," said Coyne. "The phone is fast, but the person you want to talk to isn't always there when you have a problem. The letter is slower, but you know the person eventually receives it. With electronic mail, messages are faster. People don't have to wait three days for a letter to reach Washington, another three days for the letter to be passed on to the right party, and another few days for the problem to be solved. It's particularly important in cases where Social Security checks haven't been received and in other instances where fast action is important to the people in my district." Before converting to CompuServe's two-way E-Mail system, the congressman says he experimented with another electronic message method but found the system to be limited because he could not reply to the people who sent him electronic communiques, and because it required a long-distance call. With the new system, he can send an immediate answer, which he does from the small terminal that sits behind his desk along with a telephone and other traditional office equipment. Messages via electronic mail tend to be quite similar to those received by regular mail, according to Coyne. Pointing to some examples, he recalls, "A Social Security check problem, someone who requested a congratulatory letter from the President for a relative's upcoming 100th birthday, someone looking for a job, and a person requesting information about a specific House bill. This method makes government more productive, more responsive, more efficient. We have to start thinking in terms of the technology of the '80s. Computers are the '80s." "It makes me accessible to the people I serve," he explained. . . . "I would really like to see these installations in post offices," he suggested, "because Congress received over one billion pieces of mail two years ago; last year it doubled. We will probably get even more this year. Electronic mail would make our responses fast, more efficient." |

Source: Kathy Bissell, *Communications News*, September 1982.

TABLE 4-23

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Organization | Interuniversity Communications Council (EDUCOM) and EDUNET, an international computer service that makes the facilities of 16 academic computer centers available to more than 180 EDUCOM member institutions. Headquartered in Princeton, New Jersey, EDUCOM is a nonprofit consortium founded in 1964 of more than 350 colleges and universities to promote the use of computing, communications, and information technology in higher education.                           |
| Objective    | Recognizing that many campuses already have installed their own local electronic mail networks, the purpose of the Mailnet project is to link these many local systems so that each user will have the convenience and low cost of a local system even when communicating with people elsewhere in the world, according to Paul Heller, executive director of the EDUNET network and member of the team involved in the Mailnet project.                                      |
| T/C System   | Computer teleconference/electronic mail.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Participants | The 16 initial participants in Mailnet include Carnegie-Mellon University, University of Chicago, Cornell University, Dickinson College, Harvard University, Iowa State University, Massachusetts Institute of Technology, Merit/University of Michigan, New Jersey Institute of Technology, Northwestern University, Rice University, University of Southern California, Stanford University, Stockholm University, Swarthmore College, and University of Wisconsin-Madison. |

*Source: Communication News, September 1982, p. 92.*

# 5

## AUDIO TELECONFERENCING

### INTRODUCTION

Audio teleconferencing is the use of the telephone or another electronic medium to carry out two-or-more-way voice communication among people who are geographically separated. The voices of teleconference participants are transmitted through conventional telephone circuits or by microwave. Audio teleconferencing can be as simple as a three-way call dialed directly by the participants or as complex as a multipoint, dedicated international network that is interconnected via a communications satellite. Audio teleconference bridges can join numerous sites and create a common electronic space in which many people can effectively "meet" and confer. Microphones and speakers make it possible for a group of people to participate at each site. People can gather around a table and have their hands free as they would in a face-to-face meeting.

A study by Bell Laboratories estimated that at least 40 percent of all meetings and conferences in this country can be replaced by telephone conferencing with no loss of purpose or results. Moreover, the audio teleconference is the easiest, most convenient, and most economical form of teleconferencing. It is estimated that the cost of a face-to-

face meeting is 15 times that of an audio teleconference.<sup>1</sup> A comparison of three-way audio conference calls with in-person meetings verifies this :

**TABLE 5-1 The Simple Logic of an Audio Teleconference**

| Meeting Location                                        | Total Telephone |                     | Air Costs            | Savings Realized<br>C-(A + B) |
|---------------------------------------------------------|-----------------|---------------------|----------------------|-------------------------------|
|                                                         | AT&T<br>(A)     | Audio Bridge<br>(B) | only<br>Coach<br>(C) |                               |
| Denver* from<br>Washington, D.C.,<br>and New York       | \$59.20         | \$119.80            | \$1,416.00           | \$1,237.00                    |
| Denver* from<br>Washington, D.C.,<br>and San Francisco  | \$59.20         | \$119.80            | \$1,242.00           | \$1,063.00                    |
| Detroit* from<br>Washington, D.C.,<br>and San Francisco | \$61.02         | \$148.20            | \$1,094.00           | \$823.76                      |

◆Bridge location in Denver.

Rates provided by AT&T and average coach airfares. Does not include any management travel time to and from airport, travel preparation time, expense voucher processing, or management costs.

The audio teleconference is as available as the telephone. You can "arrive" at an audio teleconference almost instantaneously from virtually anywhere there is a telephone. Because there are over 500 million telephones located throughout the world, one telephone for every ten people, an audio teleconference can easily be arranged with someone located either down the street or on the other side of the world. Because there are almost one million speakerphones already installed, arranging an audio teleconference with groups located elsewhere is becoming easier and more commonplace. Audio teleconferencing is also inexpensive compared to the costs for either travel or other means for teleconferencing. A great deal of training is unnecessary to audio teleconference effectively.

There are now over a hundred ways to call between most major cities. Typically, there are over 20 different telephone companies in the larger cities. Rates can vary as much as from 5 cents to \$1 per minute to make the same long-distance telephone call. The major common carriers are American Telephone and Telegraph (AT&T) Longlines, GTE, Interna-

<sup>1</sup> Thomas M. Jenkins, "The Party Line Returns," *Association Management*, February 1983, p. 90.

tional Telephone and Telegraph (ITT), and the regional telephone companies such as Mountain Bell, Chesapeake and Potomac Telephone Company. The major telephone companies provide the public direct-dial network. Regulatory changes affecting AT&T and the availability of satellite time have resulted in a plethora of new companies offering a wide, and often bewildering, array of services. The other common carriers, also referred to as specialized common carriers and resale common carriers, include private companies such as MCI, Sprint, ALL-NET, and U.S. Telephone. These companies buy circuits from the major common carriers at a discount and resell them to the public at a competitive rate. They also provide private lines for lease to large organizations for in-house use. Other companies, such as American Satellite (AMSAT), Satellite Business Systems (SBS), and Western Union, provide private satellite services. When voice transmission is relayed via satellite, however, there is a delay of approximately one-half second, which has proven to be a significant frustration in interactive communications.

## THE AVAILABLE OPTIONS

The available options in audio teleconferencing range from an *ad hoc*, user-initiated call to multipoint, ongoing teleconferencing by an organization that uses a dedicated private network. A dedicated network is one made up of permanent circuit connections among fixed sites in a network that an organization leases for its private use.

Audio teleconferencing can take any of the following forms:

- User-initiated teleconferences.
- Dedicated network teleconferencing.
- Dial-up teleconferencing.
- "Meet-me" teleconferencing.

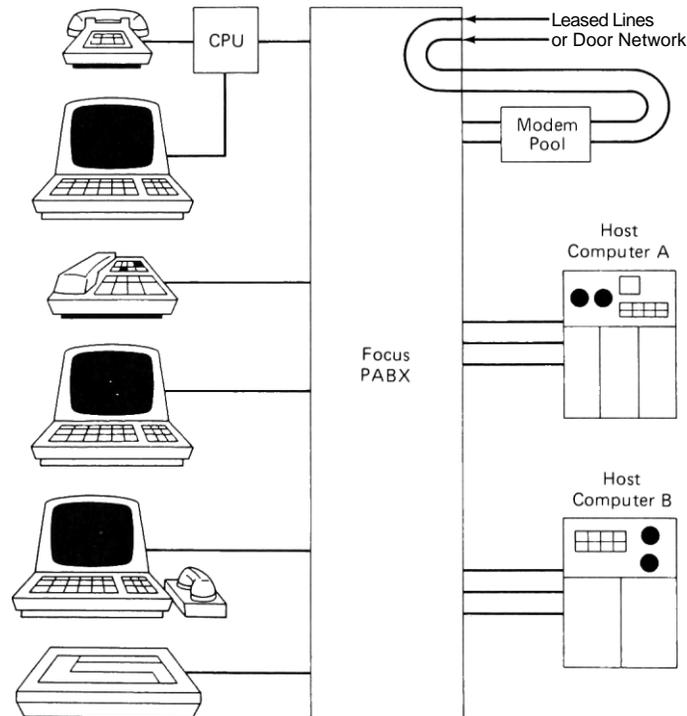
### User-Initiated Audio Teleconferences

Audio teleconferences that link from three to six sites can be initiated by the user. Three-way calls that use the public telephone network can be connected with a telephone handset, a standard telephone with a three-way call feature. The major advantages of this type of audio teleconferencing are the low cost (about \$3.25/month charge for the three-way call feature) and the ease of setting up the teleconference. Private branch exchanges (PBXs), key telephones, and hybrid systems also provide user-initiated audio teleconferencing.

### PBX Systems

A PBX is a telephone exchange that connects the telephone communication within an organization, usually a fairly large one such as a hospital or university. It is owned or leased exclusively by the organization. A PBX also connects its own exchange to telephones served by other exchanges that are either public or private, large or small. A key system is a PBX for a small organization. It does not have switching capabilities and uses an intercom system instead. A hybrid system is a key system that offers some PBX features, for example, internal switching capability.

Most modern PBX systems allow each telephone user to create a three-way conference call. The user can access another internal party and one outside local party, or two outside parties. Audio teleconferencing with a PBX system is therefore generally limited to local or internal communications. Voice bridging in PBXs and key systems are generally high quality if all the participants are part of the internal



**Figure 5-1** Focus Digital PABX provides the transmission and switching services needed to bring automated office equipment into a network of shared services. (Courtesy: American Telecom)

bridging system. The main PBX operator can connect up to six local parties. Beyond six parties, however, the audio quality of the conversation seriously diminishes without additional amplification or compensation (equipment not normally found in PBX systems). If the teleconference includes long-distance connections, there is significant transmission loss, resulting in practically inaudible voice transmission. In the case of key/hybrid systems for small offices, the user can access multiple telephone lines and accomplish multiparty audio teleconferencing, but the equipment usually lacks the sophistication necessary for high-quality performance. The pros and cons of PBX or key-system audio teleconferences are the following:

- They are cost-effective when used frequently for either voice or data transmission.
- There is a lack of amplifiers to compensate for low audio level.
- A limited number of people can participate.
  - There are generally no features available for billing, recording, monitoring, and supervision, or, if they exist, they are limited.
  - Lost parties can be reconnected to the teleconference only with difficulty.
  - Participation is limited as PBXs are set up for in-house use or for use in the local dialing area.
  - There is generally only limited assistance available from the operator.

#### **Dial-up Teleconferences**

Dial-up teleconferencing is offered on demand simply by dialing "0" and letting the operator know which parties are to be connected. Reservations are available but not required. The operator calls each participant, one at a time, and puts each party on "hold." When the participants have been contacted, their circuits are merged, and the teleconference begins. If there are only a few participants, it takes only a few minutes for all parties to be contacted and connected. When ten or more sites are involved, however, it can take 30 to 45 minutes to set up the teleconference. The teleconference leader should plan ahead and take this possible delay into account, as well as inform the participants that they should allocate some lead time before the meeting is actually scheduled to begin.

Telephone company operators leave the call once the audio teleconference has been set up and thus are unavailable to help should technical difficulties arise. If a telephone line is disconnected, the operator is unaware of this and the disconnected party cannot call back into the conference. Also, if participants encounter severe echo or noise

## Conference Bridge

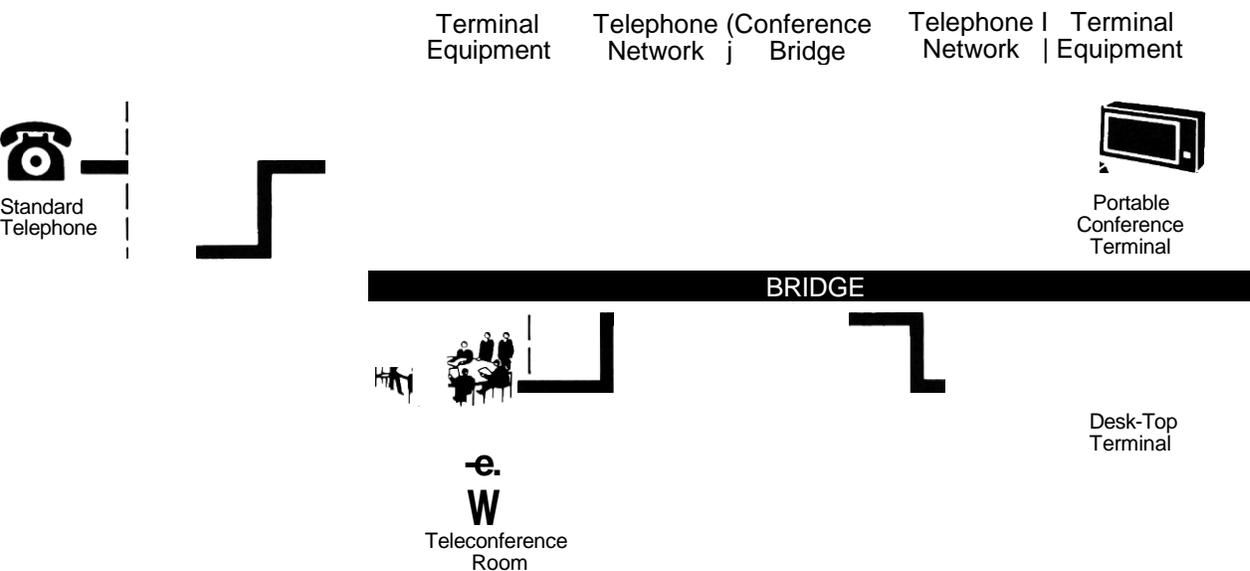


Figure 5-2 Audio teleconference bridge. (Courtesy: Darome, Inc.)

on the line, they do not have the option of hanging up and dialing in again. The major drawback of this system for busy executives is that it does not allow persons to be late for the teleconference. If someone is not available at the beginning of the conference, he or she cannot be connected into the teleconference once it has started.

The rates for dial-up audio teleconferencing are based on business-hour, operated-assisted rates—the highest rates that telephone companies charge. The charge for the audio teleconference is computed by calculating the product of the number of locations and half the cost of a regular telephone call between the two farthest points. Due to the rapidly-changing nature of pricing of AT&T services, dial "0" for current information.

To summarize, the pros and cons of this form of audio teleconferencing are:

- It is simple to use.
- There is almost universal penetration.
  - If someone is late for the meeting, there is no ability to dial in once the conference has started.
- An operator is not available during the conference.
- The audio quality fluctuates.
- It can be expensive.

### **"Meet Me" Teleconferences**

The growing trend in audio teleconferencing is to use services that are available through private companies such as Kellogg Communications, Darome, Connex, Tele/Link, and ConferTech. These companies offer a wide range of custom services not available in dial-up, operator-assisted teleconferences.

In "meet-me" bridging services, instead of waiting to be called by the telephone company operator, participants call into the meeting. They simply dial direct or use 800 toll-free numbers assigned in advance. If all parties are prompt in calling in, it takes no more than five minutes to set up the teleconference. Because teleconference participants initiate their own calls, they do not have to call into the teleconference from a prearranged location. They are therefore free to move about, and they need only go to the nearest telephone when it is time for the teleconference. For those who travel extensively and need to keep in touch, such as field sales personnel, this is an invaluable mode of communication.

Teleconference participants can enter and leave the teleconference without disturbing the meeting that is taking place. During the "meet-me" call, an operator is available to monitor the technical aspects of the call and to make a variety of technical adjustments to assure high-quality audio throughout the teleconference. These operators are also trained in teleconferencing protocols and are available to assist participants in using the medium as effectively as possible.

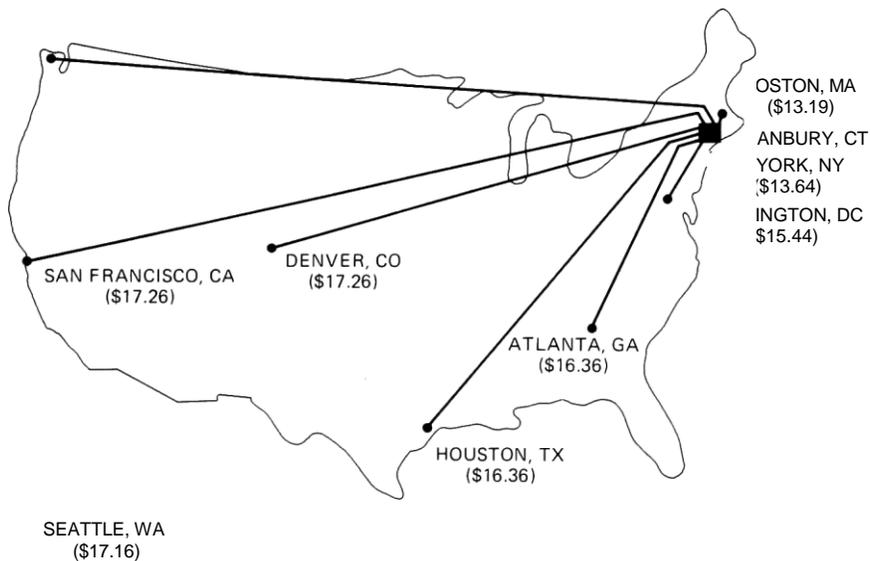
In "meet-me" bridging services, long-distance charges are separated from teleconferencing service charges. The bridge service charges average about \$15 to \$20 per hour per user (or port). The toll charges for each connection to the bridge are additional costs to the individual conference participants, and they average about \$25 per hour. Telephone line charges are based on a set fee per minute per location. Darome, for example, charges \$.333 per minute per location. A 60-minute teleconference among 5 locations would therefore cost just under \$100 for telephone line charges and approximately \$75 ( $\$15 \times 5$ ) for bridging service charges, for a total of about \$175.

As users become more experienced and sophisticated, they tend to prefer the private services because they offer an array of useful features, including the following:

- Users can dial in or leave at their own convenience.
- There is high-grade audio quality.
  - A large number of people can participate, and almost 300 sites can be connected together.

CASE STUDY: AUDIO CONFERENCING  
THE DAROME CONNECTION

Duration of conference call: 45 minutes  
 Number of sites connected: 8  
 Each site makes a direct dial call to the telephone bridge in Danbury, Connecticut.  
 Direct dial charges (daytime rates) are shown in parentheses.



|                                           |          |
|-------------------------------------------|----------|
| Costs:                                    |          |
| Total long distance charges               | \$126.77 |
| Bridging charges (\$.333/minute per site) | 119.88   |
|                                           | \$246.65 |

"Each site will be individually billed by their local telephone company for the long distance call to the bridge site.  
 "The originator (organizer) of the conference call will be billed for total bridge costs.

**Figure 5-3** Case study: The Darome Connection. (Reprinted with permission of the Institute for the Future)

The operator can connect an individual's call to the audio teleconference in less than 10 seconds.

The user can call in, the operator can initiate the call, or there can be fully automatic call-ups.

Operators can arrange to accept collect calls.

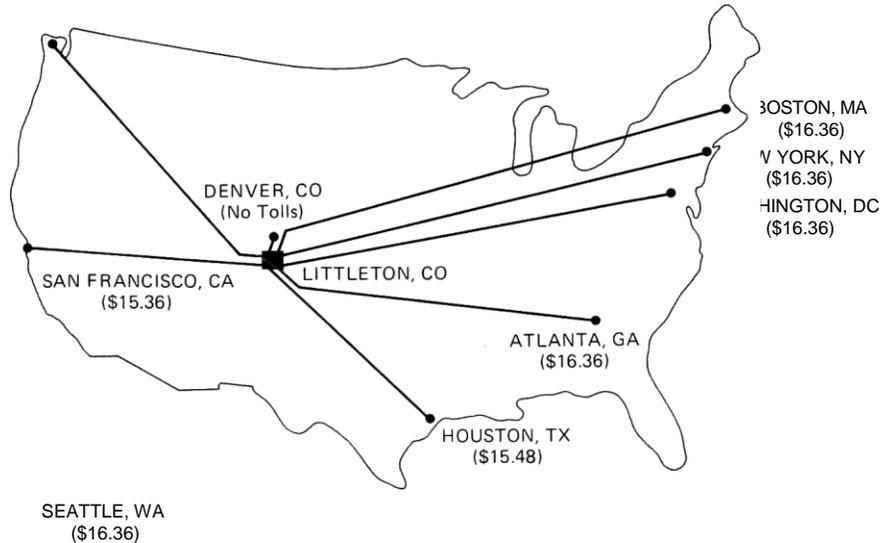
Subconferences within a main teleconference are possible. These can be either prearranged or in response to a spontaneous request.

Prerecorded user information is available and can be accessed during or after the teleconference.

The operator is immediately aware of a disconnect and can notify

CASE STUDY: AUDIO CONFERENCING  
KELLOGG TELECOMMUNICATIONS CORPORATION

Duration of conference call: 45 minutes  
 Number of sites connected: 8  
 Each site makes a direct dial call to the telephone bridge in Littleton, Colorado.  
 Direct dial charges (daytime rates) are shown in parentheses.



**COSTS:**

|                                       |              |
|---------------------------------------|--------------|
| Total Long Distance Charges           | \$113.64     |
| Bridging Charges** (16 per hour site) | <u>96.00</u> |
|                                       | \$209.69     |

\*Each site will be individually billed by their local telephone company for the long distance call to the bridge site.  
 \*\*The originator (organizer) of the conference call will be billed for total bridge costs.

Figure 5-4 Case study: Kellogg Telecommunications Corporation.  
 (Reprinted with permission of the Institute for the Future)

the teleconference leader. The disconnected party can call back and be immediately reconnected, or the operator can call the disconnected party.

- Participants can join or leave the teleconference at any time without affecting audio quality.
- The teleconference can be recorded.
- Encoding and decoding is available for security of transmission.
- There is compatibility with PBX systems, key/hybrid, slow-scan television, electro-writers, facsimile, data communications, and other signals that can be sent over telephone lines. New features are coming on line that include bridge-to-bridge connections, voice store-forward, and integrated voice and computer capabilities.

## THE AUDIO TECHNICAL SYSTEM

The purpose of any teleconferencing system is to interconnect people and provide the channels for interactive communication to take place. Interactive communication necessitates that a message be clearly received before it can be responded to by someone. It is therefore essential that teleconferencing have good audio quality. The audio channels for voice transmission are the same as those for the transmission of graphic and printed material via slow-scan television, telewriting systems and facsimile. Consequently, it is important that the audio-technical system be as high-quality as possible.

### Transmission

Fully interactive voice communications means that two people can speak to and listen to one another at the same time. A full-duplex audio channel makes it possible for a "natural" conversation to take place without noise buildup on the lines. A full-duplex audio channel (a 4-wire circuit) is actually two channels. Each transmission path allows messages to be sent and received in both directions. With full-duplex, there is two-way, independent transmission taking place on two channels at the same time. The separation of the channels prevents the build-up of noise—local echoes, "howling," and signal feedback. Full-duplex channels can carry both audio and graphic signals at the same time. Dedicated audio teleconferencing systems use full-duplex circuitry because this ensures high-quality transmission. Full-duplex channels are not offered as part of the public telephone network, and they must be leased from a carrier.

Half-duplex channels, such as the public telephone network, have only one transmission path (or a two-wire circuit) for sending and receiving messages. Voice communication is sent and received in one direction only at a time. The problem with half-duplex circuitry is that quite a lot of noise accumulates, especially in a teleconference with many ports participating. If there are many voice messages and if noise buildup is to be avoided, the single channel must be "switched" so that only one message is transmitted at a time.

Because the public telephone network is used for audio teleconferencing and is half-duplex transmission, some speakerphone models have push-to-talk buttons. Push-to-talk buttons activate the local microphone. A button is pressed before speaking. Pressing the button interrupts the transmission of the person who is speaking. Press-to-talk buttons are best in those situations where there is a lecture/presentation format and numerous sites are participating. Press-to-talk microphone switches eliminate unintended and spurious comments and sounds from being transmitted and needlessly interrupting the teleconference.

Voice switching is another device used on two-wire networks to prevent echoes and reduce the hollow sound that results when speakers are located at different distances from the microphone. The voice of the speaker activates the transmit mode of the microphone and overrides the incoming signal produced by the remotely-located person. Half-duplex systems prevent the accumulation of noise on the telephone circuit, and thus overall sound quality of the audio teleconference is significantly improved. This method requires, however, that communication protocols be employed in order to assure that everyone who has a question or comment is heard on the audio bridge. Lecture-style presentations that depend less on spontaneous interaction are obviously well-suited to teleconferencing on dedicated systems.

While voice switching solves some of the noise and circuitry problems, it creates others, most notably clipping. Clipping is the momentary loss of audio transmission. It occurs when two people who are using voice-switched equipment speak simultaneously. Because the circuit allows only one message to be transmitted at a time, the other will be cut off when interrupted. It generally results in the loss of the first syllable of the speaker's utterances, and it is quite annoying for people who are attempting to listen.

Voice signals can be transmitted in either analog or digital form. In analog transmission, data are represented by analogous physical magnitude or electric signals. Broadcast radio, television, and the public telephone network typically transmit signals in this manner. In digital transmission, data are represented electronically as binary digits. Most meet-me bridges use digital circuitry. Digital transmission combines the advantages of both half- and full-duplex systems by preventing noise accumulation, on the one hand, and by letting more than one speaker enter the system at one time and be heard without having to use the press-to-talk buttons, on the other. A speaker can be interrupted and the normal feedback of conversations can be heard. The voice switching circuits are designed in such a way that only one loudspeaker is turned on if only one person is speaking, yet others are turned on instantly when someone else speaks.

### **Bridges**

The simplest audio teleconference is two telephone lines and an extension line that allows a third person to be added to the conversation. Using an extension, however, causes significant transmission loss. PBXs, key telephones, and telephone handsets act as bridges and link together the three or more telephone lines used in a teleconference. They cannot successfully link more than three or four ports on a half-duplex channel, however, because the noise builds up from each locale,

is combined and transmitted with the noise from all other ports, and is ultimately transmitted as a loud squeal. A separate bridge is generally employed to connect ports in a multisite teleconference.

The idea of the bridge is to maintain the same quality and performance level in the three-plus location call as exists in a regular telephone call between two locations. The bridge should:

- Control acoustical and transmission noise.
  - Minimize and compensate for the transmission loss (the weakening of the signal) from the calling to the receiving station.
  - Cancel echoes that are caused by signal bounce from the telephone network.

There are two types of bridging: endpoint and midpoint bridging. Endpoint bridging is the location of the bridge at one of the end points of the network. This causes significant variation in audio quality among the different points in the teleconference. Midpoint bridging is the location of the bridge at a midpoint in the network so that the loss contrast between the peripheral point and other locations is equalized. Of the two, midpoint bridging minimizes and better controls external noise and echoes.

Transmission quality is important in identifying the speakers in an audio teleconference. If the audio quality is sufficiently good, the teleconference participants quickly identify who is speaking. Speaker identification is accomplished most successfully if the teleconference participants already know each other. When participants do not know each other, they should remember to identify themselves before they speak or the teleconference chairperson should tactfully remind them to do this.

Other solutions to the problem of speaker identification have been developed by the British and French. Unfortunately, however, these systems are only for use between two locations where there is dedicated audio teleconferencing capacity. The Remote Conference System, developed in England, consists of two conference tables located at two different sites, each of which provides for six to eight people. In front of each person there is a separate microphone and a small, table-mounted loudspeaker that is labeled with the name of the teleconference participant at the other location. This loudspeaker is placed in the same position that the participant occupies at the remote conference table, and it transmits only the voice of that person. Additionally, an indicator lights up on the specific loudspeaker in use.

Another method for identifying the speaker is the use of stereophonic sound. Each teleconference participant is provided with his or

her own microphone. There is one speaker per table, and the speaker is identified by LED displays.

## AUDIO TERMINAL EQUIPMENT

—=—™=

Conventional telephone handsets are satisfactory for the occasional, brief audio teleconference. As it is uncomfortable and inconvenient to hold a conventional telephone to the ear for any length of time, however, they are unsatisfactory for more frequent or sustained use. The teleconference participant will usually want equipment that allows hands-free participation in the teleconference. Audio terminals are therefore equipped with microphones and amplified listening devices. This also allows outgoing sounds to be modulated and the volume of the incoming sound to be adjusted. There is a wide variety of terminals that are available. They range from portable desk-top speakerphones to loudspeakers and microphones installed permanently in a room dedicated to audio teleconferencing.

### Speakers and Microphones

Portable units can be plugged into standard desk-top telephones. For groups of up to six individuals, the most common is the Bell 4-A Speakerphone. This is a loudspeaker unit that contains the electronics and a small control unit that contains the microphone, on/off switch, and volume control. These offer a great deal of flexibility and are fairly

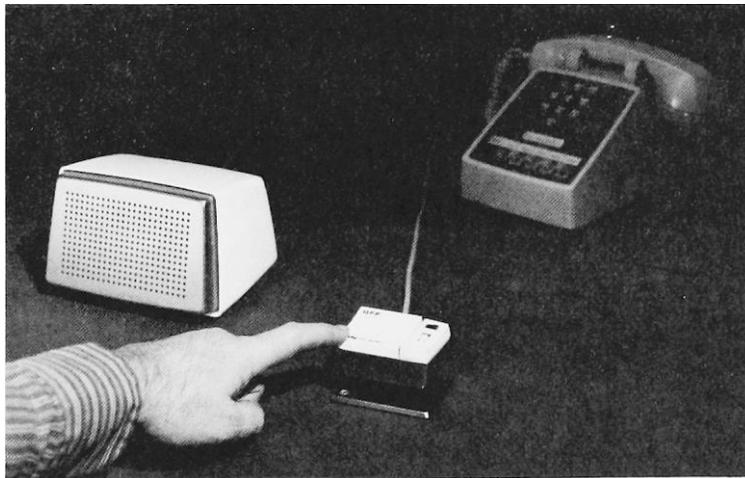


Figure 5-5 4A Speakerphone consists of loudspeaker at left and control pad. Sound is picked up from all directions by sensitive microphone under switches. (Courtesy: AT&T Bell Laboratories)

inexpensive. Each unit costs approximately \$500 or can be leased for about \$15 a month. They can be put in a carrying case and used on the road. Ideally located no further than 18 inches from the microphone when they speak, participants simply gather around the speakerphone during the audio teleconference.

The disadvantage of the Speakerphone is that the variation in distance of the speakers from the microphone can cause a hollow sound to be transmitted, as though the speakers were in a cave. This is due to the nondirectional microphone picking up and transmitting not only the voice of the speaker but also the sound waves of the voice bouncing off various surfaces in the room. Satisfactory use means that the teleconference participants have to stay close to the microphone.

When groups are larger, it is necessary to use audio terminal equipment that employs microphones that can be placed directly in front of each speaker. Units such as the Bell 50-A portable conference telephone contain large loudspeakers and amplifiers, and they can be interconnected with an existing room's public address system. The portable conference telephone has a built-in loudspeaker and microphone, as well as two extension microphones. Because it has three microphones and a loudspeaker that provides more volume than the Speakerphone, it easily accommodates up to eight people seated around a conference table.

The Darome Associate Convener™ model 730 is a "smart" telephone conference system that produces natural sound through an internal microprocessor that analyzes and responds to changing telephone line conditions and room acoustics. The Associate Convener is a duplex system that transmits and receives at the same time to create in-person



**Figure 5-6** The Darome Associate Convener is a smart telephone conference system that analyzes and adapts to practically any telephone system. (Courtesy: Darome, Inc.)

fidelity. The unit connects directly to the telephone. The system incorporates a directional, electret microphone developed by the company's acoustic R&D facility in Canada for individual conversations or small-group meetings. By adding more microphones, the 14-watt amplifier accommodates larger groups. A microphone/speaker module can be added to the basic system for across-the-room as well as across-the-country conversations. The units pick up voices within four to six feet and rejects peripheral noise.

Teleconferencing units, such as the Teletek Conferencer™, can be installed in rooms set aside specifically for audio teleconferencing. The Teletek Conferencer offers cordless microphones and amplified receivers. A wireless microphone unit, smaller than an ashtray, sits in the center of a conference table. A short antenna relays voice signals to a receiver, amplifiers, and a voice-activated switching unit that is located out of sight in another part of the room. Designed for teleconferencing lectures and other types of presentations, the Teletek Conferencer includes a mini clip-on microphone, a pocket transmitter, and a control unit that plugs into standard telephone and electrical outlets. The microphone is not wired to the control unit, so the speaker is free to walk around the stage or even into the audience unhampered by cords. The control unit is compatible with all public address systems. The Controlonics is a similar device that uses infrared to replace the wires normally associated with speakerphones.

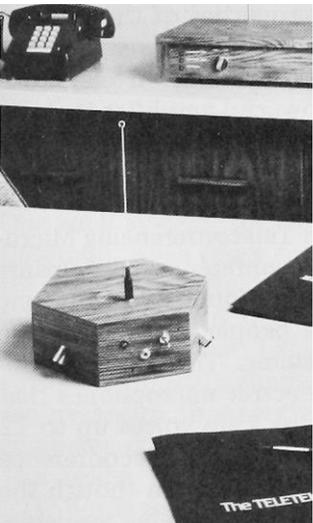


Figure 5-7 The Teletek Cordless Conferencer. (Courtesy: Teletek Systems)

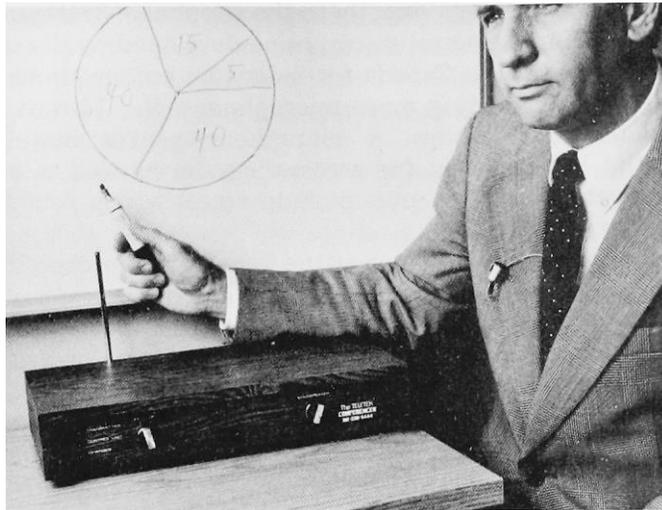


Figure 5-8 Mini Clip-On Microphone. (Courtesy: Teletek Systems)

The American Bell Quorum product line, in addition to offering the Speakerphone and the Portable Conference Telephone, includes a high-quality system for dedicated audio teleconference rooms. This is the Quorum Group Audio Teleconferencing Terminal (GATT), originally developed for the National Aeronautics and Space Administration by AT&T Longlines and subsequently redesigned for standard use. This terminal can be fine-tuned to the acoustical properties of the teleconference room and can compensate for poor transmission within the circuits. The GATT is controlled from a modified, six-button telephone, accepts any number of microphones, has a powerful amplifier that can drive several loudspeakers, is easily connected to public address systems, and is generally placed out of sight or in the audio conference equipment room.

Bell Labs has also developed the Quorum Teleconferencing Microphone, a hybrid system that frees audio teleconference participants from the inconvenience of using many table microphones. Only one Quorum microphone is needed for 20 to 30 people, eliminating the clutter of conventional multimicrophone systems. The device, a 30-inch vertical column, is an array of 28 tiny electret microphones that act as a directional acoustic receiver that can pick up voices up to 12 feet away. The microphone is placed in the middle of the teleconference room or table, out of the way of meeting activities. Even though the Quorum microphone is one of the most advanced systems available, however, users have complained that it transmits insufficient amplitude or volume to be completely effective.

### Audio Bridging Equipment

Increasingly, users are acquiring their own meet-me audio teleconferencing bridge systems. Many bridges utilize digital microprocessor-operated circuitry. They offer many advantages to the user:

- Two speakers can be heard at the same time without the accumulation of noise typical of half-duplex transmission.
- The bridge provides automatic gain control to balance volume levels on all lines. (Analog bridges require operator involvement to adjust manually each line as volume fluctuations occur.)
- The bridge is programmable to meet individual user needs. The customer has a wide range of options for bridge operations, data inclusion, and console screen display.
- The bridge takes up little space. Current analog bridges that handle 50 lines will take up a space approximately 4' X 2.5' X 8'1". The digital bridge handles that number of lines within a tabletop console no larger than a normal computer terminal.
- Digital bridges can interact with "smart" telephones at each user location.
- An operator can set up a teleconference and then leave it. Operator assistance during a call can be requested by a participant dialing an alert code on the touch-tone telephone.
- A fully automatic mode is possible that allows the user to dial the bridge and then dial a single code number that causes preprogrammed participant numbers to be dialed automatically.
- Because they are basically computers, digital bridges can be programmed with software for additional custom features, such as automatic billing, accounting, and performance measurement.

One such system, the CDR 1024 manufactured by ConferTech, Inc., of Colorado, polls every line several times a second and electronically sets the volume. It effectively boosts the volume of poor lines and creates a teleconference where all lines are normalized and sound alike. Because it reduces line noise, background noise, as well as clipping, popping, and switching noises, a superior sound quality is achieved. Only typing skills are necessary to operate the CDR bridge. The operator types a three-character code onto the bridge keyboard to answer an incoming call. The bridge can be programmed for operator-free use, thus allowing after-hours teleconferences. The standard model has a 24-line capability. This can be expanded by inserting additional circuit boards into the bridge equipment. Each circuit board adds 6 lines to the standard 24



Figure 5-9 The CDR 1024 full duplex "meet-me" audio teleconferencing bridge. (Courtesy: ConferTech International, Inc.)

lines. The price is \$48,000 for the standard 24-line model, and \$2,000 per additional line.

Another audio teleconferencing supplier, Kellogg Communications, uses the AXIS Conference Control Center systems manufactured by Communications Equipment and Contracting (CEAC) of Union Springs, Alabama. The system consists of eight-port bridge units that can be expanded according to the demands of the audio teleconference. The CEAC system offers optional 4-wire E&M (ear and mouth) signaling circuit interface so that it can be integrated with a private voice network.

The Contech C1200, manufactured by Westell of Westmont, Illinois, is a computerized audio teleconferencing system that is microprocessor-controlled and uses voice synthesis to give greetings and on-line instructions to use teleconference participants. The Meet-Me conference unit manufactured by Telephonic Equipment of Irvine, California, is a fully automatic, nine-port conference bridge. It is designed for telephone company central offices or PBX systems and allows the conference manager to "lock-out" additional participants. Other bridge manufacturers include Darome and American Bell.

#### **Future Developments**

The development of store-forward voice messaging technology, which is being carried out by companies such as VMX of Dallas, WANG Labs, IBM, and ROLM, will result in a new form of audio teleconferencing. Combining audio teleconferencing with some of the features of

computer teleconferencing, store-forward voice messaging technology digitizes the voice signals and stores them on magnetic disks. In order to get a message, a person dials in a code number that retrieves the message from the magnetic disk, retransforms it into a verbal message, and enables the listener to hear the voice of the person delivering the original message. Participants receive verbal instructions, the agenda, and other communications, and they can then think over the message and respond, as well as place multiple messages in separate discussions or subconference areas. At the appropriate time, the teleconference manager can retrieve the messages, compile the information, and distribute the results. The participants pick up the results on a store-forward basis. People can conceivably participate in ongoing teleconferences over long periods of time without any necessity for real-time communications.

Cellular radio is a technology that will increase by magnitudes the available number of channels for mobile telephone communications. This technology will be one of the key elements in local area audio teleconferencing because it makes it possible to avoid local loop charges by the telephone companies. This concept may be integrated with other narrowband technologies such as slow-scan television or computer teleconferencing to provide educational training information that does not require two-way interaction.

A local area network is a technology that can be used for voice, video, computer, or any combination of these. This technology may be used to provide high-quality digital transmission between corporate facilities or to interconnect teleconference service bureaus.

The future may bring forms of audio teleconferencing that integrate other teleconferencing technologies such as video, graphic, or computer. In fact, one "meet-me" bridge supplier presently offers an integrated voice/computer system that allows users to talk together while simultaneously reviewing text documents. Additionally, there are a growing number of computer systems that provide translation from one language to another. With the integration of this technology to audio teleconferencing, on-line instantaneous translation will mean that cross-national teleconferences will easily take place on line.

### **Audio Teleconferencing Rooms**

Dedicating and equipping a room for audio teleconferencing can eliminate most acoustical problems and ensure that equipment is in place and functioning when users arrive. This also creates the desire to audio teleconference on a regular basis. A variety of equipment arrangements is possible, ranging from a simple audio connection to a multi-location audiographic capability. Specific user needs should dictate the

design of the room, rather than the reverse. The atmosphere of the room, regardless of its specific design, should minimize distractions, provide a good working setting that is comfortable, and give the participants the feeling that it is conducive to communication. The design and installation of an audio teleconferencing system that meets reasonable cost and performance specifications should include consideration of the following factors:

**User accessibility.** The room should be located so that it is conveniently accessible to the primary users. Often the room location itself will determine who uses it and the frequency with which it is used. Thus, if the room is located in the basement, top-level management will not be likely to use it, and if it is located in the executive area, production-level management might be hesitant to use it. The best location will obviously depend upon the organization's specific needs and space availability.

**Ambient noise:** The most effective and least costly way to isolate the room acoustically is to choose a quiet location in the first place. Interior locations that are distant from elevator shafts, laboratories, and fan rooms are most desirable in terms of controlling for noise. Ambient noise coming from outside traffic, ringing telephones, public address systems, among a multitude of other possible sources, can be blocked by soundproofing the walls or double glazing the windows. Acoustic treatment need not be expensive and can include simple techniques such as carpeting the room and placing screens or hangings in appropriate places throughout the room to reduce echoing. Internal sources of noise, such as noise generated by the audiographic equipment, can be controlled by placing equipment in sound-proof cabinets or in another room adjacent to the teleconferencing room.

**Room design:** In addition to controlling for ambient noise, the audio conferencing room should minimize reverberation. This can be accomplished if the walls are nonparallel and covered with noise-scattering and noise absorbing panels.

Detailed specifications for constructing an audio teleconference room or for adapting a room for audio teleconferencing are contained in *The Acoustics of Teleconference Rooms*, AT&T Technical References, PUB 42901, 42902, and 42903. These guidelines should be consulted, as the design and installation of an audio teleconferencing system that meets reasonable cost and performance specifications inevitably involves numerous judgments and trade-offs between obtaining optimal acoustics and utilizing space already available.



# AUDIOGRAPHIC TELECONFERENCING

## INTRODUCTION

Audiographic teleconferencing is the transmission of graphic and print information over a narrowband circuit such as a telephone line. Graphics are transmitted in "real time," that is, concurrently with voice transmission. Audiographic teleconferencing allows the visual enhancement of audio teleconferences through a number of technical systems: facsimile, random-access microfiches and slide projectors, interactive computer systems, telewriting systems, and interactive slow-scan television systems. The most successful audiographic teleconferences are those in which participants think in graphic terms and maximize fully the video medium. As Glen Southworth, president of Colorado Video, Inc., has noted, "You need to have something to show, not just something to say."<sup>1</sup> Photographs, slides, charts, and schematics communicate the information, get the message across. Richard Bagozzi of The Sloan School of Management has noted: "It's not just what you say about the data, but how you say it, how you portray it. A picture *is* worth a thousand words and a feeling *is* worth a million facts. ... It is a question of being graphic with the data."<sup>2</sup> Because audiographic teleconferencing is

<sup>1</sup> Glen Southworth, in an interview by Kathleen Kelleher, October 1982.

<sup>2</sup> Richard P. Bagozzi, *Marketing News*, May 15, 1981, p. 18.

neither a handshake nor just a regular telephone call, there should be a good reason to do it. "Interactive illustration," a chance to confer verbally and visually at the same time, is the best reason.

Audiographic teleconferencing can be invaluable in creating a "common work space," a visual focus for the audio teleconference participants. Audiographic teleconferencing allows visual representation of ideas in order to demonstrate or highlight a point, direct attention to a detail, and illustrate trends and relationships among data. Audiographic teleconferencing is especially useful when the speaker cannot be seen, and indeed, some forms of audiographic teleconferencing are capable of transmitting images of the speaker. By using interactive audiographics, a more complete presentation of the information is possible and questions can be answered more thoroughly by transmitting the visual information, for example, blueprints, X rays, and the like, along with the verbal, logical explanation.

When using audiographics, it is possible to have a less planned, more open-ended discussion, as graphic information does not have to be sent in advance and can be accessed, transmitted, and discussed as the need for it arises during the teleconference. Participants can ask for and respond to printed material that is sent via facsimile. When using fully interactive audiographic systems, the same information can be viewed by all participants at the same time. By using electromechanical devices, participants at different locations can interact with the display by adding, deleting, and modifying the image.

Because audiographic systems transmit over narrowband circuitry, this means that they have all the advantages of audio systems: they are as widely available and accessible as the telephone, transmission costs are the same as local or long-distance charges, and they can be used flexibly—from desk-top to conference room. For these reasons, audiographic systems are often effective at the "working level" when, for example, engineers need to see designs, doctors need to see X rays, and repair technicians need to see broken equipment at remote sites.

## THE AVAILABLE OPTIONS

Audiographic teleconferencing systems include the following:

- Random-access microfiche and slide projectors.
- Facsimile systems.
- Telewriting systems.
- Computer/combination systems.
- Slow- scan television systems.

### Remote-Control Projectors

Remote-control, random-access projectors can be used that let the presenter remotely select a random slide and project it on the distant screen. A separate telephone connection is required to transmit the images in this fashion. If there are three or more points, a separate teleconference circuit must be established. A random access slide projector that can be remotely controlled is an effective means to introduce conferees and identify them when they are speaking. A slide of each teleconferee shows his or her name, affiliation, and location, along with his or her picture. The slide projector is controlled by the chairperson and can be activated remotely by two Touch Tone® digits that are sent by participants in the teleconference. Each has a two-digit code that can be used to signal the chairperson, who then presses the appropriate buttons on the control unit that activate the projection of the picture of the speaker. For a complete microfiche projector with a telecommunications interface, the cost is approximately \$3,500.

Another method is to use sound-activated switches that are attached to the 35 mm slide projector at the remote locations. The same teleconference circuit that is used for discussion is used to activate the sound switches. Overhead transparencies at remote sites can be generated from graphic material that is located in a computerized file. Equipment that enables the speaker to remotely control random access slide and microfiche projectors is manufactured by REVOX Corporation, and it costs between \$700 and \$1,000.

### Facsimile Systems

Facsimile is an invaluable tool for introducing and exchanging detailed documents prior to and during a teleconference. Facsimile is typically used to send sales orders to and from the home office or warehouse, to transmit reports from the field, to get instant authorizations, and to process legal documents or customer service requests.

The type of graphic material that can be transmitted via facsimile includes all information that can be put on a piece of paper: diagrams, blueprints, illustrations, and similar documents. Anything that can be photocopied can be sent by rapid facsimile, in minutes, to remote locations via the telephone network. Since many organizations currently have facsimile devices at their operating locations, printed matter can easily be exchanged to support the voice conversation. Electronic systems allow the visual information to be exchanged in "real time," that is, while it is being considered and discussed in the conference. A facsimile transceiver converts information into electronic pulses and transmits it over a regular telephone line to another facsimile transceiver that

reconverts and reproduces the information at the distant location. In most cases, an additional dial-up connection must be made to utilize facsimile; therefore, the faster the transmission, the lower the cost. If dedicated facilities are employed in the teleconference, facsimile transmissions can take place just prior to and during breaks in the meeting at no additional cost. With digital machines, several pages can be sent in less than a minute.

With their fast transmission capabilities and fully automated features, digital facsimile machines are increasingly considered an essential part of the automated office. The digital technology means that information can be received from and integrated with a whole telecommunications system that includes telex, TWX, electronic mail, word processing, and international digital networking.

Facsimile machines can be either leased or purchased. Leasing costs vary according to the complexity of the machine and range from \$50 to \$300 per month. Purchase costs of facsimile vary widely: from about \$1,200 for an analog unit to approximately \$11,000 for a digital machine with fully automated features.

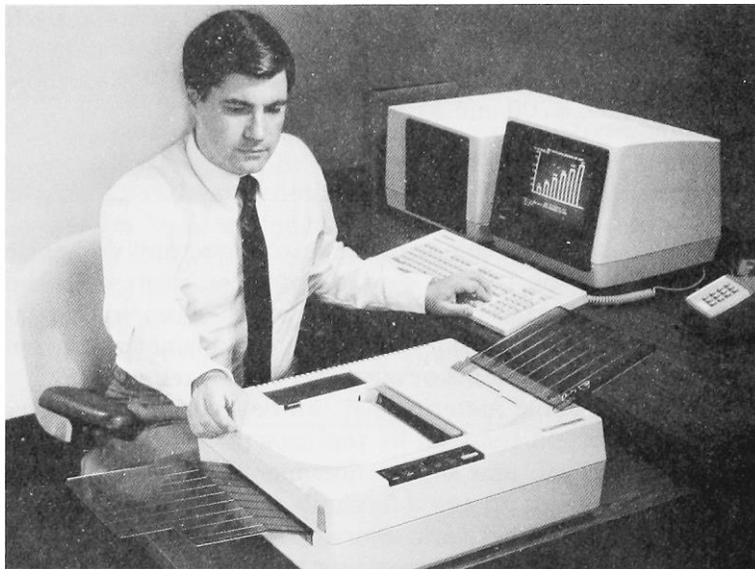


Figure 6-1 The Xerox Telecopier 295 (foreground) can be used with computers like the Xerox 16/8 professional computer (background) to print computer output or transmit computer data by telephone to other, remote facsimile devices. (Courtesy: Xerox)

### Telewriting Systems

In telewriting systems, electromechanical drawing devices permit the user to create, alter, and transmit graphic images to remote sites. Hand-drawn information is electronically produced by using electromechanical pens, light pens, and electronic tablets and blackboards. If the equipment is used at one site only, transmission of images is via a one-way broadcast mode. If the equipment is used at all sites, then teleconference participants who are located at remote sites can also revise the images on the TV monitor, as well as create graphics that are displayed on the TV monitor at each of the participating sites. As the information is written or drawn, it is transmitted to remote locations and displayed on a television monitor. The graphic information produced via a telewriting system can be stored on an audio tape cassette. There are, however, some drawbacks to telewriting systems. The major drawbacks are the small writing surface of the tablet and the fact that they only transmit two-dimensional images.

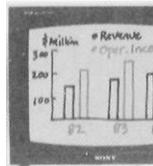
Electromechanical pens produce frequency signals on a plate that are then processed and transmitted to remote locations. The pen is used to write on a paper-covered, electronically-conductive plate that is about 4" X 6". A receiver reproduces the hand-drawn information via an etching pen onto paper using regular ink or via an inkless thermal pen. Some receivers can reproduce the graphics onto acetate film. This information is then projected onto a screen. The principal manufacturers of electromechanical pens are Infolink, Talos, and Telautograph. They sell electromechanical pens starting at approximately \$4,000 for transmit-and-receive capabilities for one location.

Light pens can also be used to produce hand-written text or graphics. The light pen is used to write directly on a television screen. The television monitor is like an electronic grid or tablet that picks up the signals of the pen and processes and transmits them to remotely located television monitors. For-A Corporation distributes the Epochal Video Free-Hand Writer.

Electronic tablets allow real-time, interactive exchange of color graphics to be transmitted over the telephone. Manufactured by FTC Services, a subsidiary of French Telegraph Cable Communications, the Telewriter lets a user at any location write or draw in two colors, red and green, on a 6.5" X 8" electronic-covered tablet. What is written appears both on the local TV monitor and on remote monitors. Any user can then erase some or all of the images displayed on the local video monitor. Since the telewriting system operates simultaneously with the voice conversation, it can be used at any time during the meeting to clarify or expand upon the topics being discussed. There is an

**Figure 6-2** Telewriter II. Using regular dial-up telephone lines, two or more users at dispersed sites interactively store, display, and transmit two-color graphic writing in real time. (Printed with special permission by Optel Communications, Inc.)

## Applications



### Teleconferencing

- Regular business meetings
- Staff meetings for multi-point operations
- Planning or budgeting sessions

### Teleteaching

- University extension programs
- Personnel training
- Field service assistance

### Teledesign

- Scientific analysis among research facilities
- Configuring electronic circuitry
- Architectural space planning
- Computer software flow-charting

### Video Annotation

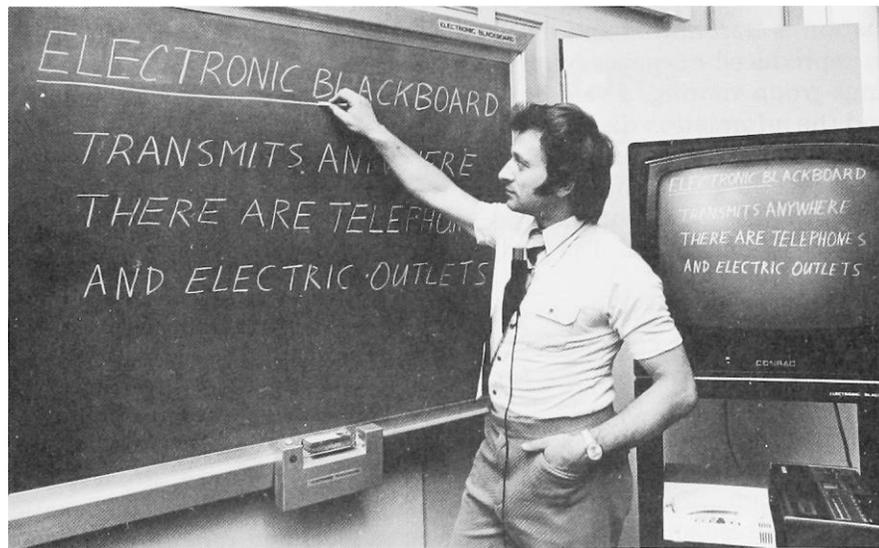
- Map-based trafficking analysis
- Advertising agency storyboard development
- Automotive design troubleshooting

Figure 6-3 Applications of Telewriter II.

optional video printer attachment that can be used to obtain hard copy of the information on the TV monitor. The second-generation Telewriter II has a capacity to store up to 15 pages of graphic material. Before the actual teleconference begins, drawings and diagrams can be prepared on the writing tablet, stored, and then, when the locations have been connected, transmitted to the remote site. The telewriting hardware can also be synchronized with the video equipment, making possible superimposition of graphic information on the video picture displayed on the TV monitor.

The cost of the Telewriter II System, including electronic pen and tablet, color monitor, graphic processor, and a Racal-Vadic modal phone, is approximately \$9,000. The optional Axiom video printer is \$2,800. There is a three-year lease/purchase plan available at \$375 per month per site.

The Electronic Blackboard® is another real-time graphic aid that can be used to enhance an audio teleconference. Manufactured by AT&T, the Gemini Electronic Blackboard® employs a specially designed surface-sensitive board, a regular telephone, and standard TV monitors. It consists of a 51" X 65" writing surface that the teleconferee uses to write or draw upon with an ordinary piece of chalk. Whatever is written on the blackboard is digitalized and transmitted to a television monitor



**Figure 6-4** Electronic Blackboard® transmits graphic communications: sketches, written equations, or other graphics transmitted via the Bell system. Electronic Blackboard could be worth the proverbial thousand spoken words to many schools and business. (Courtesy: AT&T Bell Laboratories)

at the connected distant end. Likewise, whatever information is erased on the blackboard will also be erased on the remote television monitor. The system provides an interface with any standard stereo-audio tape recorder for both recording and playback of graphics and audio. A commercial copier may be connected to the TV monitor when hard copy is desired. The Electronic Blackboard® operates in black and white only and can be used in either a dedicated or dial-up mode. Electronic Blackboards can be leased only. Approximate costs are \$400 for installation and \$800 per month to lease a complete unit.

### **Computer/Combination Systems**

Graphics software has advanced rapidly in the last few years, and now these software programs can be used in computer systems that have a telecommunications interface as a graphics complement to a teleconference. Graphics systems organize complex information into schematics, charts, and diagrams, graphically portraying relationships and trends. Computer systems also allow information to be highlighted with pointers and different text styles, logos, and so forth. Graphic information can be transmitted instantly, stored, and accessed as needed. Graphics can therefore be prepared in advance of the teleconference and stored on tapes, discs, or memory until they are needed. The information is transmitted and displayed on the remote television monitors or reproduced on paper by printers, copiers, and graphics plotters. For large-group viewing, a video projector can be connected to the terminal and the information displayed on a large screen.

The cost of a computer system varies widely, ranging from less than \$1,000 for a microcomputer to more than \$100,000 for a mini-computer. Graphics software packages run anywhere from \$150 to several thousand dollars. The purchase cost of a video projector starts at \$3,000.

Recent developments in computer technology have integrated voice and graphics/data communications. Generally, they operate with two regular telephone lines, one for data/graphics and the other for voice. Northern Telecom's Displayphone, for example, functions as a computer-telephone terminal. It includes a telephone with standard keypad, 7" display screen, keyboard, programmable keys, memory storage, and telecommunications capability. The Displayphone features automatic dialing and redialing. The user can access local and remote data bases and send messages electronically with the Displayphone. "Kontakt," introduced by Mitel Corporation, is an example of the trend toward desk-top, executive "workstations" that combine computer /telephone functions. Kontakt combines a number of functions: word processing, voice communications, electronic mail, time and financial management,

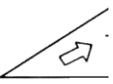


**Figure 6-5** Kontack Workstations. (Courtesy: Mitel, Inc.)

and data/graphics communications. It is designed for teleconferencing with its speakerphone and capability for conference calls.

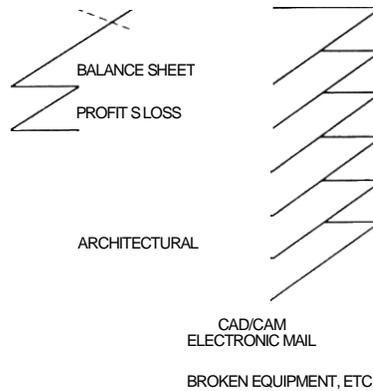
Manufactured by Interand Corporation, the Discon® 1000 combines slow-scan video capability with interactive audio and computer-aided graphic capabilities. Employing radio or satellite data links, the

## DISCON TELECONFERENCING ("PROBLEM-SOLVING")



### Foreground=Solution

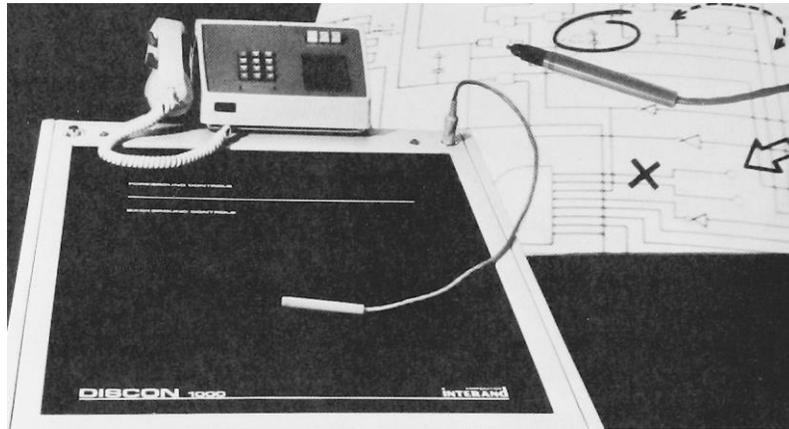
- SIMPLE
- FULL MOTION
- REALTIME



### Background=Problem

- COMPLEX
- STILL PICTURE
- DETAILED

**Figure 6-6** Discon teleconferencing: problem solving. (Courtesy: Interand Corporation, Chicago, Illinois)



**Figure 6-7** Discon 1000 Writing Surface. (Courtesy: Interand Corporation, Chicago, Illinois)

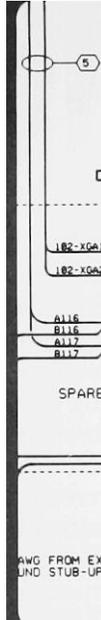
Discon system lets the teleconference participants be geographically remote from the office or factory, making the system especially useful for telemaintenance, crisis control, and resource allocation. A closed-circuit television camera, converter, and telephone line are used to capture and transmit still images to receive sites where they are picked up on television monitors. A hand-held electronic stylus lets the user make notations directly on the video image displayed on the monitor screen (which has position-sensitive Laxan® film placed over it). The still-picture "background plane" and superimposed markings that comprise the "foreground plane" are combined and displayed simultaneously on the same video monitor at each teleconferencing site.

Utilizing several microprocessors at each site to carry out switching and other functions for the teleconference participants, many functions are carried out automatically: command and control of the slow-scan background image storage devices (including stop, start, resolution choice, and erase), graphics, and network control commands (color, symbol changes, transfer of control to another site), for example. The high level of automation frees users to concentrate on the subject matter at hand rather than on the technical aspects of the system. A full-color Discon 1000 system, complete with typical features and additional video monitors and a hard-copy printer, ranges in price from approximately \$85,000 to \$110,000 per site.

Another multifunction audiographics system is the Excom 100. The Excom 100 is connected to a modem, and transmits telewriting

**DISCON 1000**

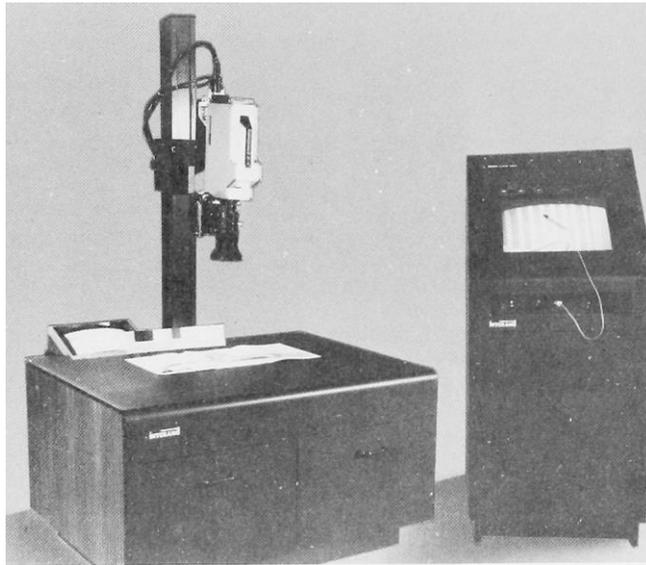
BACKGROUND CONTROLS



189

• CORPORATION!  
**INTERAND**

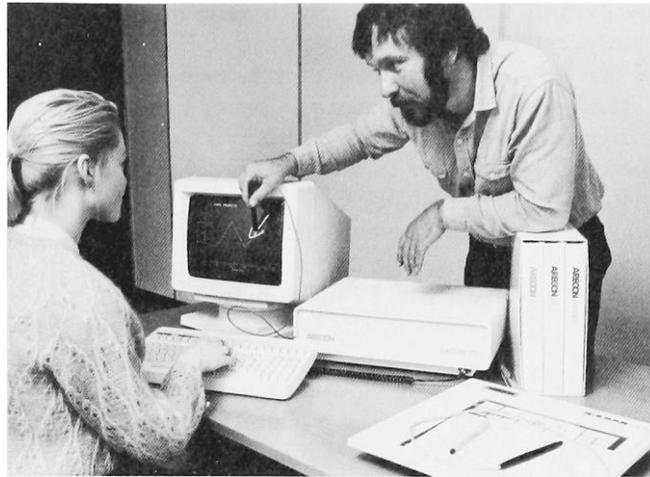
Figure 6-8 Discon 1000 Foreground Controls. (Courtesy: Interand Corporation, Chicago, Illinois)



**Figure 6-9** Discon 1000 Executive Mode. (Courtesy: Interand Corporation, Chicago, Illinois)

(writing in color on the monitor screen with a light pen) directly over the telephone network to other Excom 100s. It can access a range of industry standard text data bases, as well as access standard videotex or viewdata systems. The Excom 100 can store accessed data locally in its computer memory, and a stored page can be retrieved, annotated with a light pen, and then sent to other Excom 100s. A graphics tablet can be used in addition to the light pen when the user expects to create a large amount of written material, and a color printer can be added in order to provide a hard copy of any image on the screen. When integrated with open system software products, the Excom 100 incorporates graphics that allow the user to convert tables of figures into graphs, pie charts, and bar charts. The graphics mailbox lets the user integrate both text and handwritten graphics within a store-and-forward electronic mail system. High-resolution alphanumerical videotex data bases can also be created and achieved.

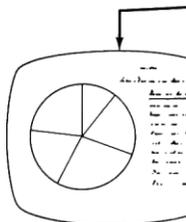
Wang's PIC™ professional image computer offers image processing/communications technology at the desk-top level. The PIC includes a desk-top, cameralike scanner that digitizes images from a sheet of paper, a high-resolution monitor that displays the image, and a desk-top thermal printer that prints the image. The PIC can handle pictures, handwritten notes, margin notations on correspondence, and drawings, as well as text. It can communicate and transmit information locally or remotely to other Wang-compatible office products. PIC image process-



**Figure 6-10** Excom 100. (Courtesy: Aregon International, Ltd.)



"Preparing your presentation? Get the regional figures from the videotex database and . . .



"you can make changes if you need to and can send a message back asking for the go-ahead"

"turn them into graphs and bar charts on the Excom 100. Then show the draft to Central Area who will . . .

"return their comments by writing on their Excom 100 screen so that . . .

The written reply is sent electronically, bringing together text and graphics communications.

**Figure 6-11** Excom 100 Brings together text and graphics communications. (Courtesy: Aregon International, Ltd.)

ing software permits users to scan, digitize, create, display, alter, merge with text, store, retrieve, and transmit images. For instance, a bar graph in a journal can be scanned, as can an annotated page from a financial report, an article from a newspaper, or a set of signatures on a contract. After the image is captured, it can be displayed, altered, integrated with text. Images can be attached to a data base, retrieved with keywords, and transmitted to another PIC or to a printer.

The scanner includes its own lighting system, which means it can be used in any office setting. The maximum scanning area is 11" X 14". The display resolution on the 12-inch image monitor is 800 pixels in the horizontal by 600 pixels in the vertical, yielding an image density of 100 dots per inch. Displayed images can be scrolled, darkened, or lightened, enlarged or reduced, viewed in landscape or portrait, positive or negative. The PIC-1008 Imaging System is intended as the base system for image capture, review, and editing. It is configured with an image scanner and has four slots available for options such as communications/networking facilities, PIC Voice Attachment, and thermal printer. The standard PIC-1008, without options, is priced at \$14,965. A "starter kit" can be purchased for approximately \$27,000. The kit consists of the PIC-1008 Imaging System and a second PIC system with a five-slot chassis, an image monitor and controller, image processing core software, memory expansion card, two local interconnect option facilities, local interconnect software, and image communications software.

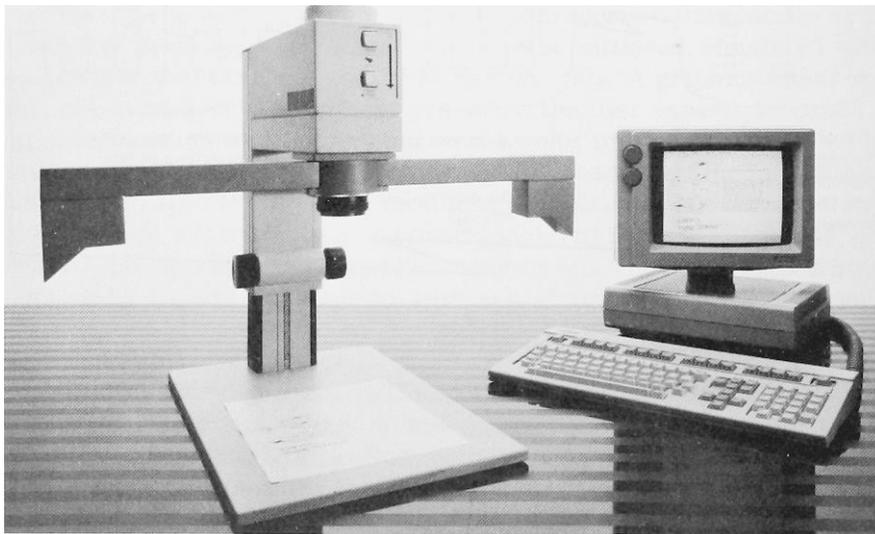


Figure 6-12 Wang's PIC professional image computer brings graphics/communications technology to the desk top. (Courtesy: Wang Laboratories, Inc.)

### Slow-Scan Television Systems

Slow-scan television (SSTV), or freeze-frame video, is a system that can send and receive still video pictures over telephone lines or other narrow-band channels. Falling somewhere between conventional television and facsimile, SSTV combines the advantages of both in terms of highly versatile input/output format and efficient use of picture content and spectrum space. The picture is sent piece by piece over the narrow-band channel; that is, the scan is controlled. The picture is stored at the receiver end. When it is complete, it is displayed. Picture signals come from a TV camera and are reproduced on standard TV sets, thus providing a great deal of system and program flexibility. SSTV is a relatively inexpensive way to add pictorial information to an audio teleconference. SSTV is especially useful for transmitting images of three-dimensional objects. Because SSTV systems utilize closed-circuit television cameras, they can transmit to the remote TV monitor images of anything that the camera can "see," and thus they are not limited by the two-dimensionality and the small size of the writing surfaces of electromechanical drawing devices.

The key features of SSTV include the following:

- SSTV transmits images over conventional telephone lines, FM, and satellite in 30 to 60 seconds, on the average.
- SSTV has a more flexible input format than facsimile and can pick up anything a closed-circuit TV camera can, including color.
- Moving subjects can be "frozen" for undistorted image transmission.
- Pictures can be monitored and stored at the receiver site for comparison purposes.
- Transmissions can be easily and economically recorded, as the receiving unit may be connected to a hard-copy machine for a permanent record of transmitted images.
- The receiver uses standard TV monitor for display, and it can be used with a projection screen for large-group viewing.
- Length of time required for transmission of high-resolution images is two minutes or more.
- It is easy to digitalize for computer-processing storage and retrieval. Since the first days of the telephone and telegraph, engineers have been trying to devise the electronic means to squeeze pictures through telephone circuits. With the development of the means to compress the bandwidth required for picture transmission and the development of memory systems for storing the large amount of information contained in a picture, this has become possible.

Conventional closed-circuit television (CCTV) cameras, monitors, and other system components are used in conjunction with "scan conversion" devices that reduce the bandwidth of a CCTV camera output from a nominal five megaHertz to approximately one kiloHertz for transmission over voice-grade circuits. To achieve the compression ratio necessary to transmit the signal requires stretching out the signal, and the resultant slowness of the picture transmission means that a second scan converter with a video memory must be used at the receiving location in order to reconstruct clear, flicker-free signals in standard TV format. After it has been reconverted, the picture may be treated as conventional CCTV and monitored, switched, recorded, or otherwise handled for the user's convenience.

A one-way slow-scan system consists of the following elements:

#### *Transmitter*

- CCTV camera (to pick up the image).
  - TV monitor (to assess image picked up by the TV camera prior to transmission).
  - Scan converter (to reduce the signal from the TV camera to audio frequencies).
  - Modem (to further convert the slow-scan TV signal to a form suitable for the telephone line).
  - An interconnection to the dial-up telephone system (such as an acoustic coupler or a direct access attachment).

#### *Receiver*

- Interconnection to the dial-up telephone system.
- Modem (to demodulate the transmitted signal).
  - Scan converter with memory (to reconvert the signal to normal TV rates).
- TV monitor (to view the reconstructed image).

Two-way operation involves the use of both transmitting and receiving equipment at each location. Separate audio channels may be used for voice and for image transmission. In this manner, voice communications can be maintained uninterrupted while images are being transmitted and viewed. Variations include use of multiple transmitters to a single receiving location (for example, for data collection purposes) or one transmitter to many receiving locations (for example, for information distribution).

An accessory to the transmitting terminal equipment is the "frame grabber," which allows the operator to "freeze" a single image. In this

way, the image on the preview monitor can be viewed and, if satisfactory, transmitted. If unsatisfactory, the camera can be repositioned, and a new picture selected and transmitted. Images can also be transmitted continuously and automatically. This provides a continuous update of the information being written on a blackboard or displayed on a flip-chart. Because the SSTV information display is in normal television format, this affords several display options for the viewer: a tiny TV monitor on the corner of a desk, a regular-sized TV monitor, and a theater-sized projection for large audiences, as well as convenient tape recordings for later reference.

The amount of time required to transmit a single picture is primarily determined by two factors: the bandwidth of the communications link and the resolution of the reproduced image. The useful frequency range of a long-distance, dial-up telephone circuit may be approximately 300 to 2500 Hertz. Because it is often necessary to transmit a DC component in the SSTV signal, this is accomplished by amplitude or frequency modulation of an audio tone. As a result, the effective bandwidth of the transmitted data is commonly about one kiloHertz, or about 2,000 picture elements (pixels) per second. Units with an acceptable resolution of 256 X 256 pixels require about 35 seconds for the data to be transmitted; those providing better resolution, 256 X 512 pixels, require about 75 seconds.

The viewer at the receiving site normally sees a new, incoming picture "build up" on the screen in any one of a number of different ways. Two common methods are the top-to-bottom "window shade" effect, and the left-to-right horizontal "wipe." Other techniques include pseudorandom pixel build-up and sequential transmission of various levels of gray scale. The appearance of instantaneous transmission of still pictures can be effected by the incorporation of multiple memories into the system. This allows instant switching from one image to another and thus frees the viewer from the distraction of seeing the next picture slowly re-created. A series of images can be transmitted ahead of time, recorded in a digital disc memory, and recalled when desired. The disc memory can thus act as a form of random-access, electronic-slide projector, controllable from either the transmitting or receiving site.

Hardware capabilities include color, high resolution, high speed (where appropriate communications facilities are available), and digital transmission (when computer interconnection or secure communications is desired). Anything that the closed-circuit camera can "see" can be transmitted, and three-dimensional subjects that work especially well with SSTV include:

- People
- Parts

- Subassemblies
- Construction sites
- Architectural models
- Telescopic or microscopic images
- Mining sites
- Weather
- Traffic

Flat copy information transfer via SSTV includes:

- Key phrases
- Charts
- Blueprints
- Schematics
- Foils
- Slides
- Photographs
- Chart recordings
- Ad layouts
- Renderings
- X rays

Data transmission via SSTV can include:

- Computer-generated material
- Radar
- Medical scans
- Meters
- Control panels

SSTV is well-suited for remote sensing, including weather observation, highway traffic, solar images, and smoke detection. Security functions, such as signature verification, intrusion detection, and area surveillance, can also be carried out with SSTV.

Even though there is considerable flexibility in the type and format of graphic material to be transmitted by SSTV, some things transmit better than others. Because the size (height-width) ratio of a TV monitor is 3 X 4, graphics should be prepared in the same ratio for best results. For flat copy, the key factors are type size and boldness of characters. For easy reading, 36-point bold lettering should be used. Standard



MEDICAL CONSULTATION

SECURITY MONITORING

. CHECK SIGNATURE  
VERIFICATION

Figure 6-13 SSTV applications.

typewriting is legible, if there is a small audience and they can sit relatively close to the TV monitor. About one half of the content of a standard page can be transmitted in one SSTV image. Two successive transmissions of the upper and lower halves can be sent. If the "page size" of the document is limited to 3" X 4", then standard typewriter-sized print can be enlarged through the zoom capacity of the SSTV camera and transmitted so that the image viewed appears in "bold" lettering.

Standard 35-mm slides can be projected at the transmitting site, captured by the SSTV camera, and transmitted to the remote monitors. Optimally, slides should be prepared in the same 3X4 ratio and numbered legibly so that the numbering can be transmitted as part of the information. The speaker refers to the slide by number, thus assuring the conferees at remote sites that they are viewing the correct slides.

The person making the real-time presentation may prefer to have several slides of himself or herself prepared in advance and organized scriptlike with slides of graphs and charts. In this fashion, the speaker can concentrate on the verbal presentation and just push buttons to relay the graphic information at the appropriate time. Then, during the teleconference the speaker (wearing the same clothes as when the slides were made) can take questions and comments from the audience in a real-time mode, with the camera capturing and transmitting images, while he or she answers the questions of remote conferees.

SSTV systems can be used very effectively to create a number of different types of electronic graphics. Prerecorded videotapes can be combined with the live, closed-circuit TV transmission; parts can be digitally processed and the image transformed as a result of being processed through a computer. Interactive electronic collage is thus possible, with input coming from participants at different sites.

There are three suppliers of SSTV off-the-shelf systems. These are Colorado Video, Inc., Robot Research, and NEC America. Colorado Video, Inc., offers a basic teleconferencing system that permits two-way, one-half duplex picture transmission that includes the transceiver, with a 256 X 512 pixel capacity, camera, black-and-white TV monitor, and other accessories for approximately \$12,000 per location. The 285 series features a color display option, high or low resolution, digital transmission of up to 500 kilobits per second, and selectable picture scan from left to right or from top to bottom. The unit price of this system is approximately \$13,000. The 290 series features a multiple memory option that can store up to four pictures, allowing the user to send pictures in advance of the teleconference and access them as needed during the teleconference. Options for all systems include hard copy, multiple cameras, portable units, 512 X 512 (highest) resolution, and a 930 Digital Disc Multiple Image Storage System.

Robot Research offers a range of choices in picture resolutions and transmission times within one model. The model 635 series has the capability to transmit images in different modes of resolution. The user can choose to send an image at resolution rates ranging from 128 X 128 pixels in 8.5 seconds to 256 X 512 pixels in 70 seconds. The receive equipment at the remote site automatically changes to the same speed that is chosen by the sender. A built-in microprocessor synchronizes the transmission time between send and receive locations. The cost for the 635 model is approximately \$6,000 per location. Robot Research



**Figure 6-14** Desk-top slow-scan TV workstation. (Courtesy: Colorado Video, Inc.)



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**Figure 6-15** Pictures can be transmitted anywhere in the world via telephone. (Courtesy: Robot Research, Inc.)

also carries a model, the VAC-IC, that features a dual memory that allows two pictures to be stored. The Robot 800 Super Terminal combines a microcomputer, keyboard, and scan converter. With this equipment, alphanumeric characters can be typed in a still-frame format, transmitted as a regular SSTV image, and transmitted on the TV monitor.

NEC-America offers a lot of flexibility in the TVS-783 model. This model can transmit and receive images that are either black and white or color, high or low resolution, and analog or digital. Optional features include high-speed transmission at reduced resolution, a pointer generator, extra memory storage, encryption device for coding and securing private communications, and an analog model that allows black-and-white pictures to be transmitted over dial-up circuits in 30 seconds. The base unit price of the TVS-783 is \$14,900. Trends indicate that equipment costs are being reduced, performance and reliability improved, and superior communications links, such as satellite transmission, are increasingly available.

The Video Rollabout unit contains two 25-inch color TV monitors, two broadcast quality cameras, and a speaker. A pan, tilt and zoom remote control panel, is included for ease of operation from the conference room. The Graphics Rollabout unit contains a broadcast-quality color-TV camera, a small TV monitor for previewing document displays, a 35-mm color slide projector and a remote-control panel with both zoom and focus capabilities. Standard printed documents, viewgraph transparencies, and 35-mm color slides can be displayed. A video hard-copy unit can be mounted in the console as an option to copy incoming or outgoing video in black and white. Both rollabouts are mounted on casters so that they can easily be moved from room to room.

SSTV Video Teleconferencing

While SSTV is often viewed as simply an audiographic enhancement, it is actually a very effective and cost-effective means for carry-



**Figure 6-16** NEC Rollabout puts videoconferencing within your sites.  
(Courtesy: NEC America, Inc.)

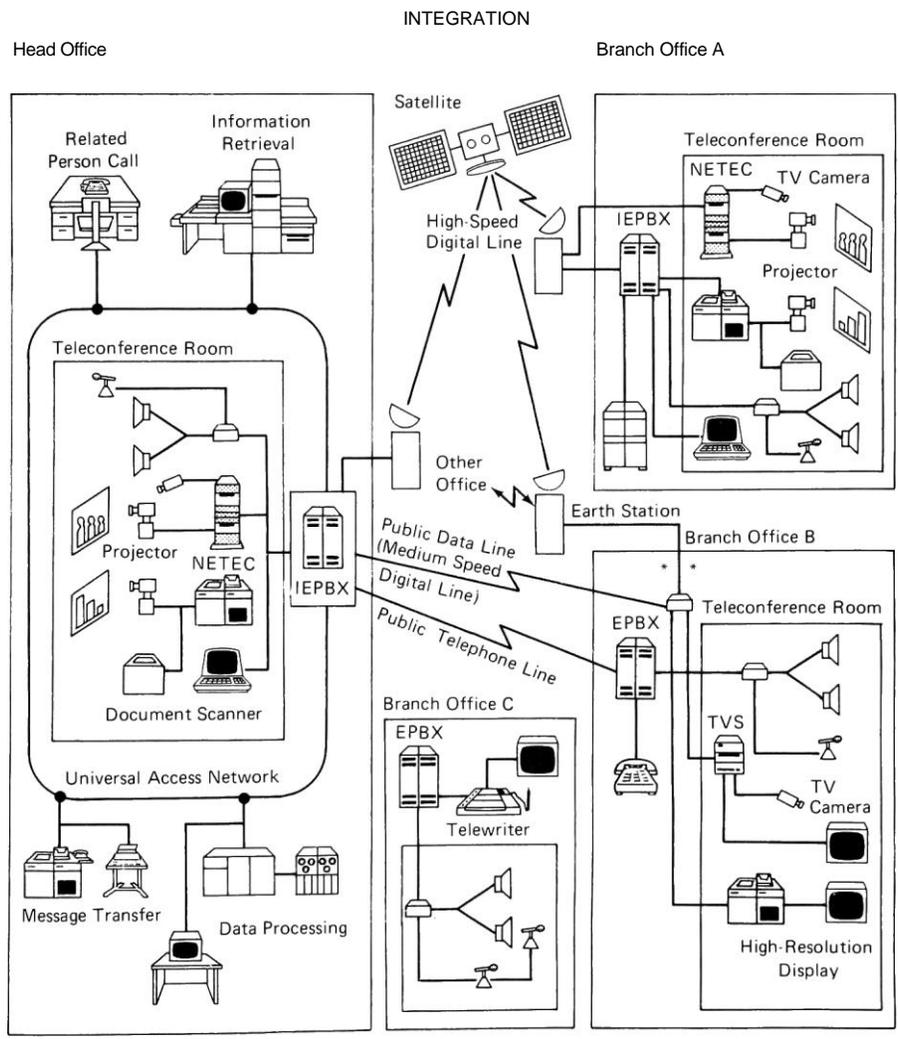
ing out interactive video teleconferencing. The basic idea of SSTV video teleconferencing, as contrasted with full-motion video teleconferencing, is that the transmission of still images of people suffices to get the message across. The other information that is relayed in a video teleconference—graphics, designs, and the like—is stationary, and does not require that it be transmitted using full-motion technology.

The slow-scan video teleconference is designed to be kept quite simple. The speaker frequently serves as director, camera person, and audio engineer. A small control panel can provide all controls for switching cameras, slide changes, and transmitting converter. Thus, expensive studio equipment and space are not needed.

A configuration for a slow-scan video teleconference might include one camera with freeze-frame for pictures of teleconference participants, a second camera focused on flip charts or a blackboard, and a third camera on a copy stand for viewing of preprepared graphics. Film slides, video tape, and video disc can be used for source material, and scan converters with multiple memories can be used for simultaneous display of three or more images. Auxiliary equipment can include large-screen projection, computer input/output capabilities, program recording facilities, and distribution of information by coaxial cable to other areas in a building or building complex.

The audio can be connected with speakerphones or other microphones, enabling a group of persons to listen to the speaker while watching the speaker and/or graphics on the TV screen. A large-screen video

projector can be used for incoming signals, a video monitor for pre-viewing outgoing images, and a videotape recorder both for taping incoming audio and video signals from all sites and for sending pretaped video presentations to receiving sites. Video printers can also be used. These differ from facsimile in that they capture the image that appears on the video screen during the teleconference. A tabletop control panel allows the teleconference chairperson to handle remote camera switching, video cassette recorder activation, audio volume adjustment, and hard-copy functions.



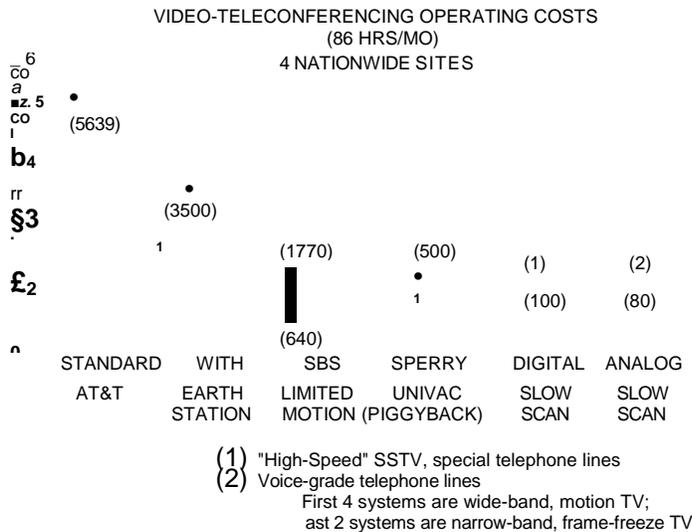
•Alternative

**Figure 6-17** Integration of main SSTV teleconferencing room with branch offices. (Courtesy: NEC America, Inc.)

SSTV video teleconference, when compared to a full-motion video teleconference, is vastly simpler to arrange and considerably less expensive. A private full-motion video teleconference network using digital compression can range from \$200,000 to \$750,000 per location. A 1,000-mile interconnection between two points (1.5 megabit data circuits) for use with the digital codecs can cost in the neighborhood of \$100,000 per month for point-to-point communication. If carried out on an *ad hoc* or special event basis, full-motion video teleconferencing requires, in addition to the costs, several months of planning and preparation and necessitates that conferees travel to a studio or other dedicated facility. An *ad hoc* SSTV video teleconference, on the other hand, can be easily arranged by air-freighting to the remote site a portable SSTV pack that contains a TV camera, monitor, scan converter, and modified telephone. The cost of the SSTV teleconference after equipment purchase (approximately \$6,000 to \$15,000 per location) is merely the cost of the long-distance telephone calls involved.

SSTV utilizes narrow-band technology. When compared to full-motion video teleconferencing technology, which utilizes wide-band circuitry, it is both more available and cheaper because:

- Wide-band circuits are expensive, often prohibitively expensive.  
Wide-band video circuits are frequently not available between desired locations on a timely and continuous basis.



**Figure 6-18** Comparative costs of different types of video teleconferencing.

- Digital video-data compression equipment is expensive and in limited supply. Commercially available compression systems (codecs) require a Bell system T-1 facility or equivalent for communication over medium or long distances. Installation delays of T-1 service can be as long as one year and, in some places, may only be available only if a dedicated satellite earth station is installed by the user.

SSTV video teleconferences are clearly simpler and cheaper due to:

Economics of transmission and storage. Voice-grade circuits are relatively cheap, both in terms of installation and usage. A one-hour teleconference, utilizing two separate, simultaneous "dial-up" telephone circuits between Boulder, Colorado, and Cologne, Germany, for example, costs as little as \$120 in 1982.

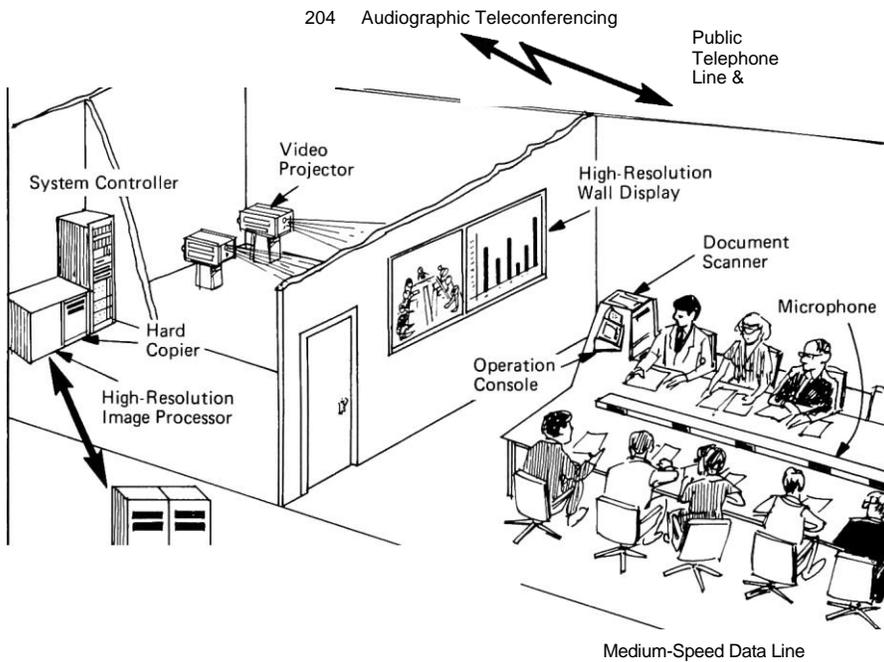
Availability of communication circuits. The large number of telephone lines around the world (literally hundreds of millions of connections) means that a SSTV video teleconference is as available as the telephone.

Flexibility and adaptability. Specific user requirements are easily met as a variety of options exist with respect to transmission rates, resolution, and monochrome or color reproduction.

Increased focus and concentration. The user can pay undivided attention to the information content of the conference, including timely and effective use of graphics, and not be so concerned with being "on camera," "in the spotlight," or "live," thereby reducing the psychological threat.

Ease of use. There is not a need for elaborate rehearsals, script preparation, or use of outside video and technical consultants.

Additionally, a SSTV system provides a cost-effective way in which to become familiar with video technology. SSTV video teleconferencing system, if properly planned, can also be a cost-effective, entry-level system for a full-motion video teleconferencing system. Cameras, monitors, projectors, and other video components that are required for a SSTV system are essentially the same as those used in a full-motion video system. Nearly all of the SSTV video equipment can therefore be employed for full-motion video transmission. Across time, a number of improvements can be made with incremental additions of equipment. The transceiver can be exchanged for separate send-and-receive units for



**Figure 6-19** Design for dedicated slow-scan video teleconferencing room. (Courtesy: NEC America, Inc.)

each site, as Portway suggests, or the SSTV receiver can be retained and used as a graphic component in a dedicated full-motion conference room, or alternatively, put to use in other locations that do not have a full-motion communications capability.<sup>3</sup>

#### Applications

Given the simple operation, moderate cost, and portability of SSTV video systems, the opportunities in narrowband communications are as numerous and creative as are users' ideas.

Corporate uses of SSTV includes:

- Executive presentations
- Consultation
- Advertising, announcements
- Sales

Patrick Portway, "Freeze-Frame Systems Offer Lower Cost Entry," *Communications News*, February 1983, p. 58D.



**Figure 6-20** Colorado Video's slow-scan TV System 250 set up for an impromptu teleconference in a hotel's meeting room facilities. (Courtesy: Colorado Video, Inc.,)

- Field service
- New-plant consultation
- Information retrieval
- Engineering

SSTV video teleconferencing can be used very effectively at the production level in large multinational corporations that manufacture heavy machinery and that must be concerned with rapid and efficient repair and/or replacement of broken or defective parts. When heavy parts, often weighing a ton or more, cannot be readily shipped, they are supplied with a SSTV system. Used as a "diagnostic tool," the SSTV system lets the equipment designer readily see the problem with the remotely located equipment. A telephone call to headquarters lets the design engineer immediately *see* the problem: the portable TV camera on the oil rig focuses on the malfunctioning part, the image is "frozen" and transmitted via one telephone line, while the operator on the rig (off the coast of Africa) and the design engineer (in Houston) discuss the problem on a second telephone line. Given that "downtime" or "glitches" in heavy equipment such as oil rigs can be extremely costly (as much \$1 million a day), the value of a SSTV video conferencing system clearly far outweighs the actual cost of the equipment. In addition to expediting response time in solving specific problems, SSTV systems may also be used to store images of parts in the company

computer for subsequent analysis and to minimize costs involved in shipment of unneeded parts.

A most innovative use of a SSTV video conferencing system was that of Ford Motor Company when it developed its "world cars," the Escort and Lynx, purportedly the most ambitious, most expensive car program ever undertaken by an American manufacturer. It required "seven years of research, and development, an investment of \$3 billion, and an innovative approach to communicating internationally."<sup>4</sup> Engineers located in Dunton, England, and Cologne, Germany, had the responsibility of designing the car, and Americans located in Dearborn, Michigan, at Ford' world headquarters, were responsible for manufacturing it. In addition to providing the general communications, the SSTV system was particularly useful when high-magnification was used to scan objects with the camera. As the project's communication director noted, "With the diopters [high-magnification attachments], you can see a scratch on the inside of a cylinder that the naked eye couldn't see. Using the diopters together with a zoom lens, it's a very flexible way to go."<sup>5</sup> When the project was completed, other engineering applications for the SSTV system were quickly found. Scale models of auto bodies were subjected to aerodynamics tests at the Lockheed wind tunnel in Marietta, Georgia. The SSTV system at the remote site enabled the engineers to observe the patterns created when smoke was blown over the models to determine resistance to the wind, and the SSTV system at the design center enlarged the image transmitted (by means of a large-screen projector), making the three-eighths-scale model look like a full-size car.

Another area in which SSTV has proven its worth is in a field that SSTV itself makes possible: "telemedicine." As it is not usually economically feasible to provide major information resources, consultants, and researching services to remote locations, a more practical approach is to make the already existing resources of a large, well-equipped facility available to practitioners at remote sites. Services to the geographically isolated as well as rapid consultation with specialists can be readily provided with SSTV. SSTV systems can provide isolated health-care personnel with a direct link to the resources they need. X rays, EKGs, and EEGs can be transmitted with a high level of resolution via SSTV. And, because the SSTV can freeze a detailed image for subsequent transmission, this can be particularly useful in a moving ambulance. Similar picture-storage techniques may be used at the main hospital, providing a series of simultaneously displayed images for comparison

<sup>4</sup>"Freeze-Frame Teleconferencing Plays Role in Design of Ford's World Cars," *Telcoms*, Vol. V, No. 4, May/June 1982, pp. 4-5.

<sup>5</sup>*Ibid*, p. 4.

and reference purposes. An entire consultation can be stored and filed on an ordinary *audio* cassette. For image enhancement and analysis, an interconnection can be made to a computer.<sup>6</sup>

In summary, telemedicine applications include:

- Remote diagnosis: nuclear, infrared, and ultrasound scans, X rays, endoscopic or microscopic images.
- Emergency patient image transmission.
- Remote machining of prosthetic devices.
- Computerized image analysis.

SSTV video teleconferencing has been used in numerous different types of teaching situations, from the elementary level to graduate school. SSTV allows the teacher to "travel" to the students via telephone and interact verbally and visually with them. It is effective because it preserves the essence of teaching, which is the interactive relationship between the teacher and the students. As the significant visual content of the instruction usually involves stationary material (equations, graphs, charts, or photographs), SSTV fully suffices for presentation of visual information in the classroom.

Based on the observations of teachers, librarians, doctors, and researchers who have used SSTV video teleconferencing in a myriad of teaching situations, with SSTV:

- Instruction can be visually enhanced, which is especially important at elementary levels.
- Specialized courses can be made available to students, nurses, librarians, and others who wish to learn, who are located at remote sites.
- Specific local educational needs can be met without the production and expense required by regular TV.
- Far-distant intellectual and research resources can be made available to a wide audience.
- Continuing education programs can be made more widely available and more convenient to take for those who are located in remote regions or who are isolated due to physical handicaps.
- The classroom can be easily brought to the home, workplace, or wherever it is convenient for the student population.
- A geographically scattered group of students can be brought to-

<sup>6</sup>Glen Southworth, "Slow-Scan TV Telemedicine," Monograph, Colorado Video, Inc., May 1981.

gether electronically so that enrollment levels can be met at the main educational site.

- The instructor who is teaching long-distance can see his or her students' facial expressions.

In short, SSTV video teleconferencing can maximize expertise and resources by making them more widely available.

SSTV technology also has applications for broadcasting. Combining elements of electro-optics, satellite transmission, computer technology, facsimile, audio, and human drama with SSTV, United Press International in 1978 began providing 24-hour-a-day news programming to cable TV systems in the United States. In June of 1980, a second nationwide cable TV program, "The Woman's Channel," was started, which provided a slow-scan video "magazine" format with a wide variety of topics. In 1981, the two SSTV/satellite programs were combined into a single program, "North American Newstime."<sup>7</sup>

The most remarkable SSTV application to date is in conjunction with the NASA Voyager space probe. In addition to using SSTV technology as part of the process of transmitting pictures of Jupiter back to earth in 1978 (and Uranus in 1986), selected photographs of humans and other earth's inhabitants were converted to SSTV signals at Colorado Video's Laboratory, compressed, converted to tape, and finally, to two phonograph records that were then bolted to the sides of the Voyager I and II spacecraft. After the Uranus fly by in 1986, the spacecraft will leave communications range, continuing on its course away from earth, reaching the center of the galaxy in about one half million years. The hope is that a space-faring civilization will find the probe and decode the contents.<sup>8</sup>

Glen Southworth, "Narrow Band Video Communications," *Communications News*, February 1982.

<sup>8</sup> Colorado Video, Inc., *Winter Bulletin*, Boulder, Colorado, 1980, p. 3.



# VIDEO TELECONFERENCING

## INTRODUCTION

Video teleconferencing is the use of wideband transmission channels to transmit audio and video information between groups of people who are geographically separated. Wideband video teleconferencing differs from other forms of teleconferencing in that it transmits full-motion or live television images. Because it allows the teleconference participants to see each other as though they were on television, this form of teleconferencing is considered to resemble most closely a face-to-face meeting. Some video teleconferencing is fully interactive, with the capability of two-way audio and video transmission. Cable, microwave, satellites, or various combinations of these are used as the transmitting technologies of the audio and visual signals that are broadcast from the originating site. Video teleconferences are often point-to-multipoint events, with one-way video and two-way audio transmission. In this case, audio connections are established between the main and remote sites through regular telephone lines, and the video images are transmitted via satellite link-ups.

Full-motion video teleconferencing is very effective in those situations where more than just "the facts" are the message. When it is important to relay the emotionality behind the facts and the urgency and intensity of a message, full-motion video teleconferencing is effec-

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tive because it lets the participants see each others' reactions and "read" each others' expressions and gestures. Moreover, research indicates that fully 65 percent of all information received by the brain is nonverbal. A communications medium that imparts the nonverbal aspects of a message is a "must" in many situations, including fund raisers, delicate arbitrations, and motivational programs that are intended to improve performance or policy implementation.

Video teleconferencing is most effectively used for dramatic impact. Ordinary presentations can be turned into memorable visual events by using production techniques that are unique to television such as cuts, dissolves, split screens, computer-generated graphics, close-ups, and image magnification. When the image of the person is magnified, that person can seem "larger than life" and can "pack more wallop." The medium itself, in other words, influences people. Television is a powerful one-to-one medium, and no matter how large the audience is, when the person on the screen speaks, he or she appears to be addressing each person in the audience individually.

Video teleconferencing provides high exposure for a new product, an association leader, a political candidate, or a new policy. Additionally, for video teleconference users, public exposure often extends beyond the particular teleconference. Since satellite video teleconferencing is often perceived as "glamorous" high technology, video teleconferencing events are often covered by the press and major communications and management journals. The user is generally cast as innovative and progressive.

Video teleconferencing also allows immediate and simultaneous delivery of the message. This means that there is a great deal of message control: everyone gets the same message at the same time. By providing the audience direct and simultaneous access to the source of information, error and misinterpretation can be reduced.

For the vast majority of the population, brought up on a steady diet of television and accustomed to television as the major source of news and information, video teleconferencing is familiar terrain. There is an expectation on the part of the users that the programming will meet the general high standards of television programming. Advance planning and preparation is therefore necessary for a successful video teleconference, requiring a high capital investment. Despite the typical high costs of producing video teleconferences, they can nonetheless be cost-justifiable for large groups in multiple locations.

AT&T first announced the idea of Picturephone® (video telephone) more than 20 years ago. The device consisted of a small television viewing screen, solid-state video camera, and a hands-free audio apparatus mounted in a single desk-top unit with all the necessary controls located on an attached pad. Lack of acceptance of AT&T's early Picturephone

by the public and the business community led it to be termed "the proverbial solution in search of a problem." While the early Picture-phone service fizzled, the emergence of satellite technology combined with developments in computer technology, has brought full-motion video communications back full force onto the communications scene. Satellite video teleconferencing is also prominent today because it is highly publicized as the "most advanced" form of long-distance audio-visual communication. Vendors, hoteliers, and journalists are busy advocating the "glamour" of satellite technology and how satellite video teleconferences most closely approximate face-to-face meetings. Major vendors, including AT&T, Satellite Business Systems, and American Satellite, and hoteliers such as Holiday Inns, Inc., and Marriott are making full-motion video teleconferencing via satellite more readily available to the public on an *ad hoc* or one-time, special event basis. *Ad hoc* satellite video teleconferences tend to be highly promoted, receive a lot of attention from the press, and attract the attention of large organizations.

#### **Satellite Video Teleconferencing**

Satellite teleconferencing was pioneered by the National Aeronautic and Space Administration in its Communications Technology Satellite experiments during the early 1970s. The launching of the Advanced Technological Satellite in 1974 made possible the first satellite video teleconferences. These were experiments in delivering "telemedicine," or long-distance medical support systems, to remote communities in Alaska. A few years later, the Communications Technological Satellite, a joint United States-Canada project involving several Canadian universities, made possible satellite video teleconferences for the purposes of education, scientific research, and community action.

Today, there are over 15 domestic communications satellites in orbit over the Western hemisphere. Communications satellites are now placed into orbit by space shuttles (instead of by booster launches). In November 1982, the space shuttle Columbia placed into orbit two communications satellites, Satellite Business System's SBS-3 and Telesat Canada's Anik-C. This was the first of numerous shuttle missions scheduled to place communications satellites into earth orbit over the next several years. Already, over 100 satellites from companies like Western Union Corporation, RCA Corporation, and American Satellite Corporation have been scheduled to be launched by many of the more than 60 planned shuttle flights during the period 1982 to 1987. An orbital transfer vehicle on the shuttle has made it possible for repairs to be made on malfunctioning satellites while they are in orbit.

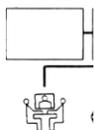
Long-distance video teleconferencing usually employs satellite and/

or terrestrial channels to transmit picture and voice information. Local or regional video teleconferencing generally uses microwave and cable. Often, the transmission modes are interconnected at a video teleconferencing facility, with cable or microwave being used to link the teleconferencing room or studio to the earth station, and the satellite channel being used for the long-distance link.

Satellites can handle a combination of voice, data, and image traffic, and can be used for document delivery, data transmission, and teleconferencing, as well as for television programs and telephone con-

|                                                             |                                                                                        |                                                                                   |                                                                                     |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Radio<br>Frequency<br>Antenna<br>(Transmitter/<br>Receiver) | High-Speed<br>Burst Modem<br>(converts all<br>transmissions<br>into<br>digital pulses) | Satellite<br>Communications<br>Controller<br>(controls<br>access to<br>satellite) | Port Adapter<br>System<br>(connects<br>customer's<br>equipment<br>to earth station) |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|

Figure 7-1 Satellite, microwaves, satellite receive dishes, map of the United States.



versations. Satellite technology, advanced well beyond the capabilities of telephone land lines or microwave line-of-sight relay systems, can provide almost instant communication between any points on earth. The bandwidths available are far greater than any other bandwidths available for intercontinental communication. Satellites provide accelerated information delivery at costs that are independent of the distance involved and at speeds ranging from 9,600 bits per second (bps) to 100 million bps. A text page containing 20,000 bits, for instance, would be transmitted in less than one tenth of a second.

Satellites, particularly in a domestic role, will continue to influence and shape established market structures and business processes during the '80s. As the technology-reduced costs make private business networks more practical and bring services tailored to specific applications closer to reality, the communications satellite may prove to be the most significant by-product of the space program to date and the tool that makes it possible to change the old ways of doing business.

## THE AVAILABLE OPTIONS

Full-motion video teleconferencing is a complex, expensive process. A number of different options are available to users:

- Single-organization dedicated facilities.
- *Ad hoc* video teleconferencing.
- Multi-user, shared-room teleconferencing.

### Single-Organization Dedicated Facilities

For large, multisite national and international organizations that regularly have top management meetings between offices located at geographically remote sites, private, dedicated facilities can be cost-justified and can positively affect management decision making and productivity. A few companies, such as Aetna and Atlantic Richfield, have installed permanent, in-house facilities. Most dedicated rooms are set up to be fully interactive with two-way audio and video communications. Many of the major corporations that have dedicated rooms are for local or regional video teleconferencing. The major advantage of installing dedicated teleconference rooms is the availability of teleconferencing to users in familiar surroundings and the likelihood that the facilities will promote the regular use of teleconferencing by management as a decision-support system.

Although several organizations have installed dedicated networks, a number of market factors have prevented private video teleconferencing.



**Figure 7-2** A fully interactive two-way video, two-way audio dedicated teleconferencing system. (Courtesy: Green/Hansell Satellite Business Systems)

ing systems from making headway. The major reason is the high capital investment necessary. It is especially difficult for organizations to make the economic commitment to video teleconferencing when many people are still confused about its advantages. There have been no clear industry leaders in the video teleconferencing industry as in the computer industry, resulting in an unclear perception of the value of video teleconferencing. In addition to the high capital investment required for video teleconferencing equipment and facilities, there are high transmission costs associated with video teleconferencing. These factors, combined with an uncertain business climate, have meant that video



**Figure 7-3** A fully interactive two-way video, two-way audio dedicated teleconferencing system. (Courtesy: ISACOMM)



Inc. (SATSERV), CCN is a dedicated network of earth stations that links 60 accredited colleges and universities. The lease price for the TVRO steerable satellite earth terminal is approximately \$4,000 to \$5,000 per year.

Equipment and services can be leased from Satellite Business Systems (SBS) or American Satellite on a monthly basis starting at \$10,000 in 1984. Rates are based on the total volume of transmission purchased, including voice, data, and video transmission. It costs approximately \$1,100 per hour to lease a 3-megabit link and about \$500 for a 1.5-megabit channel. The SBS satellite network is accessed through an earth station that, when leased and dedicated to one organization, costs approximately \$17,000 a month. The costs of installation of satellite earth stations are separate.

The disadvantages of a leased system include limited growth capability, future cost increases, competition for satellite time, and potential transmission and reception interference from nearby licensed private satellite systems.<sup>1</sup>

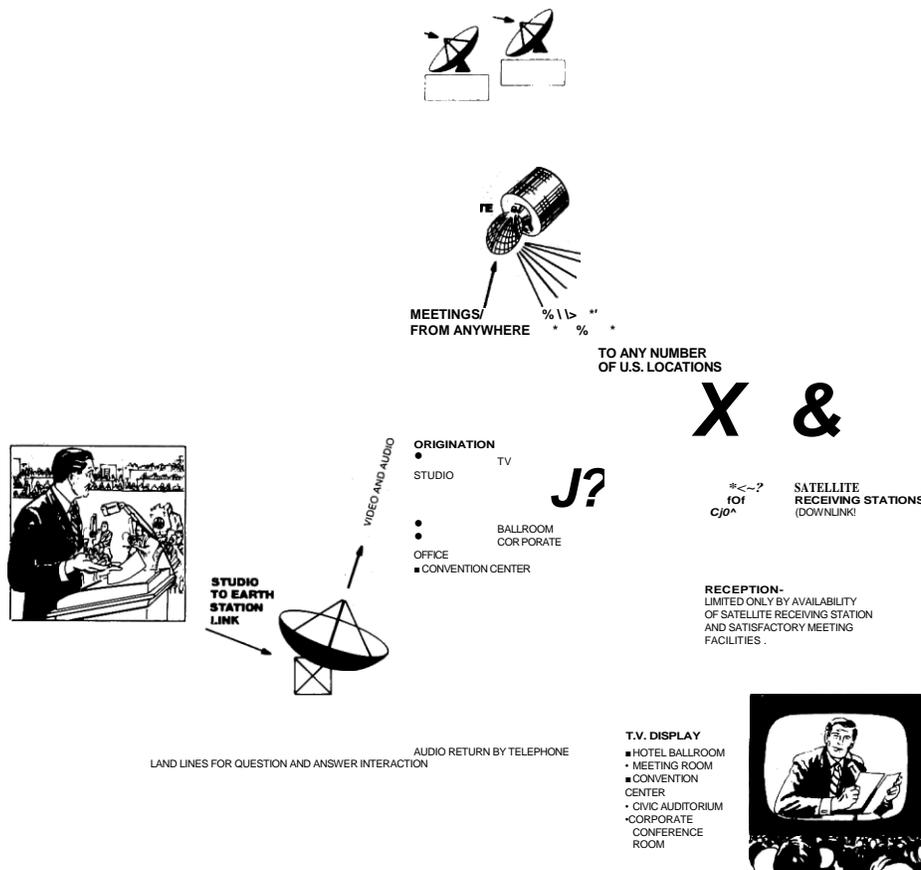
#### **Ad Hoc Video Teleconferencing**

*Ad hoc* video teleconferencing refers to a special, one-time event that an organization chooses to broadcast, such as the announcement of a new line of products. Room and network are used on a one-time basis. *Ad hoc* video teleconferences provide maximum flexibility in meeting design. These teleconferences frequently involve converting a hotel conference room into a TV studio by bringing in special TV and lighting equipment. They are usually "outreach" broadcasts, that is, point-to-multipoint. "Inward" or "embedded" teleconferences are also being used effectively to bring into an ongoing conference a key speaker who is not able to travel to the conference site.

An *ad hoc* video teleconference is usually arranged in a one-way-video, two-way-audio transmission mode. In this arrangement, there is full-motion video transmission via satellite of the production at the broadcast site to the receive site and regular two-way telephone connections that link the receive sites to the main site. Interaction between sites through the two-way audio connections is usually for a scheduled question-and-answer period. This arrangement generally works well because typically about 90 percent of the time spent in an *ad hoc* video teleconference is consumed by information being transmitted from the broadcast site to the main receive sites.<sup>2</sup>

Willard Thomas, "For Fun and Savings, Use Your Own Satellite " *E & ITV* December 1980, pp. 52-53.

<sup>2</sup> Elliot M. Gold, "Wideband Conferencing: The Other Side of Teleconference Systems," *Telephony*, August 2, 1982, p. 37.



**Figure 7-6** Typical configuration for an *ad hoc* video teleconference.

*Ad hoc* teleconferences can be domestic or international. Transportable satellite uplinks and downlinks make it possible to originate the video teleconference from any location and transmit it to any other location. The Public Service Satellite Consortium (PSSC), an international telecommunications association of public-service, nonprofit organizations, is one of the first organizations to negotiate *ad hoc* access to satellite systems. Its purpose is to encourage and arrange appropriate and timely applications of satellite and other telecommunications technology for public service. PSSC, for example, operates an uplink satellite-access facility in Denver, Colorado, that consists of a television studio designed for production of video teleconferences, a network control center, and a 36-foot earth station capable of accessing all domestic commercial satellites. A for-profit subsidiary, Services by Satellite (SATSERV), performs similar services for corporate clients. The Consortium staff provides a wide range of teleconferencing and engineering studies to member and nonmember organizations and operates its National Satellite Network, a closed-circuit, broadcast-quality video teleconferencing service. Additionally, PSSC has con-



**Figure 7-7** Network Control Center operated by PSSC in Denver, Colorado. (Courtesy: Services by Satellite, Inc. [SatServ], a subsidiary of the Public Service Satellite Consortium, Washington, D.C.)

structured, operates, and leases a Transportable Earth Station (TES) that is equipped as a mobile production facility to be used for remote-site transmitting and receiving. In large cities, where microwave interference is likely to be a problem, the satellite signal can be brought in



**Figure 7-8** Transportable earth station based in Morrison, Colorado. (Courtesy: Services by Satellite, Inc. [SatServ], a subsidiary of the Public Service Satellite Consortium, Washington, D.C.)



**Figure 7-9** Teleconference studio in PSSC/SatServ technical center in Denver, Colorado. (Courtesy: Services by Satellite, Inc. [SatServ], a subsidiary of the Public Service Satellite Consortium, Washington, D.C.)

via terrestrial landlines. Another company, Netcom International, provides a fleet of over 300 transportable uplinks and downlinks and its own full-time satellite transponder.

The television station broadcasting studio is another type of facility available on an *ad hoc* basis. Confersat, the central video teleconferencing networking office of the Public Broadcasting Service (PBS), claims that it offers television facilities to users at a substantially lower price than commercial video teleconferencing services and boasts, as well, that (PBS) staff and facilities have been producing high-quality programs for years over a well-maintained network that includes 288 satellite-receive sites throughout the United States. On a grander scale, Net Telecon, the for-profit subsidiary of WNET in New York, offers to lease a number of television studios for teleconferencing sites. These studios can accommodate groups from 2 to 1,000 participants.

#### **Shared Room Teleconferencing**

There is a growing trend for teleconferencing facilities to be offered on a "shared room" basis. Real estate developers and hotel companies are investing in dedicated facilities in major regional locations and making the facilities available to organizations on an *ad hoc* basis.

Video teleconferencing via satellite is being offered in a package that can include:

- Satellite network access and management.
- National reservation system.
- Centralized booking for meeting rooms and sleeping rooms.
- Central booking for food and beverages.
- Central billing.
- On-site support.
- Connection to other shared rooms.
  - Complete state-of-the-art conference rooms equipped for full-motion video teleconferencing, high-resolution graphics, slow-scan television, audio bridging, and the like.

Video teleconferencing on a shared-room basis is most widely available through Picturephone Meeting Service® (PMS). Public rooms, located in major cities nationwide, are available to businesses and the general public, and private dedicated video teleconferencing rooms can be equipped to link into the public rooms that form the PMS network. Equipped with standard closed-circuit television equipment and full-channel (6MHz) transmission, PMS combines satellite, cable, and radio transmission with the most current digital technology. The rooms have oval tables that seat a maximum of six active participants and a gallery for approximately six to ten additional people. Incoming and outgoing pictures are shown on two full-color monitors. A third monitor is available to preview images before sending them. Cameras are cued automatically or manually through push-button controls. The rooms have graphics and recording capabilities. Transparencies, slides, printed materials, and three-dimensional models can be presented at one site and simultaneously transmitted to other sites. A videotape recording and/or hard copy on paper of the incoming picture can be made. In addition to coordinating room activities, PMS includes guidance, training and recommendations from AT&T staff. Plans are to include 42 cities on the network.

PMS rate structures are based upon time and distance. The charge for a customer using two public rooms for a one-hour meeting between New York and Washington has been \$376, and has been \$1,000 for a similar meeting between New York and Los Angeles.<sup>3</sup>

The first commercial real-estate group to announce an investment in a video teleconferencing system to be available for use by its tenants

<sup>3</sup> *Communication News*, Vol. 19, No. 2, February 1982, p., 1.

is Texas Plaza in Dallas, Texas. The Plaza is a 3-million-square-foot, multiuse business complex adjacent to the Texas Stadium. The video teleconferencing facilities are located between a hotel and a cluster of high-use offices. The developers, after concluding that communications is one of the areas that most significantly affects business today, joined with Insurance Services of America Communications (ISACOMM) to install facilities and equip them with digital satellite-transmission capabilities. ISACOMM planned to have a network of 40 dedicated rooms in several different U.S. cities by 1984. In addition to two-way, full-motion color video teleconferencing, tenants of Texas Plaza have available satellite-transmitted telephone calls, a high-speed facsimile system that can transmit 30 pages per minute, and data processing via the digital network that allows remote computers direct access to one another.

Olympia and York (O & Y), the second largest real-estate developer in North America, is planning an even more ambitious video teleconferencing service. O & Y is developing the 6-million-square-foot World Finance Center adjacent to the World Trade Center in Manhattan's financial district. Two potential users, Dow Jones & Company and Shearson/American Express, Inc., plan to relocate their corporate headquarters to the center. Fully interactive, two-way video teleconferencing equipment is being constructed in rooms set aside for this service. More than 40 cities in the United States are expected to be on the OlympiaNet video teleconferencing network by 1986. London and Paris were added to the network at the end of 1984.

Another shared-room facility is The Mansion Club, the renovated Wrigley mansion outside Phoenix, Arizona. STARNET Corporation designed and installed The Mansion Club's communications facility, including two video teleconferencing locations outside on the terraces.

Holiday Inns, Inc., was the first of the hotel companies to offer video teleconferencing facilities and services to its guests. In a dual-faceted business concept—providing both HBO and video teleconferencing via satellite to its clients—Holiday Inns established HI-NET Communications, which is today the largest privately owned satellite video reception network in the United States.

Until 1982, most other hotel companies took a cautious approach to video teleconferencing and saw teleconferencing as a replacement for travel and thus likely to reduce revenues for the hotel business. Today, however, the predominant thinking is that there is a substantial market for regional teleconferencing as well as "teleconferencing within conferencing," that is, including teleconferencing in an in-person gathering taking place at a hotel site. Consequently, hotels are announcing and promoting their video teleconferencing capabilities with fanfare. Marriott Hotels, for example, initiated its 15-city teleconferencing network in

September 1982, with an address by former ABC news commentator Howard K. Smith to 4,000 planners and association executives meeting at different regional Marriott Hotels.

Hilton Hotels Corporation joined with the Robert Wold Company, the Los Angeles-based production firm that pioneered the use of domestic satellites for commercial TV program distribution, and in making the announcement, the two companies claimed to be the first to offer an end-to-end turnkey package that includes program design and production, as well as the other types of services mentioned above. Hyatt is also establishing its own integrated satellite network for offering video teleconferencing and voice and data communications, specializing in highly technical communications.

## EQUIPMENT AND TRANSMISSION SYSTEMS

### Satellite Systems

Satellite technology is rapidly becoming more sophisticated because each day new technologies are developed and older ones merged together, for example, the development of high-powered transmitters and the refinement of abilities to focus and send stronger signals to earth. Satellite systems are proliferating and satellite access is rapidly expanding. More and more associations and businesses are acquiring their own systems or parts of systems.

Before the development of communication satellites, terrestrial microwaves requiring relay stations about every 30 miles (due to the curvature of the earth) were used to transmit television programming and video teleconferences. This "distance-sensitive" method is expensive because it is based upon a calculation of the number and length of the transmission lines needed to deliver the programming. In contrast, satellites are "distance insensitive," meaning that it is not much more complicated to send a message around the world than it is to send one to the East Coast from the West Coast. The variation in cost of satellite video teleconferencing is therefore not a result of the variation in distance between the sites that are connected, but rather is due to the variation in the distance that must be covered by microwave relay-station systems that are used regionally to link the teleconferencing facility to the earth station.

A satellite system is made up of one or more satellite-transmitting facilities, an acquired amount of frequency bandwidth, and a network of satellite receiving stations. Earth stations, or the ground equipment that gathers terrestrial microwave signals and transmits them up to the satellite (and vice versa) are usually located on the outskirts of major

# SBS/BTI TRANSATLANTIC INTERCONNECTION

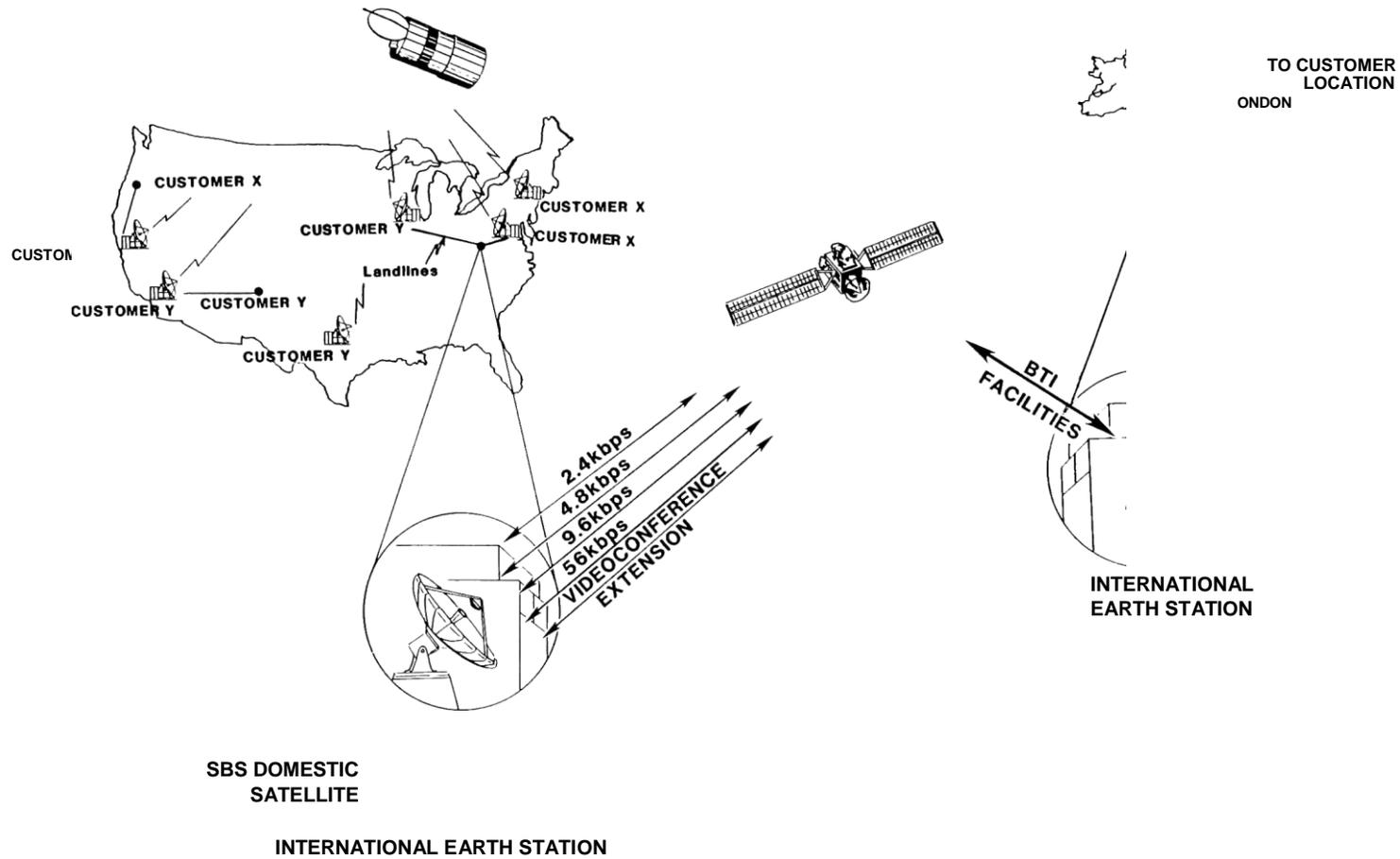


Figure 7-10 SBS/BTI Transatlantic Interconnection. (Courtesy: Satellite Business Systems)

metropolitan areas. Uplinks transmit video, voice, and data signals up to the satellite. Carriers that lease time from satellite owners typically own and operate uplinks. Uplinks are also available on a lease basis from organizations that own uplinks and resell unused time to outside users. Transportable uplinks are very versatile but more expensive to use than fixed uplinks. A frequency clearance is desired to ensure that no existing microwave transmission will disturb, or be disturbed by, the uplink's transmission. Special temporary authority from the FCC may also be required to use a microwave transmitter at the desired location.

Another satellite system part is the transponder. A transponder is the electronic repeater on board the satellite that receives the microwave beam at a given frequency, amplifies it, changes its frequency, and transmits it back to earth.

The downlink or receiving dish, a satellite system part referred to as a TVRO (television receive only) dish picks up the signal transmitted from the satellite, amplifies it, and processes it so that it can be viewed on a television monitor. The voice signals of the person being broadcast are also picked up on the receiving dish. Most permanent downlink sites can receive from one satellite and one transponder only. Portable downlinks are more flexible and can be rented from a manufacturer who can be on site during the meeting to provide backup. TVRO dishes are much smaller and easier and cheaper to make than uplink dishes, and the prices are falling steadily due to economies of scale. They are available starting at approximately \$3,000.

Once the transmitting dish and receiving dish are in place and properly aimed at the satellite, further adjustment is unnecessary. This is because the satellite is orbiting around the earth at the same speed that the earth is rotating. The satellite is, in other words, in "geosynchronous" alignment with the earth. It is always in the same position with respect to the earth, and thus it is in a stationary position with respect to the transmitting and receiving dishes.

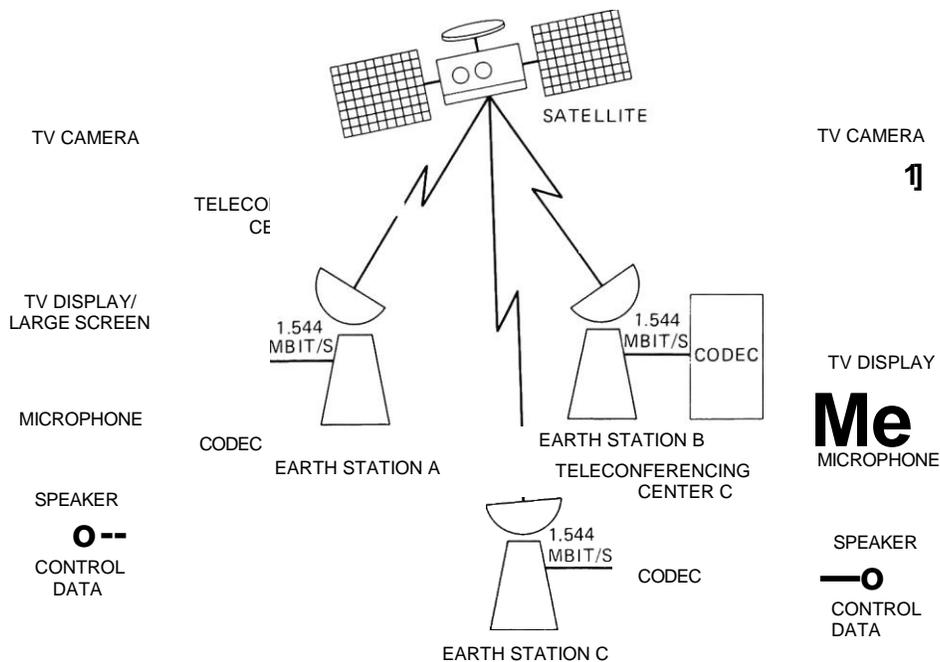
Video signals are transmitted in either analog or digital form. Analog transmission is the conventional manner in which signals are transmitted via regular telephone lines, broadcast radio, and television. In digital transmission, signals are modeled as a time series of binary numbers, the language of computers. Computers process digital signals economically and efficiently, offering high-quality signal reproduction.

An analog full-motion video signal has a bandwidth of about 4.5 MHz (megaHertz). It occupies a channel with a minimum size of 6.2 MHz when transmitted from one site to another. Because the wideband channels of this size are quite expensive to use, engineers have developed codecs. Codecs (coder/decoders) are picture processor devices that convert the analog signal to digital form, thereby reducing the amount of information that is required at the receiving end to reconstruct the

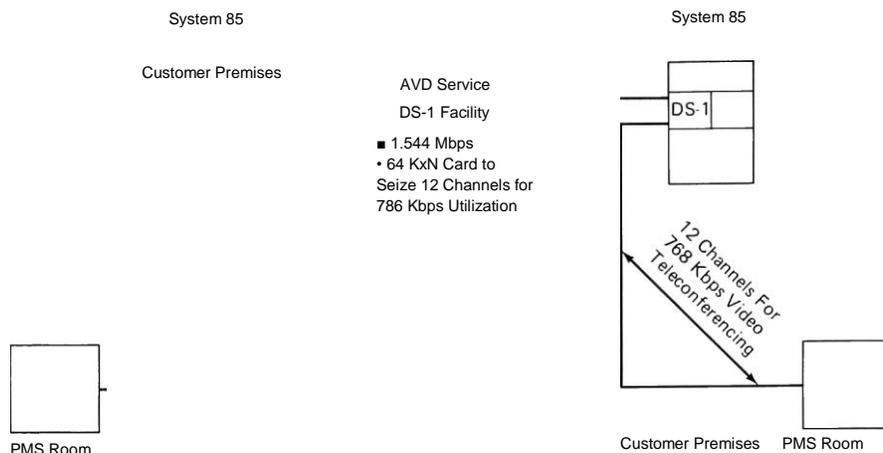
video image. Compression of the graphic information reduces the channel bandwidth required to transmit the graphic information. When the channel requirements are reduced, the cost of transmission is reduced significantly.

A full-motion color picture signal of more than 100 million bits can be compressed to as little as 1.5 million bits. A compression technique is used to eliminate recurring graphic information. This can be accomplished by either interframe or intraframe coding. Drawing upon the fact that the information contained in each frame is much the same as the preceding frame, interframe coding equipment transmits only frame-to-frame changes. Intraframe coding equipment examines each frame individually, seeking redundancy within each frame without regard to prior or subsequent frames. There are advantages and disadvantages to each. Interframe coding, for example, retains the picture quality better when there is a lot of motion, while intraframe coding captures the motion better. As compared to full-motion images, compressed video images are often blurred and tend not to have high background resolution.

Once compressed, the information can then be transmitted over a TI communications channel—a 1.544 megabit communications channel.



**Figure 7-11** Codecs compress the signal before it is uplinked and decompress it after it is downlinked.

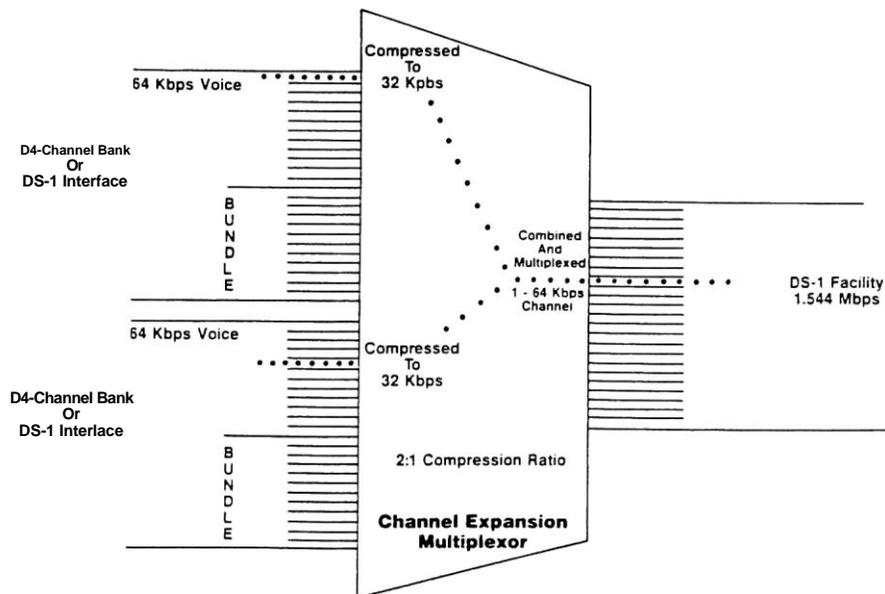


**Figure 7-12** T1 communications between two different Picturephone Meeting Service facilities for full-motion video teleconferencing and other communications services. (Courtesy: AT&T Information Systems)

Sixteen to 20 T1 video signals can be transmitted over the same satellite transponder as compared to, at most, two analog full-motion video signals. T1 codecs are capable of accepting voice, data, facsimile, and high-resolution graphics information for coding and integrating into a single T1 channel. Transmission on a T1 channel decreases costs significantly. However, T1 codecs are expensive, approximately \$150,000, and satellite ground stations are needed for T1 carriers.

AT&T's DS-1 Channel Expansion Multiplexer (CEM) provides business with the means to reduce transmission costs by doubling the capacity of a 1.544 Mbps DS-1-type facility. The CEM compresses 64 Kbps voice and voiceband data signals into 32 Kbps channels and can accept incoming signals from two DS-1 Interfaces (for example, Channel Bank, DS-1 Interface, and so forth). At its full-rate side, the CEM compresses the 48 incoming signals and multiplexes, or combines together, those signals onto a single DS-1 Interface at its subrate side.

The most significant problem posed by satellite communications is the delay caused by the half second it takes for information to travel 22,300 miles into space and back down to the earth again. It is a big stumbling block for data, voice, and in some cases, video. Many executives who have used satellite communications for telephone or voice conversations have found that the half second delay is unacceptable for normal conversations. With respect to data communications, the modem (modulator/demodulator) transmits data in blocks, in certain modes. Because some protocols require that each block be acknowledged before another transmission begins, waiting the half second to get this



**Figure 7-13** DS-1 Channel Expansion Multiplexer. (Courtesy: AT&T Information Systems)

approval can reduce the efficiency of the network. Some manufacturers have introduced satellite delay compensation units (SDCU). The microprocessor-based device increases transmission efficiency by continually sending approvals to the transmitting end, even though there may be errors in the data received.

### Security

Once a signal has been uplinked it is difficult to control the down-link. The signals coming back to earth are strong and can be received by anyone in the region who has the appropriate equipment. An issue that is important for many organizations is therefore how to ensure the privacy and security of data that are transmitted across national borders as a result of the irregular "footprints" on the earth's surface (the area to which the satellite is beamed). Privacy and confidentiality can be obtained by encrypting or scrambling the audio and video signals at the sending end and unscrambling them at the receiving end. Because most of the raw information transmitted in a video teleconference is auditory, an audio-only scrambling device may suffice. This equipment adds cost to a satellite system—approximately \$10,000 to each teleconferencing terminal.

Dale Hatfield, who is the former deputy assistant for communica-

tions to the U.S. Secretary of Commerce, emphasizes that the Organization for Economic Cooperation and Development (OECD) considers information as a source of trade revenue. Banking transactions that are transmitted via satellite, for example, raise issues of privacy and freedom of information. Electronic publishing raises questions of legal jurisdiction and royalty issues. The OECD has promulgated guidelines for the transborder flow of information, endorsed by 96 multinational corporations and 12 trade groups.<sup>4</sup>

### **PLANNING A VIDEO TELECONFERENCE**

"Video teleconferencing is either a terrifically efficient and economical way to communicate simultaneously with large numbers of people in multiple locations, or is an overpublicized, overrated, ineffective, and overpriced example of what the Age of High Technology has wrought," Jay Johnson of TeleConcepts has noted. Because the costs of a video teleconference are high and the benefits often cannot be measured in precise dollar amounts, the value of the video teleconference must be established on its own merits. If the message is more than the straightforward content of the information, then a video teleconference can be judged to be "worth" the costs and preparation required. That is, if the message itself is the intensity of the concern and emotionality of the issue, then it is "worth it" to use a medium that captures facial expression, hand gestures, and other body language that impart an intense or emotional message. Video teleconferencing has the potential for conveying fully the nonverbal dimensions of the message as well as the intensity of concern, however, only if the medium is fully and properly utilized. This requires a creative approach from the very outset. The user should be able to answer the following questions:

- What specific aspects of the message require that it be delivered verbally and visually at the same time?
- Is video teleconferencing going to add something to the message that cannot be achieved otherwise?
- What advantages will accrue to the user if the message is delivered simultaneously to a larger number of people?

Once it has been established that a video teleconference is the correct medium or, more aptly, the correct message, sufficient lead time must be scheduled to coordinate the overall structure and content of the

<sup>4</sup> Hal Glatzer, Robert Violino, "Transborder Data Issues Slow Satellite Growth," *Information System News*, September 6, 1982, p. 35.

video teleconference, a process that can vary depending upon the complexity of the video production and the transmission network. Clear thinking should also be devoted to the content of the information and the form of delivering it most effectively. Robert Keiper, an experienced professional in video teleconferencing, recommends the following:

- Work with professionals.
- Allow plenty of time.
- Involve the producer from the beginning of the planning process.
- Develop theme continuity.
- Use videotapes.
- Have a live audience.
- Get questions and feedback from the remote sites.
- Be creative.
- Deliver the best.<sup>5</sup>

When dedicated facilities are available, and people have had sufficient training and experience in front of the camera, a video teleconference can be produced with only a few days' lead time. Generally, however, a lead time of three to four months is often needed for preparation, especially in *ad hoc* teleconferences. Lead time is necessary for:

- Announcement and/or promotion of the video teleconference.
  - Gathering, training, and rehearsing the people who will appear on camera.
- Preparation of the program, including the script.
  - Preparing the visual materials to be used in the production and the program materials to be distributed to conferees.
- Assembling the technical communications network.

The numerous and varied aspects of a video teleconference that must be planned and coordinated are set out and discussed in a useful handbook published by PSSC for video teleconference planners entitled "Teleguide: A Handbook for Video-Teleconference Planners."<sup>6</sup> The "phases of program development" from inception to conclusion include the following:

<sup>5</sup>Robert Keiper, "Video Events: A Meeting Planners Guide to Videoconferencing." A paper presented at the Teleconferencing Symposium, Coronado, CA, May 1982.

<sup>6</sup>*Teleguide: A Handbook for Video-Teleconference Planners*, Public Service Satellite Consortium, Washington, D.C., and Denver, Colorado, 1981. The *Teleguide* can be purchased for \$34.50 or a review copy obtained by contacting PSSC.

- Establish objectives, general production goals, and set lead time.
  - Assemble a core development team that unifies program, personnel, and budget and usually consists of a finance person who will contract services, a content specialist who will coordinate the substance of the production, and a public relations or media expert who will identify and profile the potential audience. Think through the "network configuration," that is, the most suitable location for originating the program and the remote sites where participating audiences will congregate.
  - Develop a promotional strategy for the video-teleconferenced event, if necessary.
  - Estimate the budget in order to obtain from a professional video teleconference producer and a networking agent a reasonably accurate estimation of costs, taking into consideration the date and duration of the video teleconference, program format and description, place of origination, and location of receive sites.

Because large-scale video teleconferences are complex, creative projects that call upon broadcasting and networking skills, these video teleconference producers not only arrange the technical details of satellite time, downlinks, viewing locations, and communications, they also help the client develop and perfect the message. Companies such as TeleConcepts, Net-Corn, Video Net, and Sat Net specialize in the coordination of video events in much the same way that advertising agencies take a commercial from the initial concept to the finished product that the viewer sees. It is typical that two types of professionals work collaboratively to produce a video teleconference: content specialists and media experts. Content specialists are familiar with conventional television production, but may be unfamiliar with interactive television. Communication specialists can advise about satellites but usually cannot advise about which form and content best mesh with the objectives of the video teleconference.

People are accustomed to watching television. They have high standards in their minds and expect a high technical quality in broadcasts. For this reason, it behooves the organization to work with professionals. As each of the visual and technical components of the video teleconference must be well planned and executed to create a successful video event, and, because the process of arranging for and leasing a satellite network system is very involved, it behooves the planner to consider the exact role and functions of network coordinators and production consultants.

### Network Coordination

The network coordinator is responsible for the technical aspects of the video teleconference. This includes uplink arrangements to transmit the live signal from the origination point to the transmitting earth station. This is accomplished by way of a cable or microwave from the studio to the uplink. Transportable uplinks can also be used for this purpose, but they are an expensive alternative. The network coordinator also books transponder time for premeeting test time and for the duration of the meeting. The satellite is chosen according to scheduling flexibility and technical performance and, in some cases, signal privacy.

The network coordinator also arranges international satellite circuits. His or her expertise in tariff rates and regulations is needed for making arrangements with foreign postal, telegraph, and telephone authorities. The network coordinator must also be familiar with international satellite or common carrier services, procedures, and costs. This is because two satellites are used for an international video teleconference that originates or terminates outside New York or San Francisco. The functions for which the network coordinator is responsible include the following:

- A configuration and cost analysis of the technical resources that are to be utilized.
- Negotiation of contracts.
- Coordination of purchase orders and payments. According to PSSC, this is one of the most time-saving services offered by the network coordinator, because requisitions are released and invoices are returned in a stream. The network coordinator's expertise and experience determine which of these best suit the budget and the teleconference objectives. Fact sheets and status reports to the network facilitator, from suppliers and, in turn, to the meeting planner, ensure that all aspects of the teleconference are being coordinated.
- Arrangement of transmission security, if necessary. This includes installation of scrambling units at the originating facility and descrambling devices at each of the remote sites.
- Monitoring the transmission of the live telecast from behind the scenes (including qualified field engineering affiliates to operate the receiving and display equipment at the regional meeting sites) to ensure quick remedial action for any technical problems that may arise.

Skilled network coordination means, ultimately, that the distribution system is transparent to teleconference participants. Interaction and information exchange should be almost as easy as though everyone were in the same room.

## VIDEO PRODUCTION COORDINATION ~~~

Preproduction (the preparation of people, objects, and images), production (the live video teleconference), and postproduction (the editing of a videotaped recording) are all aspects of a video teleconference that require expert attention and must be meshed with the requirements of good meeting formats. The contracted video teleconference producer:

- Provides theme continuity.
- Coordinates how different people will be involved in the production.
- Prepares the visual material.
  - Oversees and coordinates the technical aspects of video production such as camera usage, lighting, and set design.

Working within the production budget, the producer can choose to enhance the video teleconference by using the services of a professional moderator, for example, or by adding special art and music effects.

Preproduction begins with a detailed video agenda—the "working" script. A working script is usually necessary for even the most informal teleconference. Participants need to feel confident in front of the camera.

### The Talent

Lifelong exposure to high-quality television production techniques means most people expect a polished broadcast-quality production for video teleconferences. Yet most individuals do not realize the level of technical sophistication necessary to ensure that programs are broadcast quality as well as visually and verbally interesting. Even fewer people have been in front of a camera on "live" television. The ability to feel and look comfortable before the television camera varies from individual to individual. Some are "naturals," and others are intimidated and disoriented by the idea of being in the spotlight and freeze as soon as they are on camera. Coaching, scripting, and rehearsals are therefore standard elements incorporated into the preparation of a video teleconference. They provide the structure that ensures that (1) conferees know clearly what is expected of them, (2) the program is kept on schedule and on the topic, and (3) a "talking heads" syndrome is avoided. The talking heads syndrome is one in which people sit and talk without breaking

up their discussion. To avoid this, a program can be made more interesting by inserting preprepared videotapes and employing technical production techniques such as close-ups, split screens, and the like. Most video production firms advocate practice before the cameras and even offer elocution lessons.

A "run-through" or rehearsal should prepare participants in the following areas:

- Self projection, that is, awareness of the image being conveyed, including speech patterns, body language, gesticulation, type of clothing, and eye contact with the camera.
- Exactly how the preprepared audiovisual material is to be incorporated into the script of the teleconference.
- How the participant should interact with other conference members, the technical crew, and the site facilitators.

#### **The Audience**

Teleconference planners should have a fairly clear idea who the audience is. An audience profile should help determine a number of the following aspects of the video teleconference:

- The teleconference format, for example, lecture, panel discussion, workshop.
- The types of questions that can be asked of the audience to activate discussion and the types of questions that the audience is likely to ask.
- Specific concerns of persons from a particular region that should be addressed.
- Where the remote sites should be located, for example, in hotels, near an airport, downtown.

Successful television shows are often staged in front of a live audience, even if they are broadcast from a television studio where not too much space is available. This heightens the sense of a "live" production in the following ways:

- People are talking to someone, not just at the camera. Then-speech and body language reflect this interactive dimension, making them more dynamic and interesting.
- The audience provides an instant "feedback loop," indicating to the speaker if something is unclear, funny, insightful, or otherwise stands out.

- Camera shots of the audience provide visual variety.
  - If there are technical difficulties during the interactive audio portion of the teleconference with participants at remote sites, the audience can also be the source of questions and comments at the originating site.

The working script should structure into the format of the video teleconference different ways to generate interaction with teleconference participants at the remote sites. This adds a special "live" dimension to the video teleconference. No matter how separated the participants are, either time-wise or geographically, interaction underscores the fact that the event is happening "now" and that each person is an active participant. Involvement gives each person a sense that it is "his" or "her" meeting.

#### **The Site Facilitator**

The site facilitator is a vital link in the video teleconference. Even though site facilitators may be contracted separately, the audience at the remote site will find the teleconference more meaningful if they can interact with someone directly involved in the organization. At any rate, site facilitators must involve themselves in the entire planning process, and they should have an active interest in the success of the teleconference. They are responsible for ensuring the success of the interactive portions of the video teleconference, and they should:

- Register and greet participants.
- Hand out the seminar notebook.
  - Establish rapport with the teleconferees, discuss protocol with them, and provide whatever verbal instructions may be necessary.
- Moderate discussion and activity during the "off-air" time.
  - Be responsible for telephone interaction, encouraging remote teleconferees to contribute their comments and questions.
  - In case of failure of picture or sound, be prepared to explain to the audience the nature of the technical difficulties and what remedial action is being taken.
- Make closing comments and carry out evaluations.

#### **Graphics**

Graphics prepared and produced ahead of time can include photographs, slides, videotapes, overheads, viewgraphs, electronic effects (in which text is entered into a terminal and appears on the screen), computer-generated effects (in which visuals with special effects such as

repeating, swirling type, or animation can be generated with a computer), and digital video effects (in which computers generate three-dimensional effects that mimic or exaggerate reality).

Videotapes are especially useful. In fact, the teleconference is usually videotaped. The tape is edited, some portions of the teleconference are highlighted, and narrative is added to enhance theme continuity. The final copy is distributed to people in the organization who do not have the opportunity to participate when the event itself is occurring and to others outside the organization for promotional reasons.

Videotapes can be used either for rehearsal purposes, or they can be incorporated into the script of the video teleconference. The main advantage of using a videotaped presentation as part of the teleconference is that the speaker can make his or her presentation in a "forgiving" atmosphere, that is, not in a "live" setting before the camera. The videotape can then be edited before being telecast. After the videotaped presentation is telecast, the speaker (wearing the same clothes) takes questions from the audience in "real time" during the teleconference. Thus, when incorporated into the script, videotapes ensure greater message control. Product demonstrations, for example, can be taped ahead of time and incorporated into the teleconference. An expert who is unavailable for the live telecast can be videotaped beforehand, and the tape can be incorporated into the telecast. The use of videotapes, in short, takes the pressure off the speaker and ensures greater message control.

#### **Arranging the Site and the Equipment**

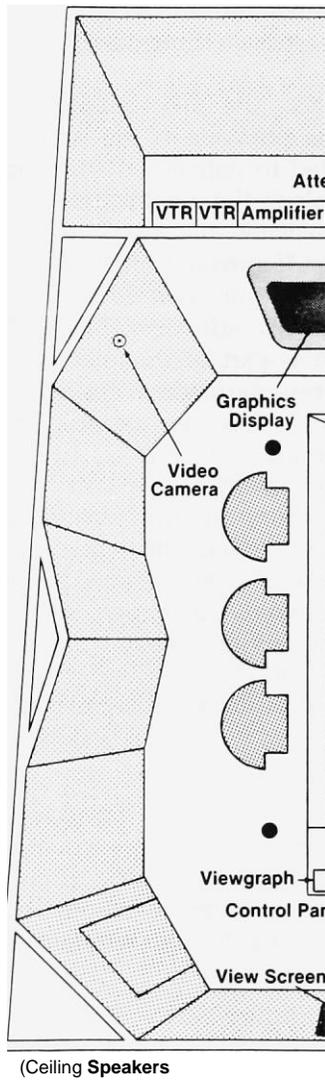
There are an increasing number and variety of sites from which to choose for a video teleconference, including hotel conference rooms, television studios, public-access rooms, and teleconference centers that are equipped with the latest technology. Choice of the sites will depend upon:

- The size of the audience for any one site.
  - How scattered the audience is, how far they would have to travel to the conference site, and whether overnight accommodations need to be planned.
- Whether meals will be offered.

Dedicated teleconferencing rooms are typically designed and styled according to the business needs of upper management.

*Ad hoc* video teleconferences can take place in a television studio, however, and design sets can be styled for the particular event. Whatever the design of the room or studio, teleconference participants should be able to see one another. This necessitates that they be in full view of

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 teleconferencing room.



**Figure 7-14** Design of full-motion video  
 (Courtesy: Cross Information Company).

the camera. In order for it to appear that teleconference participants at different sites are looking at one another, the camera should be located near the TV monitor, because this is where the teleconference participants will direct their gaze. That is, the speaker, in addressing the remotely located participant, is looking at the monitor, and, if the camera is

located near the monitor, the image of the speaker transmitted to the remote site appears to be establishing some eye contact. The layout of the table with respect to the cameras and monitors is thus quite important. Generally, a half-circle or crescent-shaped conference table that seats six to eight people is used, with the cameras and monitor located on the wall in front of the open part of the table. For larger audiences, additional monitors and cameras must be set up so that all the people in the audience can see easily and so that their image can be picked up by the camera if they make a comment.

Most dedicated video teleconferencing rooms come equipped with several cameras, each having a particular purpose:

- Face-to-face cameras to pick up images of teleconference participants.
- Slide-chain cameras for 35-mm slide displays.
  - Ceiling-hung camera over the conference table to transmit pictures of documents.
- Graphics camera that transmits images of chalkboard, flip charts.
- Overview camera to scan the audience.

Proper lighting is, of course, important if the cameras are to capture images with a clear contrast. Proper modeling of light is just as important as the amount of light. Higher light levels are required for color transmission. The additional costs of color over black and white are moderate and can enhance the "realism" of the video teleconference.

The factor that contributes most to realism, however, is life-sized displays of the person speaking on the TV monitors. A 50-inch-wide monitor or screen means that a bust shot of a single person will produce a life-sized image—approximately 18 inches across the shoulders. Placing the monitors or screens so that they are about 55 inches from the floor means that the person seated at the conference table is at eye level with the monitor and with the face-to-face camera. Two television monitors or large-screen projection systems are generally used. The first displays images of the people at the remote sites, and the second shows the picture being transmitted of people at the origination site or, alternatively, displays to both groups the graphics that are being discussed.

The most frequent problem that is encountered in a video teleconference is poor audio. In a full-duplex, open-microphone satellite teleconference, audio from the origination site is heard through a speaker. The microphones at the receiving site pick up the sound being transmitted from the speaker, and this sound is then transmitted through the microphone back to the satellite, resulting in the speaker having an

echo that is delayed one half second. If the participants wear unidirectional, lavalier microphones (that can be used with wireless transmitters), the noise level can be better controlled. In case of technical difficulties, there should always be a backup audio system.

Controlling what is transmitted is part of managing the teleconference. Camera switching is usually automatic, and it is activated by the speaker's voice. For greater control, the teleconference chairperson can manually control image transmission so that it overrides the voice-activated switching. Cameras can also be controlled with respect to zoom, tilt, pan, and iris. Some or all of the components can be interfaced with the controller, giving the conference chairperson control over microphones, audio-mixers, monitors, video recording machines, video switches, and the communications hardware. The exchange of video images and management of the communications link are additional communications functions that the controller makes possible, as well as session protocol functions, such as system activation and video source selection. The controller is, therefore, a crucial integrating element of the video teleconference.

The controller is a computer-based system, a microprocessor-based unit that uses software-defined commands to provide various equipment functions selectable from items on a menu. Some controllers are compatible with both slow-scan television and full-motion systems. A microprocessor-controlled, voice-activated switching system can be programmed with software to provide practically all the production values and capability of a director and crew of camera persons. The chairperson, by using the controller, can select the camera and camera angle in order to tape what is displayed on the screen, and even use a mix of voice switching, split screen, and other effects that have been programmed into and can be controlled by the microprocessor.

Not surprisingly, a mini-industry of middlemen has sprung up that offers teleconferencing packages. The technical and visual components of the video teleconference can be contracted through the same firm. These firms should be able to:

- Offer sophistication and experience in video production, as well as satellite experience.
- Offer options on time and place of the teleconference origination, including available dedicated facilities and *ad hoc* facilities in hotels, studios, and the like.
- Offer downlink facilities anywhere throughout the country and around the world.
- Advise on all the various sources for securing satellite transponder space.

Manage teleconference audio bridge for return audio.

Coordinate ancillary services, such as hotel accommodations and meal services.

## APPLICATIONS

Because the medium of video teleconferencing itself has ability to influence, it is a good motivational tool. Specific applications include:

- The introduction of new marketing and advertising programs.
  - Announcement of new policies or policy changes that affect marketing.
  - Motivational programs that are intended to improve communications, performance, policy implementation.
  - Monthly/annual meetings between headquarters and regional offices.
- Political and religious fundraisers.

Who uses this technology? Ford, IBM, Texas Instruments, among others, have hosted *ad hoc* video teleconferences. Atlantic Richfield, Aetna, and Allstate Insurance have dedicated fully equipped video teleconferencing facilities. Some examples of the wide variety of uses of full-motion video teleconferencing can be drawn from PSSC members:

- The American Dietetic Association conducts several video teleconferences yearly to provide continuing education to member dietitians throughout the United States.
- Teacher Corps used video teleconferencing to link identical workshops in nine cities with experts in a tenth city. This video teleconference involved intermittent transmissions throughout a two-day period.
- The AFL-CIO video-teleconferenced 29 cities from 10 states in order to gather information from state labor leaders during the 1980 presidential campaign.
- The National Telecommunications and Information Administration cooperated with the Corporation for Public Broadcasting to produce a three-hour video teleconference on increasing the participation of women and minorities in public telecommunications. Audiences from 20 cities participated.
- Knoll AG sponsored a medical video teleconference on "calcium antagonists" that originated in Florence, Italy, and was viewed by physicians in 275 U.S. hospitals and medical schools.

## COSTS

The major costs in a video teleconference are for equipment, satellite time, room design, and television production services. Other factors affecting the cost of a video teleconference include:

- Location and number of origination sites.
- Location and number of receive sites.
- Whether the teleconference is domestic or international.
- Length of telecast, time of day.
- Availability of fixed receiving dishes at viewing sites.
  - Complexity of the production, for example, an elaborate entertainment format versus a speaker/panel format.
- Types of viewing sites, for example, hotels, offices, auditoriums.
  - Amount of preproduced material required, for example, graphics, scripts.

The satellite system and equipment for video teleconferencing can be (1) purchased, (2) leased, or (3) rented on an *ad hoc* basis.

### Private Satellite Network

There are a number of engineering companies that provide design, specification, and contracting assistance, as well as complete networking services. Western Union and Universal Satellite Corporation, for example, design and develop specialized teleconferencing systems for clients' requirements, as well as integrate all aspects of production, transmission, satellite relays, and multiple-location reception.

There are no clear guidelines to calculate costs for a satellite video system. The costs of each part of a dedicated video teleconferencing facility vary widely. The cost of the equipment components—cameras, monitors, audio support equipment, and a control system—can range from about \$100,000 to more than \$500,000. The high-resolution graphics scanner, which scans, transmits, and displays high-resolution images of documents, slides, three-dimensional objects, and so forth, and is integrated into full-motion video teleconferencing rooms, is roughly an additional \$150,000 per site. The display monitor or projection system for the scanner costs about \$60,000. A codec for picture processing costs about \$150,000. To lease a full-duplex T1 data transmission channel costs approximately \$20,000 a month. A one-way analog transmission channel is approximately \$100,000 per month.

In addition to the leasing costs of long-distance channels, transmission costs also include the costs of transmitting the signal from the video teleconferencing room to the earth station satellite uplink. The

cost of an earth station must also be considered if an organization has its own private satellite system. In addition to the costs for facilities and the network, there are the costs of producing the teleconference. These can exceed the total cost of the network and leased equipment. Production includes scripting, rehearsing, props, and so forth, and can cost as much or as little as desired. Costs generally range between \$30,000 and several hundred thousand dollars.

In 1981, Aetna Life and Casualty Company spent \$125,000 for the construction, preparation, and equipping of each of four full-motion-equipped teleconference rooms, with teleconferencing transmission equipment costs being about the same. The rooms are equipped with five cameras and include facsimile equipment. The total system cost was \$940,000, including both construction and equipment. The transmission links cost \$75,000 to install, with a monthly lease of \$7,600.<sup>7</sup>

With AT&T Picturephone Meeting Service, the customer can choose to have Bell construct private video teleconferencing rooms on their own premises that can be equipped either by AT&T or by the customer. Customers installing private rooms in 1982 pay one-time AT&T System installation charges of \$124,800, \$100,000 to \$150,000 construction costs (if AT&T equipped), as well as a monthly rental and access fee of \$13,420. In addition, there would be a monthly charge of \$250 per mile to connect each room to AT&T network facilities. Typical rates from dedicated facilities are \$600 for a one-hour New York-Washington meeting, and \$1,640 for a New York-Los Angeles conference.<sup>8</sup>

#### Ad Hoc Video Teleconferences

A configuration and cost analysis for an *ad hoc* video teleconference is similar to a "connect-the-dots" puzzle. The dots, according to PSSC, are origination and termination points identified by the planner. The connections are the various technological resources that can be assembled to accomplish the planner's objectives. Each connection may represent a number of costs. Typically, configuration and cost analysis are worked up while the core development team is in its initial planning stages. The result of an analysis is an estimated budget, or budgets, if various options are available. Budgets for most large-scale video teleconferences range between \$50,000 and \$300,000.

In an *ad hoc* video teleconference, each piece of the *ad hoc* network is contracted for separately. Dozens of requests for quotes and

<sup>7</sup>*The Telespan Newsletter*, Vol. 1, No. 7, November 1981, p. 13.

<sup>8</sup>*The Telespan Newsletter*, January 1982; *Communications News*, Vol. 19, No. 2, February 1982, pp. 1, 43.

service orders may be issued for a single video teleconference; some involve hundreds of service orders. Due to the nature of *ad hoc* video teleconference, it offers the most complex scheme of issues. Some of the *ad hoc* network suppliers include Holiday Inns, Inc. (HI-NET), Netcom International, Public Satellite Services Consortium, Video Star Connections, Wold Communications, Bell and Howell, WNET in New York City, and TeleConcepts.

The following scenario, depicted by TeleConcepts, offers a general idea of the costs of the production and transmission of international video teleconference. A major American automobile manufacturer has just perfected a new fuel-efficient car. The firm wants to introduce the car to auto dealers and the press around the country and Japan. The video production will originate from a custom-designed set in a Detroit studio and will be transmitted to hotels in 25 continental U.S. cities, Honolulu, and Tokyo. A well-known director is hired for the three-hour event, which includes videotape inserts showing various research and testing activities associated with the new car. One-way video is provided to each of the hotels, where some 300 people at each location will view the teleconference on a 10-foot video screen. Telephone lines to each receiving location from the Detroit origination studio enable two-way communication. The total cost of this video teleconference, according to TeleConcepts, is \$289,250. With 7,800 people attending, this works out to a per-person cost of \$37.08.

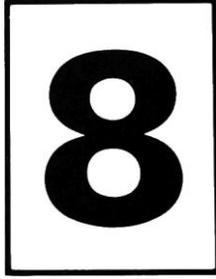
HI-NET user fees are based on a number of factors. There is a minimum charge of \$11,000 for 10 or fewer sites, with up to 50 persons per site. An additional \$500 to \$700 per hour is required for leasing satellite time to transmit the teleconference. The price for Holiday Inn's "most basic of packages"—two TV receivers in each meeting room, a telephone system for two-way communication, and a network of 25 remote sites—is approximately \$15,000.<sup>9</sup> In 1980, Picker Corporation, a Cleveland-based medical equipment supplier, utilized Holiday Inn's HI-NET video teleconference services to reach its salespeople located at 30 Holiday Inns around the country. The teleconference package, including meals, was \$85,000. The budget breakdown was: \$60,000 for production, including travel, taping facilities, satellite rental; \$15,000 to Holiday Inn; \$10,000 in travel costs to 30 conference sites. The director of corporate communications for Picker estimated that, had they not video teleconferenced, the cost would have been \$550,000.<sup>10</sup>

"Holiday Inns Install Receivers to Attract Teleconferences," *Meeting News*, September 1980.

"Motivating Salespeople by Teleconference," *Boardroom Reports*, October 1980.

MG&M Communications, located near San Francisco, offers package deals that cover the cost of assistance to a meeting planner, arranging for the television production equipment to be located at a company site, all transmission, and portable satellite receivers located at sites designated around the United States. For companies located in the San Francisco Bay area and willing to uplink from that area, MG&M will provide a two-hour video teleconference preceded by a test period for a total of \$22,500. For this fee, they will provide for and coordinate a domestic five-city downlink network with interactive audio tying all sites together.<sup>11</sup>

""Package Deals Available for *Ad Hoc* Satellite Meetings," *The Telespan Newsletter*, Vol. 1, Number 5, September 15, 1981, p. 19.



# COMPUTER TELECONFERENCING

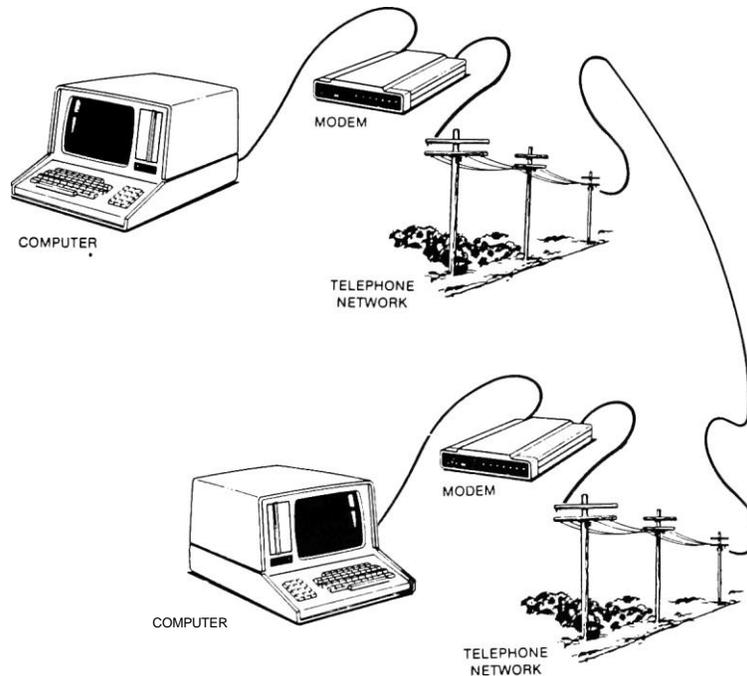
## INTRODUCTION

Computer teleconferencing links the power of the computer to that of the telephone. It is a medium that allows an unlimited number of people who are geographically dispersed to communicate with one another by accessing computer terminals. Sitting in front of a display terminal with a keyboard, teleconference participants access the meeting (or electronic space where the meeting is taking place), type in their message, edit it, and then send it. Information is sent electronically and received at the remote sites almost instantly. The message is transmitted over telephone lines, through a central computer, to other participants' terminals. The information is stored until the recipient has time to read it. The teleconference can thus be carried out asynchronously, that is, in "non-real time," with everyone participating at his or her own convenience, or synchronously, for example, in "real time," with everyone accessing the electronic meeting space simultaneously. The asynchronous nature of computer teleconferencing means that a meeting need not be delayed until everyone's schedule permits it, and, conversely, meetings are no longer dependent on any one person's time schedule. With computer teleconferencing it is impossible to be late for a meeting, and time zones do not create problems as they do with telephone calls or audio teleconferences. Everyone works at his or her convenience, and weather,

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travel, distance, and illness do not interfere with the momentum of a meeting. The computer teleconference therefore does away with administrative headaches associated with arranging a meeting in which every participant's schedule must overlap with every other's for the duration of the meeting. This means that each person can participate independently of every other person, meeting participants are "always available," and meetings can take place at any time.

Computer teleconferencing contributes to high-quality communication and lessens frustration because it eliminates many of the time-consuming problems associated with meetings, and it breaks down many of the communication barriers that exist in an organization. In a typical meeting, for example, it is often necessary, either before or after the meeting, to solicit expertise from people who are not in attendance. Computer teleconferencing allows many people who do not have direct responsibility or job-related activities to participate. Interested users may easily offer fresh ideas. Computer teleconferencing encourages and facilitates their contributions. Additionally, in a computer teleconference, people can participate anonymously, thereby lessening status and rank as factors in decision making. Controversial statements and criticisms can be made and accepted with less tension.



**Figure 8-1** Computer teleconferencing links the power of the computer to that of the telephone.

Most groups have a specified task to perform. Meetings exist for the exchange of information, discussion, problem solving, implementation of decisions, and evaluation of the group's work. When a group is sidetracked before it can solve a problem, the next time it occurs, the group must resort to the same approach to solving that problem, resulting in wasted time. Computer teleconferencing systems provide an organized structure that makes these tasks easier. Participants can use the services of their secretaries, researchers, and writers to contribute to the meeting without wasting valuable meeting time. Computer teleconferencing lets people concentrate on the substance of the task at hand.

The computer teleconference can be either an allocated chunk of time or an ongoing, open-ended process. Its duration depends on the type of task to be accomplished. Some computer teleconferences go on for months, some for years. Computer teleconferences are especially useful for strategic planning, project tracking, educational coursework, and projects that include many people at different locales, such as engineering design projects.

A characteristic of asynchronous computer teleconferencing that distinguishes it from face-to-face meetings and other types of teleconferencing is that it allows participants ample time to reflect upon questions and issues being discussed before responding and making their thoughts known. Langdon Winner, a professor of environmental studies at the University of California, Santa Cruz, who teaches university courses via computer teleconferencing, suggests that the technology creates a synergy of minds:

One value of this medium of communication is that it's fast when you need speed, but it also allows time for reflection. The phenomenon of synchronous conferences can in its best moments be an experience in collective creative consciousness. Other voices on the line begin to seem like parts of your subconscious mind.<sup>1</sup>

Computer teleconferencing structures the flow of communication and expands the opportunity for reflective thought. The computer software that is integral to computer teleconferencing restricts communication so that it flows toward the person(s) who need it and not toward everyone, as it would in a face-to-face meeting. Andrew Feenberg, a professor of philosophy at San Diego State University, who also teaches university courses via computer teleconferencing, suggests that the computer teleconference not only provides the time to clarify one's

<sup>1</sup> "Anatomy of a Network," *Psychology Today*, October 1983, p. 50.

thoughts but also offers the possibility for expanding one's scope of vision:

I think that the comments people make in writing on these networks are generally much clearer and better thought out than what they say, frequently, in meetings. I find it easier to pay attention to a written text than to a face-to-face meeting. So, at least for me, there is a great economy here. Better thinking, easier to attend to. This seems to create a context in which people dare to be more reflective and philosophical. It enlarges the scope of people's vision, or at least of that part of their vision they are willing to talk about publicly.<sup>2</sup>

Reaching a consensus is usually the most difficult and challenging goal of a meeting. Computer teleconferencing can make this easier. Group members can exchange memos or discuss their positions. They can test the waters with fellow workers before bringing an issue or suggestion to the other participants of the teleconference.

Computer teleconferencing is a powerful management tool. By allowing issues to be dealt with as soon as they arise and making it possible to access relevant data and statistics, on the one hand, and improving the quantity and quality of consensus among project participants, on the other, computer teleconferencing increases the speed, quality, and effectiveness of decision making. Additionally, while computer teleconferencing may not break the habit of meeting, it breaks the habit of meeting face to face, which typically entails scheduling and travel as well as limits the number of people who can effectively participate. With a computer teleconferencing system, there is increased access to personnel whether they are down the hall, across town, or on the other side of the world. Briefcase computer teleconferencing lets people who are "on the road" stay in touch with their home offices wherever they are.

## **CREATING AND COMMUNICATING INFORMATION**

In a computer teleconference, text is created by many people across time and geographical barriers, and as a result of accessing common data sources. The process is one that has the potential for changing what is meant both by information and communication. Information is "built up" by exchange and combination through telecommunica-

<sup>1</sup> *Ibid.*

tions links, prompting what some analysts refer to as the "information/communications revolution," which is described as follows:

The essence of the information/communications revolution caused by electronic technology is this: electronics make it technologically feasible to (a) generate, store, process, manipulate, and transmit any combination of text and graphics; (b) replace paper-based information with electronically encoded information; (c) permit any degree of access to these information bases by any number or combination of users, wherever located, along with interactive communication among these users.<sup>3</sup>

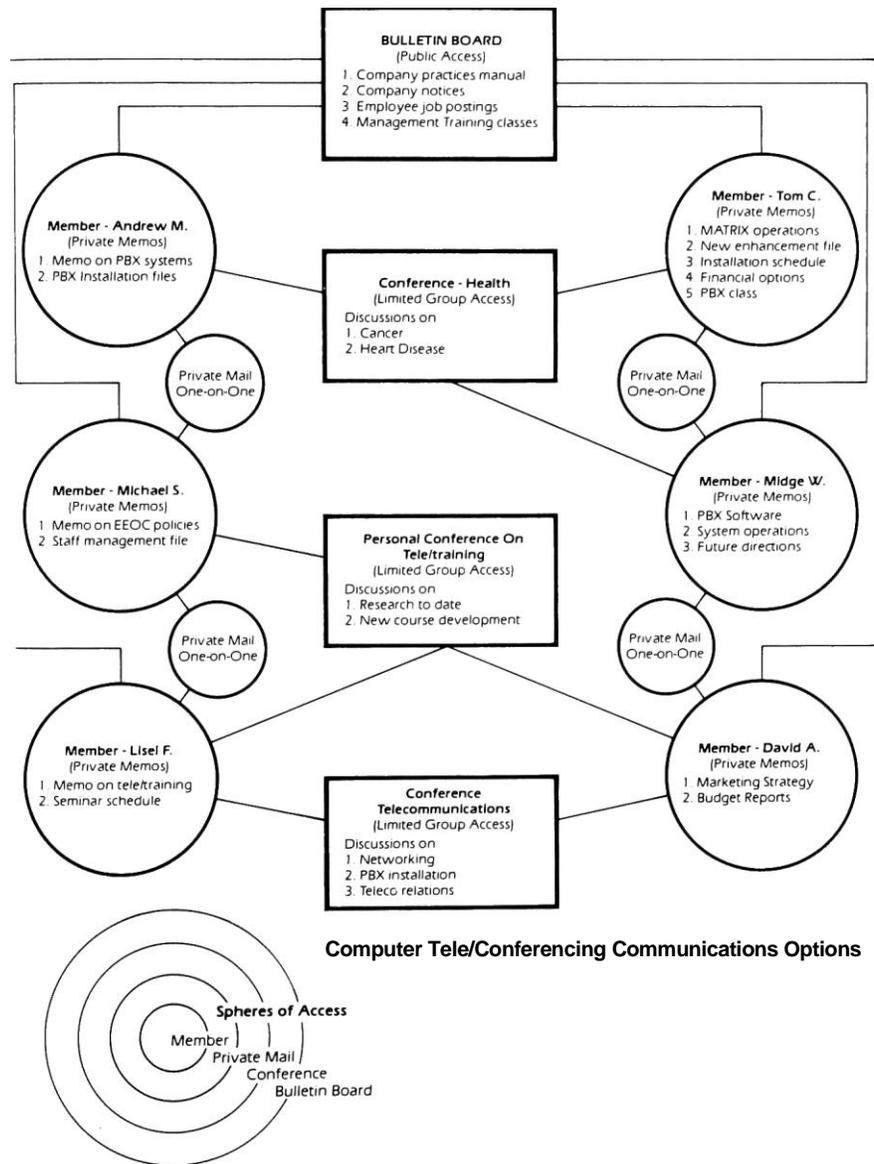
Computer teleconferencing software lends itself to organizing data into useful information and, eventually, into decisions, because it can draw upon a myriad of data banks as well as the expertise of many individuals. It is a valuable management tool for coordinating, developing, and using information in a manner that is particularly effective for managing the activities of ongoing projects.

Sometimes called text or terminal teleconferencing, computer teleconferencing is actually a computer software applications package that permits a group of any size to create, store, and distribute text, data, and graphics as well. Text is created by typing and entering it, using any one of a number of software functions. New text is kept in a temporary storage area until the user instructs the system as to its ultimate disposal. The options for the user include sending the text to a private memorandum file, a message file, or a topic within a multi-topic conference. By using an on-line memo system to record communications among meeting participants, each teleconference participant can access, read, and respond to messages regardless of whether other participants are communicating simultaneously or not. The system provides a transcript of the meeting, and the non-real-time method of participation offers extraordinary flexibility, especially if meeting members travel frequently and cannot be in two different places at one time!

Computer teleconferencing is like the text editing systems that are now used in most newspapers. Text editing systems resemble teleconferencing to the extent that the text that they handle is topically organized and can be shared by many users. The computer software manages and indexes files that individuals create. The files that reporters create are copied and then sent to the appropriate general topic areas such as "sports" or "city desk" or "features." Thus, today, creating, editing, and printing stories is a far cry from the tedious process it once

Charlton R. Price, Murray Turoff, and Starr Roxanne Hiltz, "Electronic Mail and Teleconferencing: 'Information' or 'Communication'?" Report prepared for Conference on Innovation in Primary Publication: Impact on Producers and Users, Brussels, Belgium, March 24, 1980, p. 1.

was. Computer teleconferencing incorporates the form and process of text editing, and joint text creation has proven to be highly effective for information exchange and the *management* of ongoing projects. The



**Figure 8-2** Computer teleconferencing communications options.  
 (Source: Cross Information Company)

flexibility of the teleconferencing software that permits material to be switched among the various subsystems makes teleconferencing attractive as a medium for cooperative action.

#### THE SHAPE OF A COMPUTER TELECONFERENCE

Most computer teleconferencing systems are organized like "electronic desks," with places for memos, letters, messages, a bulletin board, and calendar. Virtually an electronic library at the user's fingertips, the computer teleconference has structured into it an ongoing "electronic filing system" for systematic and rapid retrieval of information. Files can be quickly accessed, and there is a complete record of all messages that can be printed out whenever desired. The control or structure that is incorporated into the many-to-many communication process that makes the computer teleconference a well-organized meeting rather than a jumbled series of messages flying back and forth are the following aspects of the computer software:

- Roles for teleconference participants can be specified, permitting or restraining access to certain files, the ability to vote on issues, and so forth.
- Selective communication among a subset of the teleconference participants can be specified. Discussions among some of the members of the larger group can thus be held during the course of the teleconference.
- An individual can have his or her own personal work space by accessing a notepad/memo area. Each user has private files or scratchpads that are kept on line for ease of use.
- Individuals can access an on-line bulletin board in order to post and read public announcements.
- Management and user reports and directories can be accessed by and made available to participants in the teleconference.
- Newsletters and journals that participants can access and to which they can contribute are available on-line.
- Functions can be specified that allow teleconference participants to track a project's status and find out, for example, who has read which memos or contributed to particular reports within the project.
- Calendar and scheduling functions can be specified.
- Decision support systems can be accessed. These include, for

example, graphic support, financial modeling, and data base management.

- Teleconferencing participants can be polled, and automatic analysis allows tabulation of the data, which can then be made available to participants.
- Information can be retrieved from the central computer, filed, and cross-referenced.
- Electronic mail/messaging can be specified in order to send notes and memos to one other individual, a subset of the larger group, or to the entire group.

#### Electronic Mail

Electronic mail is a store-and-forward, point-to-point computer-based messaging system. Electronic mail systems are either separate systems or a subset of computer teleconferencing. As a separate system, electronic mail is typically used for private, one-to-one messaging and often there is not a transcript of the messages. As a subset of a computer teleconferencing system, electronic mail allows private messaging to be carried out either independently or as part of the ongoing computer teleconference.

With electronic mail, it is not necessary to interrupt a person when sending him or her information. The message is sent electronically, and it is stored until the recipient has the time to read it. Because files are electronic, paperwork is reduced, and files cannot be misplaced or lost. One message can be routed to several people. Costs of labor, mail, and photocopying are thus reduced and efficiency is increased.

With electronic mail, there is:

- Electronic access to personnel.
- Instantaneous delivery of information.
- Reduction of unnecessary interruptions.
  - Improved coordination of group activities; for example, editing and transmitting of messages can be carried out by administrative personnel in a simultaneous process.
- A significant reduction in the volume and cost of photocopying.
  - Automatic addressing of electronic messages and letters to individuals and/or groups.
- More concise messaging and reading time.
- Electronic records of messages.
- Reduction in paperwork, paper handling, and postage costs.

- Reduction in office space used for files.
- Efficient automated file searching and retrieval.
  - Delivery unaffected by weather, holidays, geographic location, and other outside influences.
  - Freedom from geographic and time constraints, enabling the user to send and receive messages around the clock.
  - Elimination of no-contact telephone calls ("telephone tag"), which can lead to reduced secretarial and long-distance telephone costs and to an improvement in time management.

Direct interface with public telex systems is possible. Worldwide communications can thus be easily synchronized, meaning that the message can be sent in the sender's prime time and reviewed in the user's prime time.

#### What a Computer Teleconference Looks Like

Like a regular meeting, the computer teleconference has a manager who organizes and decides who should participate. There are also moderators and coordinators who are given the tasks of editing, deleting, and reorganizing material that is submitted by participants. Unlike a regular meeting, people join the meeting whenever and from wherever they like.

A computer teleconference can go on for as long as necessary. Everyone involved in the teleconference can access, read, and contribute to discussion, use private files as personal scratch pads, or send memos and notes to other participants in the teleconference. Assignments can be given, people can respond, argue, or discuss work without physically having to go to a meeting. Teleconference participants can also review all the conference material, taking the time they need to acquire information or make decisions. If necessary, they can seek their supervisor's approval before voting on an issue, a process that would delay the momentum of a regular conference.

People can "talk" with one another in a computer teleconference. However, they use explicit or written cues rather than implicit speech conventions. Computer teleconferencing systems simplify the learning process, providing menus, maps to the logical network, and on-line help to guide the inexperienced user through the process step by step. When a user logs in, he or she is notified when there is new material present. The system records the names of participants and observers who contribute ideas to the discussion. The text is also machine-readable, and it may be searched by keyword, date, or source, and integrated with the

Cross  
 Communications  
 Company  
 934 Pearl, Suite B  
 Boulder, CO 60302  
 (303) 499-8888

# SPECIFICATIONS

—Lists Directory of Members

—Whose Available Now

## INSTRUCTIONS FOR MATRIX

- |                        |       |                             |
|------------------------|-------|-----------------------------|
| 1. Mail                | oil > | ruclio                      |
| 2. Bulletin Board      | Conf  | 1. Sending messages         |
| 3. Conferences         |       | 3. Receiving messages       |
| 4. Newsletters         |       | 3. Scoring messages         |
| 5. Other Information   |       | <. Advanced mail techniques |
| b. Return to MAIN MENU |       | 5. Return to main menu      |
- Enter your choice: 1

### -Mail: Summary of commands

- Send.....Send mail to user
- Head.....Head oil letters in mailbox
- Scan.....Scan for specific letters
- Quit .. . . .Quit and return to MENU
- Brief.....Enter brief display mode
- Normal .. . . .Enter normal display mode
- Help .. . . .Print this list of commands

### Send commands:

- QUIT.....Abort entry
- INSERT n.....Insert line before line n
- CHANGE n.....Change (replace) line n
- DELETE.....Delete Line n
- HELP.....Display list of commands
- SEND.....Done Send message
- US1 n

### .Disposition commands:

- Again j.....Print text again
- Save.....Save text in
- Delete.....Delete text
- Reply.....Reply to leu.
- Forward.....Forward to 5
- Carriage Return.....Go on to no

[Default is list all]

### -Bulletin Board: Summary of commands

- ADD.....Add message to system
  - READ.....Read messages
  - SCAN.....Scan for specific messages
  - DELETE.....Delete messages
  - US1.....List possible categories
  - QUIT.....Quit and return to MENU
  - BREF.....Enter brief display mode
  - NORMAL.....Enter normal display mode
  - HELP of .. . . .Print this list of commands
- Note You may abbreviate commands to one letter.

is used only as an example- Any number of or simultaneously. The system can be modified e Iran five discussions or ten scratchpads.

### -Conferences:

- 1. List all Conference chairpersons
- 2. Oil and Gas Conference
- 3. Telecommunications Committee Conference
- 4. Corporate Management Conference
- 5. Return to Main menu

Enter your choice:

Please enter the password for TELECOMMUNICATIONS  
 Welcome to TELECOMMUNICATIONS! One moment, please  
 Calling the session in order

### CURRENT DISCUSSIONS Being Held Within Telecommunications\*

- DISCUSSION TITLE
- 1. VIDEO AND DATA NETWORKS
- 2. COMPUTER TELECONFERENCING
- 3. LIBRARY INFORMATION SYSTEMS
- 4. NATIONAL LIBRARY ISSUES
- 5. INTERNATIONAL LIBRARY ISSUES

### -DISCUSSION MENU FOR TELECOMMUNICATIONS

- Enter Your Choice (1-8) or H (or Help or CHAT) to Read Your Private Messages: HELP CHOICES
- 1. List Conference members
- 1-2. Edit /Read /Create a Scratch Pad (10 in use now)
- 3. Send a Scratch Pad to a Discussion
- <. Read a Discussion
- 5. Send a Scratch Pad to another Conference
- f> Return to the Main Menu

### -Scratch Pad Editing for TELECOMMUNICATIONS

- SCRATCH PAD MENU (ID in use now)
- Enter your choice (1-5) or H for help: HELP CHOICES
- 1. List Scratch Pad Titles
- 2. Edit /Read /Create a Scratch Pad (10 in use now)
- 1. Erase a Scratch Pad
- \*. Return to Conference Menu
- S. Return to Main Menu

Specific and features subject 1

- CROSS  
 COMMUNICATIONS  
 COMPANY  
 MTX - MATRIX  
 TRANSACTION EXCHANGE  
 MAIN MENU  
 Enter choice (1-7), or 'Help':
1. MATRIX Member List
  2. Members on System Now
  3. Instructions (How to use MATRIX) -
  4. Mail -
  5. Bulletin Board -
    - b. Conferences -
  7. Quit

—End Session

Figure 8-3 Computer teleconferencing specifications.  
 Information Company)

(Source: Cross

individual user's private text files. Members of a computer teleconference also have access to complete documentation of their common project. The host system software keeps track of who has seen what material through a "status" system. Thus, the progress of the conference can be tracked by any participant. In some systems, the status indicator notes the stage of the meeting.

Computer teleconferencing allows members to work privately, without formal scheduling requirements. People can also pair off to work on portions of the main topic of discussion. In other words, there may be many ongoing "discussions" within a multitopic computer teleconferencing system. Subconferences can be open to anyone with a password into the system or restricted to a specific group. The software tracks who belongs to which conference, and within each conference it logs who has seen which items.

Computer teleconferences may contain text, numbers, graphics in any form. Content may range from items of general interest for a loose group of colleagues to the draft of a precise electrical specification. Because any item can be a mix of text and programs (a program is, in a sense, a particular kind of text), one item can call up other text items or other software. By up- and down-loading teleconference material to and from personal computers, the individual user can easily integrate private work with that of others.

Documentation is an important aspect of meetings, and computer teleconferencing systems decrease confusion over what occurred at the meeting by providing a verbatim transcript rather than a notetaker's interpretation of what transpired in the conference. If clarification is necessary, it can be quickly accomplished by posing questions to individual members of the teleconference. It is also possible to review an earlier meeting.

A computer teleconference can shape the decision-making process. Its structure sets out guidelines for approaching a problem as well as for logically channeling the users' input along the way. When a group of psychologists "gathered" electronically for a teleconference that lasted 20 days,

. . . the participants indicated that [the computer teleconference system] was very useful in the early lay-out of the problem and in shaping the group's thinking. Other benefits reported included an increased ability to think about problems in terms of flow-charts, the thought-provoking nature of many messages, and relatively quick feedback compared to other forms of written communication.<sup>4</sup>

<sup>4</sup>Quoted in "A Psychological Conference," *Planet News*, No. 13, January 1979, p. 2.

Computer teleconferencing also simplifies an inherently difficult task: reaching a consensus among several persons in a fairly short period of time. Probably the most innovative contribution of computer teleconferencing, in fact, is its ability to structure group communication in such a way that many people can reach one mutually agreed-upon decision in an efficient manner. This is due to the fact that in a computer teleconference text and data are made available and shared widely, but they are controlled by being made subject to any of the functions of the computer software that structure the teleconference. The computer teleconference used as a decision support system is discussed in more detail in Chapter 2, Adaptive Planning.

You need to have a valid MATRIX member name that is created by the MATRIX manager. Write or call that person for assistance. The MATRIX manager will assign your member name and password. You can change your password at any time thereafter.

USING MATRIX:

After you have acquired your MATRIX member name and password, ask the MATRIX manager what your computer system username and password are.

For example, to get started or logged on, the computer will ask you:

Username:

Password:

You will need this information to get on to the Computer System. After you have successfully passed this point you will need to type in the command to run MATRIX. You can get this information from the MATRIX manager.

Once you have accessed MATRIX you will see:

```
WELCOME TO MATRIX
LICENSED TO YOUR COMPANY NAME      MATRIX VERSION X.X
```

```
ENTER MATRIX MEMBER NAME OR H-HELP, Q-QUIT?
```

Once you have passed this point you will be presented with:

```
YOU HAVE X NEW MESSAGES
WOULD YOU LIKE A LIST OF NEW MESSAGES (Y/N) ?
```

This information will only be presented if there is new mail for you. If you would like to see the titles of your new messages, enter a "\_Y\_" for Yes. After you have looked at your new messages, or if you did not have new messages, you will be presented with the following:

After selecting the version you will see the following banner:

```
MENU OPTION:  MAIN MATRIX MENU          YOUR NAME          DATE
              LOCATION:  SYSTEM LEVEL          TIME
              COMMANDS:  MF, PM, CO, BB, CM, AM, LI, ST, SO, LO, LG

SELECT NUMBER (1-11) OR COMMAND or RETURN FOR MENU OR H-HELP,
Q-QUIT?
```

1. MF-MEMO AND FILING OPERATIONS (Private)
2. PM-PRIVATE MESSAGE OPERATIONS (One-to-One)
3. CO-CONFERENCE OPERATIONS (Membership)
4. BB-BULLETIN BOARD OPERATIONS (Public)
5. CM-COMMAND MODE
6. AM-MATRIX ADMINISTRATION (Assigned Positions)
7. MI-MATRIX INSTRUCTIONS
8. ST-SEARCH OPERATIONS
9. SO-SEND OPERATIONS
10. LO-LIST OPERATIONS
11. LG-LOGOFF

At this point you may enter a carriage return, which will display the entire MATRIX menu. To enter Conference Operations type CO or the number 3\_. You will then be presented with:

```
MENU OPTION:  CONFERENCE OPERATIONS  YOUR NAME  DATE  TIME
              COMMANDS:  CC, RC, SO, CR, CS, CI, CL, SC, SD, MA, LE, RE

WOULD YOU LIKE TO SEE THE CONFERENCES WITH COMMENTS YOU
HAVE NOT READ (Y/N)?
```

You will then be sent to the CONFERENCE OPERATIONS menu where you will see:

```
MENU OPTION:  CONFERENCE MEMBER          YOUR NAME          DATE
              LOCATION:  CONFERENCE--          DISCUSSION--          TIME
              COMMANDS:  CC, RC, SO, CR, CS, CI, CL, SC, SD, MA, LE, RE
```

Before you can choose a menu option you will be asked to choose a conference (if you are not already in one):

ENTER CONFERENCE TITLE OR H-HELP, Q-QUIT?

WOULD YOU LIKE TO SEE THE CONFERENCES WITH COMMENTS YOU HAVE NOT READ (Y/N)?

|              |                                                |              |      |
|--------------|------------------------------------------------|--------------|------|
| MENU OPTION: | CONFERENCE MEMBER                              | YOUR NAME    | DATE |
| LOCATION:    | CONFERENCE--                                   | DISCUSSION-- | TIME |
| COMMANDS:    | CC, RC, SO, CR, CS, CI, CL, SC, SD, MA, LE, RE |              |      |

SELECT NUMBER (1-12) OR COMMAND OR RETURN FOR MENU, H-HELP, Q-QUIT?

If you input or enter a carriage return you will be presented with the entire Conference Operations Menu:

1. CC-CREATE AND SEND COMMENT
2. RC-READ COMMENT
3. SO-SEND OPERATIONS
4. CR-COMMENT STATUS REPORT
5. CS-CONFERENCE SCRATCHPAD
6. CI-CONFERENCE INSTRUCTIONS
7. CL-CONFERENCE LISTINGS
8. SC-SWITCH TO ANOTHER CONFERENCE
9. SD-SWITCH TO ANOTHER DISCUSSION
10. MA-CONFERENCE MANAGER
11. LE-DISCUSSION LEADER
12. RE-RETURN TO MAIN MATRIX MENU

SELECT NUMBER (1-12) OR COMMAND OR RETURN FOR MENU, H-HELP, Q-QUIT?

|              |              |              |      |
|--------------|--------------|--------------|------|
| MENU OPTION: | READ COMMENT | YOUR NAME    | DATE |
| LOCATION:    | CONFERENCE-- | DISCUSSION-- | TIME |

"ENTER"R"E"AD MODE R-REGULAR, S-STATUS, O-OUTLINE, L-READING LOOP OR H FOR HELP?

There are many ways to read: back to front, side to side, or the funnies first, followed by sports.

? This comment is more appropriate in the conference  
? on air and space.  
? \*

After you have entered an "" the system will prompt you with:

COMMENT - - (comment title) - **HAS BEEN SENT TO DISCUSSION** - - (discussion title) **IN CONFERENCE** - - (conference title)

Figure 8-4 Getting started. (*Source*: International Tele/Conferencing Company)

### Human Factors

It has been said that computer teleconferencing is "least like face-to-face meetings"<sup>5</sup> and "perhaps *the* major departure from traditional models of communications among groups."<sup>6</sup> Computer teleconferencing generates a different type of social interaction than either audio or video teleconferencing. Formulating thoughts and typing them in at a keyboard are, of course, qualitatively different processes from expressing them verbally to a group in person, on the telephone, or in front of a television camera. In a computer teleconference there is an ongoing interaction among the participants, but a person need not respond as soon as he or she receives a message. As a result, reflection and precise expression are possible. Additionally, issues can be explored and resolved on an ongoing basis, rather than being allowed to accumulate. It is a simple process to oversee or gather the right people together to monitor a project as it unfolds and progresses.

In a computer teleconference, shy people can contribute without worrying about conference "bullies." A "speaker" is not interrupted or intimidated. A friendly rather than confrontational atmosphere is created. Instead of being pressured into answering a question "on the spot," people can think about one question, do some research, then respond to it when they are completely prepared. These aspects of computer teleconferencing improve the flow of information in an organization and help foster a team spirit. Communication and morale improve because people interact with their supervisors on an equal basis. If they make a contribution to the discussion, it is attributed to them, and thus they have more incentive to carry out the final decision of the group.

<sup>5</sup>R. Johansen, J. Valee, and K. Spangler, *Electronic Meetings*, Institute for the Future. Reading, MA: Addison-Wesley Publishing Company, Inc., 1979, p. 1.

<sup>6</sup>Suzanne Keller, "Forward," in Starr Roxanne Hiltz and Murray Turoff, *The Network Nation*. Reading, MA: Addison-Wesley Publishing Company, Inc., 1978, p. xx.

Users of one computer teleconferencing system, Notepad, reported several positive outcomes:

- The frequency of communication with distant workers was increased . . .
- [They] enjoyed greater flexibility in their work because they could take their terminals along during business trips, or to their homes on weekends. . . .
- Satisfaction with group communication was increased, leading to a greater feeling of team work and greater quality of the final product.<sup>7</sup>

The protocols of communication in a computer teleconference are not the same as they are in verbal/visual communication. The context of communication is radically different. The design of the on-line system provides the communication cues, and thus the context of communication is reduced to the cues designed into the system. A successful computer teleconference, however, does not rely solely on cues generated by the computer software. Rather, programs and conventions that reflect the aims and expectations of the group are carefully considered and then structured into the teleconference. These programs and conventions are referred to as "groupware." Groupware is defined by Peter and Trudy Johnson-Lenz as "intentional GROUP processes and procedures to achieve specific purposes plus softWARE tools designed to support and facilitate the group's work."<sup>8</sup> Groupware includes the consideration of the following types of expectations and modes of behavior:

- The roles of different participants and the responsibility that each role entails.
- The topics and the order of their presentation.
- The desired tempo of discussion.
  - The appropriate types of responses to be elicited from teleconference participants.
- The degree of abstraction or specificity that is considered appro-

<sup>7</sup>"Management Control and Productivity," *Planet News*, No. 16, Infomedia Corp., April 1979, p. 1.

<sup>8</sup>Peter and Trudy Johnson-Lenz, "Consider The Groupware: Design and Group Process Impacts on Communication in the Electronic Medium," in Starr Roxanne Hiltz and Elaine Kerr, *Studies of Computer-Mediated Communications Systems: A Synthesis of Findings*, NJIT Research Report #16, 1981.

priate in private discussions, group discussions, reports, and the like.

- The expected level of technicality of the discussion.

Ideally, computer teleconference participants already know one another or have the opportunity to get to know one another in a face-to-face setting before the teleconference begins. This also provides moderators and participants a chance to decide upon the groupware of the teleconference before launching into it.

Problems of communication can arise in a computer teleconference if the participants have not had the opportunity to get to know one another in any way except through the medium itself or if they do not have the opportunity to meet at intervals during the course of the teleconference. This point was made by professors at the Western Behavioral Science Institute who organize and teach university-level courses on-line via computer teleconferencing to executives and managers enrolled in their two-year program. They warn:

A group which depends almost entirely on teleconferencing as its means of communication is ... a fragile entity which may break down and dissolve back into its individual elements. Extreme care is needed in designing and operating a teleconferencing system which must serve as the backbone of a group that cannot engage in frequent face-to-face meetings, and serious mistakes are likely to result in withdrawal by all concerned.<sup>9</sup>

Even when participants know one another, problems can arise in a computer teleconference with respect to interpretation of messages and the conference text. Robert McAndrews has noted that there is a tendency for people involved in complex on-line discussions to "flame," that is, to misread the meaning of a message, read something more into a message than is actually there, or miss subtleties and nuances. The problem can obviously be with either the sender or the receiver of a message, and the solution, of course, is more precise expression and more careful reading.

#### **Attitudes Toward Computer Teleconferencing Technology**

Studies carried out at the New Jersey Institute of Technology of their computer teleconferencing system, the Electronic Exchange Information System (EIES), have found that the prime determinant

<sup>9</sup>*Final Report, United States Department of Commerce Teleconference on Productivity*, conducted by the Western Behavioral Sciences Institute, Grant #RED-795-G-82-13 (99-7-13603), p. 11.

motivating people to use the system was not typing ability, familiarity with computers, or preference for written over verbal communications, but rather the attitude of the user. Users who most often professed benefit from it were those who anticipated that they would like using EIES before they ever tried it. It was also observed that, among those using EIES, there was a change of focus across time. Users progressed from using the system for simple messaging to using it for composing material on-line. In fact, as the researchers note, there was a tendency to become addicted to the computer teleconferencing system and users claimed not to be able to think when the system is down. Their study, which surveyed 200 professionals using computers, many for the first time, found that about 20 percent of the users became so dependent on their terminals that when the computer did not work, neither did they! They report the following tale:

One EIES user in Boston formally had access only once a week, when he worked in the office building that contained a terminal. He reports that he found himself making special trips to that building several times a week, just to sign on the system. This "addiction" is the source of considerable antagonism from the families of EIES members with terminals at home because members are prone to sneaking off after dinner for a session rather than talking or helping with the dishes.<sup>10</sup>

More evidence of the executive's active interest in learning to operate a computer teleconferencing system is being gathered at the Western Behavioral Sciences Institute (WBSI) where top-level executives study in the School of Management and Strategic Studies via computer-teleconferenced courses. The directors of the program note that they have encountered none of the attitudinal problems that are presumed to be typical of executives' attitudes toward computer technology in general and a keyboard in particular. There is "a kind of inner drive to play," notes Robert McAndrews, executive director of WBSI, and "their response to the keyboard and other equipment is as to a toy."<sup>11</sup> According to McAndrews, a maximum of ten hours suffices for the user to arrive at a point where the computer terminal is "transparent," that is, to arrive at a point where the mechanics of using the machine are no longer a hindrance to communication.

Another assumption that may adversely affect attitudes toward computer teleconferencing is the one that holds that computers are "intrinsically biased in a technocratic or positivistic direction." Such

<sup>10</sup>Starr Roxanne Hiltz and Murray Turoff, *The Network Nation*. Reading, MA: Addison-Wesley Publishing Company, Inc., 1978, p. 102.

<sup>11</sup>Robert McAndrews, talk given at International Teleconferencing Seminar, Boulder, CO, December 6-7, 1982.

thinking might lead to the conclusion that computer teleconferencing is "a medium more appropriate for business meetings and technical communication than for the dissemination of humanistic knowledge." After using computer teleconferencing as the communications medium for his course, Andrew Feenberg, one of the professors at WBSI, concluded that "those who fear computers may have drawn premature conclusions concerning their social implications from a rather narrow range of applications."<sup>12</sup> Feenberg suggests that the focus should not be on the artificial intelligence (AI) aspects of the computer, such as its capacity for data analysis and storage—the very aspects that "shape the image of the technology." Rather, he believes, the appropriate metaphor is the one that considers computer teleconferencing an "artificial" model of normal human communication:

The interesting feature of "AI" is not the use of computer hardware, but the conscious construction of new programs and conventions by which to simulate familiar communications systems, and to make possible new systems not previously conceived.<sup>13</sup>

### THE AVAILABLE OPTIONS

Computer teleconferencing software is packaged in a variety of ways, and there are a number of organizations that offer computer teleconferencing services. The following are the major computer teleconferencing systems available:

- EIES
- Notepad
- Genie
- Augment
- Matrix

Differences among computer teleconferencing systems usually refer to different design philosophies that the various systems integrate. Before discussing the characteristics of the individual systems, therefore, it is important to note the different general philosophies that underlie computer teleconferencing systems.

Andrew Feenberg, "Moderating an Educational Teleconference," in Murray Turoff and M. Heimerdinger, eds., *Educational Teleconferencing*, Ablex Publishing, Norwood, NJ, in press.

<sup>13</sup>*Ibid.*

### Differences in System Designs

Access to information in a computer teleconference is controlled by the design of the system. A teleconference can be designed so that certain users are privileged to access, read, and write files. It is frequently useful to give at least one member editorial power to add and delete text. Typically, in an open computer teleconference, all members read all items and contribute their own at will. Normally they are not permitted to change files created by others, but this aspect is up to the system designer. All permutations are possible.

Computer teleconferencing systems may take a variety of forms. Some, like Infomedia's Notepad, are extremely simple and tightly controlled from the top. By contrast, the experimental Electronic Information Exchange System (EIES) offers a great variety of patterns of access and use. EIES is considered almost baroque due to the multiplicity of its subsystems. If the user knows where to look, almost every type of communications pattern may be found somewhere on EIES. Designer Murray Turoff has even constructed an electronic "marketplace" where members can advertise information and buy and sell it, with the EIES host recording the exchange of credits.<sup>14</sup>

The underlying philosophy of the first EIES system is different from that of other systems that were developed later, as the following statement suggests:

The philosophy of design that underlies EIES has always been that the objective of computerized teleconferencing is to utilize the computer to tailor communications structures and to build as an integral part of such communication structures any computer aids or functions that would act to facilitate the communication process. Therefore, EIES, as a system designed for long-term use by scientists, is designed as a rich and complex system to meet what are felt to be diverse needs.<sup>15</sup>

The extent to which this design philosophy differs from that underlying the Planet and Forum computer teleconferencing systems developed by the Institute for the Future is explained as follows:

There are differences of opinion . . . over what comprises "computer teleconferencing." In the New Jersey Institute of Technology system, for instance, computerized teleconferencing is combined with other computer resources, such as a journal system, a text editor, and even a kind of management information system. While such a system provides more computer power, it does so at the expense of simplicity of operation we felt was necessary for an initial exploration of the utility of small group communication through com-

Clifford Barney and Thomas B. Cross, "The Virtual Meeting: A Report on Computer Conferencing," *ComputerWorld*, September 20, 1982. Copyright 1982 by CW Communications/Inc, Framingham, MA 01701. Reprinted from *ComputerWorld*.

<sup>15</sup>Hiltz and Turoff, *op. cit.*, pp. 427-8.

puters. PLANET [a predecessor of NOTEPAD] is a simple system which enables social scientists to explore the potentials of computer teleconferencing without requiring that they control for the effects of peripheral elements involved in more complex computer services. Our approach has been to base our assessments of computer teleconferencing on this basic system for group communications through computers.<sup>16</sup>

User orientation rather than computer orientation is the crux of the difference in the two design philosophies. EIES was designed to maximize computer resources, necessitating, as a result, an ongoing reliance on human monitors to interface users and technicians. Planet and Forum were designed from the outset to be user oriented, structuring communication flow for simplicity and maximization of group interaction. One design stresses "computer," suggesting access to a rich data bank and sophisticated modeling techniques, the other stresses "interaction," suggesting structured communication and teleconferencing.

The thrust of computer teleconferencing systems that were developed after the first EIES system was towards ease and flexibility of use as well as differentiation of the computer teleconferencing capabilities. The delineation of functions was along the lines of separating out teleconferencing from one-to-one messaging and interactive from non-interactive types of communication. Similarly, The Institute for the Future carried out extensive field trials, testing the appropriateness of the Planet/Forum system to meet the needs of scientists, engineers, and other professionals. After 28 Forum teleconferences, 5 styles of computer teleconferencing were differentiated: the "notepad" and "questionnaire" (noninteractive) and the "seminar," "assembly," and "encounter" (interactive).

Systems were developed specifically for mail in which messages could be stored and forwarded. Once functions were differentiated, however, users soon wanted to move beyond simple messaging:

What happens in an electronic message system is that a set of individual users discover there is some subject they wish to address as a group, and that they desire to collect all the discussion about that topic in a single file that now represents a common proceedings of the discussion the group is having. It is soon discovered that the ability of the computer to aid in editing and reviewing the discussion is useful for further development of the topic. Once these capabilities are incorporated, there is little distinction possible between a simple teleconference system and a sophisticated message system.<sup>17</sup>

Based upon their extensive research, development, and use of computer teleconferencing in conjunction with many different types of confer-

<sup>1</sup> R. Johansen, R. DeGrasse, Jr., and T. Wilson, 1977, *Group Communications Through Computers*, Vol. 5: *Effects on Working Patterns*, Institute for the Future, Menlo Park, CA, in Hiltz and Turoff, *op. cit.*, p. 427.

<sup>17</sup>Hiltz and Turoff, *op. cit.*, pp. 69-70.

ences that have included numerous people from a myriad of professions, Hiltz and Turoff have noted the design factors that should be considered in the selection of a computer teleconferencing system. Some of these "specific short items of wisdom" include the following:

- The most efficient structures for computers are not necessarily efficient for users.
- Effectiveness of an interface design is measured by the extent to which the user can forget that there is an interface.
- Users should not have to cope with details extraneous to their tasks.
- Error messages should be informative.
- Charges should represent resources that the user can understand or that relate directly to the user task.
- Users should be involved in the evolution of the system.
- A system that does not evolve begins to die.
- Users learn best by doing—trial and error.
  - Users should find it convenient to get to a system when they need to.
- Users will evaluate systems in their terms, not in computer terms.
  - What you can count on for at least some users is that they are highly intelligent, too busy for any training course, very impatient, and intolerant of inconveniences; and they also require useful results from the system.<sup>18</sup>

These experientially based bits of wisdom should help the user know how to choose among the available computer teleconferencing options.

### EIES

The Electronic Information Exchange System (EIES) network is operated by the New Jersey Institute of Technology under the direction of Murray Turoff and Starr Roxanne Hiltz. The system takes into consideration the specific needs of the user community and provides the most relevant communications features and computer-assisted computational functions. Then, as the designers note:

Once the computer is put into the communication loop, the potentials for structuring, facilitating, and augmenting the communication and information exchanged among members of a user group are virtually unlimited.

<sup>18</sup> *Ibid.*, pp. 354-355.

<sup>19</sup>*Ibid.*, pp. 18-19.

NAME/#?  
CODE

rCl>

GET ITEMS (U)  
DISPLAY TITLES (2)  
SEARCH/FIND (3)  
SEND/COMPOSE/SUBMIT (4)  
EDIT/DELETE (5)  
ORGANIZE ITEMS (6)  
VOTE/FORM (7)  
SET OPTIONS (8)  
..... CHOICE?  
(Message/Conference/Notebook/  
Report/Assessment/News)

MESSAGES (1)  
CONFERENCES (2)  
NOTEBOOKS (3)  
BULLETINS (4)  
MEMBERS/GROUPS (5)  
EXPLANATIONS (6)  
PROCEDURES (7)  
ACCOUNTS (8)  
MONITOR CHOICE? (9)

<I>

0

ACCESS TO: 1 1/2/3  
NEWS (1)  
ASSESSMENTS (2)  
ABSTRACTS (3)  
REPORTS (4)  
DESCRIPTION (5)  
FUNCTIONS FOR REFEREES (IS)  
EDITOR (71)  
BULLETIN CHOICE?



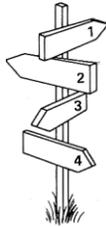
ACCESS TO:  
MESSAGES (1)  
CONFERENCES (2)  
NOTEBOOKS (3)  
BULLETINS (4)  
DIRECTORY (5)  
EXPLANATIONS (61)  
REVIEWS (71)  
COMPOSITION (8)  
MONITORING (9)  
INITIALCHOICE?

GET ITEMS (1)  
DISPLAY TITLES (21)  
SEARCH/FIND by:  
NAME PARTS (3)  
FROM-TO-DATES (141)  
WORD/PHRASE (5)  
ZIPCODE (6)  
UPDATE ENTRY (171)  
DIRECTORY CHOICE?

GET ITEMS (1)  
DISPLAY TITLES (2)  
SEARCH/FIND (3)  
EXPLANATION OF  
GENERAL DESIGN (41)  
SPECIFIC CHOICES (5)  
CONTROL FEATURES (61)  
ANSWER AIDS (71)  
TEXT EDITING (81)  
DOCUMENT EDITING (91)  
COMMANDS (101)  
SPECIAL FEATURES (111)  
HAL (999) (112)  
EXPLANATION CHOICE?

Questions Asked

MESSAGES  
CONFERENCES  
NOTEBOOKS  
BULLETINS  
MEMBER/GROUPS  
MEMBER STATUS  
GROUP STATUS  
SYSTEM STATUS  
REVIEW CHOICE?



CHOICES



Computerized Conferencing and  
Communication Center  
New Jersey Institute of Technology  
323 High Street  
Newark, N.J. 07102  
201 -645-5503

Designer:  
Murray Turoff  
Department of Computer  
and Information Science  
Support: NSF  
Communications: TELENET  
Equipment: INTERDATA  
Implementation:  
NJIT & LSD

(  
1  
1  
(  
2  
)  
(  
3  
1  
4  
)  
(  
5  
1  
6  
1  
(  
7  
)  
(  
8  
)

Scratchpad (ISP) k  
Storage Areas (ISA)

USE TEXT FOR:  
MESSAGE (1)  
CONFERENCE (2)  
NOTEBOOK (3)  
BULLETIN (4)  
CONTINUE AND:  
SAVE TEXT (51)  
GET TEXT (16)  
RETURN TO SP (7)  
COMPOSE CHOICE?

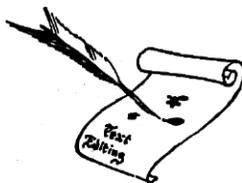


|     |                                                                                              |                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                       |                   |
|-----|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|     |                                                                                              | ITEM NUM TIONS FOR:<br>(-# for DELET MARGIN/LINE<br>CONTROL                                                                        | (6)<br>REMOTE PRINT<br>PARAMETER CHANGES<br>PROCEDURES<br>SET CHOICE?                                                                                                                                                                                                                                                                                 | (7)<br>(8)<br>(9) |
| 1/2 | ITEM NUMBERS (#,#-#)?                                                                        | REVIEW STATUS (1)<br>EXCHANGE ITEM ON/OFF OF:<br>COPY/MERGE ITEM LINE<br>TRANSFER/MOVE I PAUSE<br>MODIFY FOR ITEM (2)              |                                                                                                                                                                                                                                                                                                                                                       |                   |
|     | SEARCH BY:<br>NUMBERS/NAMES<br>STATUS/TYPE<br>COMBINATIONS<br>FROM-TO-DATES<br>WORDS/PHRASES | KEYWORDS MENU<br>ASSOCIATIONS LISTS<br>SEQUENCES<br>DISPLAY STRUCTL<br>KEYS                                                        |                                                                                                                                                                                                                                                                                                                                                       |                   |
| 3   | ASSOCIATIONS<br>SEQUENCES<br>DISPLAY STRUCTURE OF<br>KEYS<br>ASSOCIATIONS<br>SEQUENCES       | ASSOCIATIONS (3)<br>SEQUENCES (3)<br>ORGANIZE CHOICE AUTOMATIC<br>DELIVERY                                                         | CONTROL FEATURES FOH<br>USE OF MENUS:<br>+ Go back/finished questions/<br>finished text/when<br>in doubt do it<br>++ Goto INITIALCHOICE/<br>request messages<br>++# Goto INITIAL CHOICE #<br>— Start over/made mistake/<br>stop and go back/<br>ignore answers/don't do it/<br>terminate string variable<br>8K Break Key stops printout<br>— sign off |                   |
| 4   | SEARCH CHOICE?<br><br><i>Scratchpad ISP) k</i>                                               | GET ITEMS (4)<br>RECEIVE ONLY<br>DISPLAY ITE (SLEEP)<br>FIND/REVIEV<br>VOTE/FILL IN (5)<br>VOTE/FORM C ESTABLISH<br>MEMBER<br>LINK |                                                                                                                                                                                                                                                                                                                                                       |                   |
| 5   | <i>Storage Areas (SA)</i>                                                                    | OP                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                       |                   |

ANSWER AND HELP AIDS

Interaction Aids:

Carriage Return used to end input line/lists menu/ Assumes YES answer/Makes no change in what is there already



**CTRLandX** Line Delete (Cancel) current line/Start over)

**CTRL and H** Character Delete (May also be: backarrow/underscore/backspace/terminal dependent]

**?** short explanation provide

**?#** Explains CHOICE: #

**??** detailed explanation

To get Human help:  
**??? message** Send one line 'message' to console operator

**???#. message** Send to Member #

**+ON** Tells who is on now

**+ LINE#** Request terminal Link to member #

**ICNM** Compose New Message

When all else fails phone 201 -645-5503

Questions may be answered ahead utilizing separate answers end multiple answers to one question let this question be asked (+, .. Y) equivalent carriage return answer ACCEPT question YES

**||** (V)

Line and Item Number Aids:  
**##-##** range of item or line numbers  
**## ##-## ##** any combination  
**##** from # until end  
**##** from first till #  
**-##** all lines or items  
**-**

TEXT COMPOSE/EDIT COMMANDS

Used in Scratchpad (SP) starting with first character of line. (# indicates line numbers/range)

**+** text complete/finished

**= #** go to line #

**#** go to end of text

**#** print lines indicated

**-** print all lines as typed

print all lines after editing

**: #** do for lines #

**:/word/** print first line with 'word'

**:/word/a** print all lines with 'word'

**:/cat/—/dog/** print from line with 'cat' to line with 'dog' in it

**\* #** deletes line printed above

**\*\*** delete lines indicated

**\*\*** delete all of SP

**/old/new/** replace 'old' with 'new' in line printed above

**/old/new/#** do for lines indicated

**/old/new/a** all occurrences on line

**/old/new/a#**for lines indicated

**/old/new/a—**for entire scratchpad

**t** back up one line

**+ cat** replace letters printed above with letters 'cat'

**t #** delete letters above #

**tt cat t** insert 'cat' at first up arrow

CONTROL COMMANDS

(May be entered any time)

Text Control Commands for Output:

**+ left #** set left margin at column #

**+ left** set left margin at column 1

**+ right #** set right margin at column #

**+ right** set right margin at column 72

**+ space** normal line spacing

**+ space - 1** eliminates all blank lines

**+ space #** # blank lines between text lines

**+ trace #** copy the next # lines of output into the Scratchpad (up to 100).

**+ trace # SA #** copy into SA # instead of SP

Set Option Commands:

**+ SAM** Set Automatic Message delivery

**+ SNAM** Set No Automatic Message delivery

**+ SSM** Set Short Mode of interaction

**+ SNSM** Set No Short Mode

**+ SLP #** Set Line Pause every # lines (For pauses on output at CRT's)

**+ SLP** Set Line Pause every 23 lines

**+ SNLP** Set No Line Pause

**+ SCM #** Set Conference Marker at item #

**+ SAC code** Set Access Code (up to 12 characters)

**+ SPEN name** Set PEN name (up to 24 characters)

Alerting Control Commands:

**+ sleep** Terminal goes to sleep until new comment or message delivered

**+ sleep mm:ss** Will print new items until time delay specified is reached

**+ sleep MG#** Will sleep until member # gets on or off the system (break key negates sleep state)

**+ alarm mm:ss** provides an alarm after time delay specified

**+ alarm MG#** provides an alarm when member# gets on or off the system (alarm discontinued when user gets off)



**|** blank this line

**| #** blank lines indicated

**|text|** fill this line with 'text'

**|text| #** do for lines #

**|text (#)** place text in columns#

**—** insert one new line here

**—#** insert lines indicated here

**—#** insert a series of new lines

**—#** end insert of a series of new lines

**—#** copy lines #

**&#** list blank lines

**:|** insert blank line

**<|** delete blank lines

**\*|** print lines with indirect edits

**= 3;<20 = 13** Use; to do multiple edits



TEMNAMES

SPECIAL MEMBERS:

name (nickname, number)

SYSTEM MONITOR (EIES, 1001)

CONSOLE OPERATOR (HELP, 101)

OPERATIONS MANAGER (REQUEST, 102)

CENTER DIRECTOR (BOSS, 1041)

USER CONSULTANTS: 110-119

PUBLIC CONFERENCES:

| name        | number |
|-------------|--------|
| PRACTICE    | 1000   |
| PROBLEMS    | 1001   |
| SUGGESTIONS | 1002   |
| IMPACTS     | 1003   |
| NOTICES     | 1004   |
| WISDOM      | 1005   |
| TERMINALS   | 1006   |

Figure 8-5 User's guide for Electronic Information Exchange System. (Source: Computerized Conferencing and Communications Center, New Jersey Institute of Technology)

EIES offers so many teleconferencing features that beginners may feel overwhelmed. The system works perfectly well, however, with a small subset of these features, and new users tend to "find their way around" fairly quickly. An "on-line consultant," for example, an experienced EIES user, is generally available at all times to provide a quick response to users' queries. There is also always a system monitor available for help.

Users write text into EIES in temporary "scratchpad" files. After the user is finished editing the file, it is stored in the appropriate "notebook" or sent as a message. The mechanisms for carrying out each step of the process are designed to be tailored to each user's level of experience. Easy-to-understand, tree-structured menus help beginners as they are taken step by step through a series of menus. After the beginner gains some familiarity with the system, he or she can ignore the on-line "help" menus and respond directly to system prompts. When the user is more experienced, he or she can "answer ahead" by providing the system with a series of commands that anticipate system prompts. Once having gained expertise, the user can access functions from the EIES programming language, Interact, to create his or her own macro commands. An even more sophisticated function/command level permits the user to move directly from one subsystem to another, thereby bypassing the system's tree structure.

When a set of files is accessible to specific users only, this creates a "private teleconference." The moderator has the responsibility (and freedom) to control which people participate in a particular teleconference and to add, delete, and modify the text of the teleconference. Files are numbered consecutively, dated, and given keywords by the system. Keywords are used to enable the system to search for a particular file.

EIES has elaborate monitoring software, and user activity is carefully tracked. Because the system automatically acknowledges messages, a sender always knows when a message has been received. The system also lets the user know who has seen his or her text. Authors can find out who has read their comments by means of a "marker" that indicates read and unread messages. Members can also access monthly and cumulative totals of their time on-line and see which messages and teleconference items were composed and read. Because EIES has a variety of modes, for example, simple messaging, teleconferencing, private and group notebooks, bulletin boards, and the like, organizations can experiment with different ones and then track use of each to determine which approach offers the best tradeoff between costs and user acceptance.

A true on-line community, comprised of hundreds of users, is often created on EIES. Like any community, an on-line community can have its means of "spreading the word." On-line bulletin boards and

newsletters alert members to activities on the system that are of interest to them and thus they function much like trade journals or association newsletters.

Accessed via the Telenet or Uninet packet-switched networks, or by direct dial to its Newark, New Jersey, headquarters, EIES offers a variety of pricing structures. The basic Class 1 account costs about \$75/month, with users being billed for Telenet charges (approximately \$9/hour) or Uninet (approximately \$7/hour).<sup>20</sup>

### **Notepad**

Notepad is a descendant of Forum, designed by Dr. Jaques Vallee and developed by the Institute for the Future in 1973. Forum used the Advanced Research Projects Agency Network (ARPANET), and it was the first computer teleconference system that was available on a network basis. In 1974, the Institute designed a more sophisticated system called Planet. Planet, in turn, was replaced with the even more advanced computer conferencing services of Notepad, which integrates file structure and text editing as well as an electronic mail system.

Synchronous and asynchronous messaging, as well as graphics and keyword searching, are provided by Notepad. Beginners can learn all essential features of Notepad's menu structure in a matter of hours. Users are provided with a color-coded function card that fits over the number keys and turns a keyboard's numeric pad into a set of function keys. In command mode, the keys become entry points into Notepad's various subsystems.

Notepad allows the user to: (1) read or write private messages, (2) choose a particular teleconference, (3) read or write teleconference items, (4) edit and change text files, or (5) access special Notepad features such as graphics, communications from an off-line word processor, and on-line help. The user also has other options within subsystems.

A drawback of Notepad is that its text editor is rather unsophisticated, being line oriented rather than screen oriented. Text that has been prepared and edited off-line, however, can be easily accepted by the system.

Notepad is operated by Infomedia Corporation. Most Infomedia clients access Notepad via TYMNET at up to 1,200 bits/second. They use the software resident on the host at the company's San Bruno, California, headquarters. Infomedia charges a \$1,000 startup fee and then \$60/hour, plus \$7/hour for Tymnet. For long-term commitments, however, discounts are available. A user may establish as many projects as required within an account, and as many teleconferences (called "activities") as required within each project.

<sup>20</sup>Barney and Cross, *op. cit.*

When setting up projects and activities, Infomedia first consults with the user as to the specific applications required. Infomedia provides training for customers in order to familiarize them with the system, and an Infomedia representative participates in one of a customer's teleconferences in order to provide on-line assistance. The charge for this assistance is limited to the actual connect costs for the Infomedia representative, approximately \$1/minute. Free use of 100 pages (approximately 2500 characters per page) per month is provided with an account, and users pay \$1/page/month thereafter.

Infomedia also sells the entire Notepad package for about \$50,000. The package runs on any DEC computer supporting the TOPS-20 operating system. The company expects to introduce a version tailored for IBM's VM/SP operating system. The IBM version, which will also run on compatible Magnuson and Amdahl mainframes, will cost approximately \$80,000.

About thirty large organizations now use Notepad, including Bechtel Power Corporation, Cities Service Company, NASA's Ames Research Center, and the Electric Power Research Institute.<sup>21</sup>

#### **Genie**

Genie (for GENeral Information Environment) was designed by Steve Heitman and is being marketed specifically for scientific and engineering applications by Data Dynamics, Inc., of Portland, Oregon; it is used by more than 300 users at a large Portland area electronics company. Referred to by Heitman as a "value added data base management system" that integrates text and data, the heart of the system is a relational data base in which users may read and write.

Genie incorporates the following functions: (1) communications, (2) word and graphics processing, (3) calendar and scheduling functions, and (3) a "personal information management" system. It has an on-line "help" system that may be tailored to a user's level of expertise. The full text of Genie files is searchable, and Data Dynamics also plans to add a bulletin board function with a controlled vocabulary that may be searched by keywords. Additionally, its communications software enables the routing of memos and questionnaire functions as well as electronic mail and teleconferencing. An administrator who has general editing functions organizes the "repositories" or teleconferences of the Genie system. Genie also offers sophisticated directory management and multiple user interfaces.

Written in Pascal, the system operates on Cyber 175. Its designer points out, however, that it is portable and will run on the Unix operating system. It requires 256K of a main memory. It is compatible with

<sup>21</sup> *Ibid.*

X.25, DECNET, and Hyperchannel communications protocols, as well as telephone packet switched networks.

The mainframe version is sold by Data Dynamics for \$65,000, and the smaller version that is designed for a DEC VAX 11/70 is sold for \$35,000. The reason for the price differential, the designer notes, is that the VAX version supports fewer users. The system may be tested by new users on a Data Dynamics host for \$5,000/month over a three-month period.<sup>22</sup>

#### **Matrix Transaction Exchange**

Developed by Cross Information Company and winner of the Outstanding Information Technology Award for 1982 from the Associated Information Managers of Washington, D.C, Matrix is a second-generation teleconferencing system. Resulting from research into management information network development, Matrix was designed to parallel the structure of organizational hierarchies and offers a range of management functions that aid corporate decision-making processes. Its features include (1) unlimited teleconferencing, (2) unlimited discussion and unlimited user memo "yellow pad" capability, (3) extensive management reports, (4) mail/bulletin board, (5) on-line "help," (6) low memory requirement, (7) multi-user environment, and (8) complete system management via tree-structured menus.

The innovation of Matrix lies in the administration that is structured into the entire system. Designed for management control in corporate organizations, Matrix incorporates specific menu-driven functions for the system operator, teleconference manager, discussion leader, and users. Certain privileges for teleconference management and administrative activities are permitted with Matrix functions. Extensive report generation can be accomplished through use of the number keys only. Managers can fully participate in and manage teleconferences without typing skills. There is an extensive directory function, providing a wide range of information on such topics as teleconferences, discussions, memos, leaders, managers, messages.

With on-line "help," instructions, and training teleconferences, the beginner can become accustomed to the system quite rapidly. There are mail/messaging and bulletin boards for person-to-person communications. A meeting "status" indicator lets each person know where the meeting is and what has occurred. At any point in the meeting, the user can review everything that has already transpired. In addition, he or she can go back to the first meeting or any one in between for reference.

Matrix is designed to support a wide range of communications, from projects carried out by small groups to those carried out by multi-

<sup>22</sup> *Ibid.*

national organizations. Matrix has an unlimited "electronic file cabinet" with user-determined key words and open searching, which means that it is ideally suited as a management information system. With modular software, Matrix can be integrated with other applications software residing on the computer system. Matrix is designed to be used in this capacity for the multinational operation, as such organizations are extended around the globe with manufacturing, assemblage, and marketing taking place at different sites.

Matrix is the lowest priced of all teleconferencing and mail systems with prices starting at \$1,000 for monthly lease installed in-house for DEC computer systems. Matrix is also available as a modular system designed to interface other existing computer programs.

#### **Augment**

Augment is not a teleconferencing system in the strictest sense of the word. Rather, it is an extensive package for the joint processing of computer-generated text. Most teleconferencing systems are organized around communications requirements, but Augment is text-oriented.

Augment was developed under Douglas Engelbart at Stanford Research Institute in the 1960s. Originally known as NLS (for oNLine System), Augment became the kernel of the worldwide ARPANET (Advanced Research Projects Agency Network). It was the designer's intent to create a system that would take a computer terminal and change it into a tool that would "augment" the human intellect. The structure of Augment is still used today by thousands of ARPANET users who may have nothing to do with the commercial system that is now marketed by Tymshare, Inc. Tymshare markets the system as an "electronic briefcase" in which text can be written, edited, formatted, filed, and distributed.

Not designed to be "user-friendly," Augment has no real teleconferencing front end, and it requires much practice to operate with skill. Nonetheless, veteran users, almost without exception, say that learning to operate the system is worth the trouble. When used properly, Augment permits text to be easily manipulated, from the creation to the production of a finished document. Then, if the user so desires, the finished product can be printed in four colors.

The power of Augment derives from its use as a collaborative tool. Rather than organizing text according to formal teleconferences, Augment structures various levels of file protection and user group definition that permit flexible methods of cooperative effort. All files are kept in a vast seamless "journal." These may be accessed according to a user's predefined rights. The system logs in changes in the text, keeps several versions on file, and notes who is responsible for each version.

Augment permits users to view up to eight files simultaneously in its synchronous mode, passing control back and forth and "pointing" via a cursor to particular portions. An electronic mail service is provided by a messaging system, and users are notified of new messages as they arrive.

The Augment system recognizes text in logical elements, rather than as fragments of the particular text display system. Thus, the system does not "see" lines; rather, it sees sentences or paragraphs. A user-assigned level relates each text element to other text elements. The topic sentence of each paragraph, for example, may be on one level, and the rest of the paragraph on a lower level. The paragraphs, in turn, may be related to higher-level sections. Six different levels of text are recognized by Augment. By choosing to view only certain levels, the user may review text through "filters" that are as coarse or fine as the situation requires. This allows the user to scan text or "zoom in" for more detailed information.

Augment includes a calculator, a sort function, graphics (with a Tekronix 4014-type terminal) and various print functions. It may also be used to create forms. Accessed via Tymnet, Augment may be used with any ASCII terminal. But, for fullest use of the system, Tymshare recommends its own terminal, which has been modified to accept directions from two I/O tools that supplement the normal keyboard. One is a "mouse," a small device that rolls around a table top and generates error voltages that the terminal turns into X-Y coordinates on the screen. It permits the user to move the cursor around the screen quickly in any direction, without awkward time-consuming arrow keys required by most systems. The other device is a five-key chord set, similar to a court reporter's stenotype machine, that enters characters through binary code. Pressed two at a time, the keys allow the entry of 31 different ASCII characters. With shift and supershift button on the mouse, the total number of characters is increased to 93. Skilled users operate the chord-and-mouse set to enter commands, reserving the keyboard for entry of long sections of text.

Tymshare markets Augment to Fortune 1000 companies, government agencies, and "anyone who wants to augment professional activity." The system is specifically targeted at professional information workers; it is not a secretarial tool. The cost is based on Tymnet access charges, and averages \$14-\$18/hour, depending on how the buyer uses the system. The special terminal may be leased from Tymshare at \$200/month. Tymshare will also sell the software, for installation on a user's host (a DEC system running TOPS-20).<sup>23</sup>

<sup>23</sup> *Ibid.*

## COMPUTER TELECONFERENCING EQUIPMENT

The equipment required for computer teleconferencing is the same equipment that is used for data processing. Terminals are used that may be as "intelligent" as the user wishes. A portable thermal printing terminal has the same access to the teleconference network as the largest mainframe. The difference is in the amount of user dependence on the network for all computer services. The "dumb" terminal must refer to the computer requests for storage, editing, and other housekeeping functions. The station with local processing, storage, and printing facilities can use its own software on information received from the net. The terminal must have access to communications, via a modem or some other local interface. Systems that access the telephone normally use a modem at 300 or 1200 baud. Locally, resident software can run on a high-speed digital network. Somewhere in the system must be a host computer; its location affects the system's cost and operations, but not its function. Several manufacturers are marketing "briefcase" terminals and other small video display terminals designed for executives. These devices have programmable functions keys to make connections to remote systems easy.

The local loop is the connection to the local hub; it may be a line to a telephone company central office, to a packet network interface, or a local network or other connections to the local host computer. For a remote host, switching is provided by the telephone or packet network link between host and terminal. Packet networks use phone lines efficiently by breaking data into small packets and efficiently routing the information along transmission paths. The transmission paths are telephone lines, satellite links, microwave systems, and the various networks that use them: the phone company itself, or various specialized common carriers, value-added networks (such as packet nets), or private networks. Data is loaded together to form packets, much like products are loaded into the boxcars of a train and routed in a manner to reach the destination in the most efficient and quickest way possible. To enable different types of equipment to "talk" with each other, the packet nets provide protocol translation. The three commercial packet networks are Tymshare—Tymnet, GTE—Telenet, and United Telecommunications—Uninet. AT&T—Information Services and other terminals connect to these nets at hourly rates, which are billed as collect calls to the host, at \$4-\$18/hour, depending on the time of day. For local-resident teleconferencing software, the connecting rate is determined by the local network or host.

### Graphics

The medium has some limitations and barriers to access. The chief limitation, the lack of good graphics, is gradually disappearing. Some

computer teleconferencing packages, such as Augment and Genie, already contain graphics software. Matrix is modular, and it can interface other computer programs (graphics or otherwise) available on the mainframe. In other systems, graphics are stimulated by using alphanumeric characters. Computer teleconferencing software will include graphics, financial modeling, or any other computer activity. With the cost of graphics terminals declining, these programs will fit together as user requirement grows.

### Security

Security is always an issue in systems used by large numbers of people. Teleconferencing folklore is rich with tales of broken security codes, and in some circles not to have penetrated the Advanced Research Projects Agency Network is to lack a required "merit" badge! Security takes on a quixotic aspect in the discussion of systems that are, after all, designed to disseminate information, not restrict it. In Matrix there is a wide range of restrictions available for teleconferences, messages, and personal "padlocks." Even without malice, system malfunctions can result in lost and misdirected data. EIES has a whole teleconference devoted to mishaps involving GTE Telenet, the packet network by which many members access the system. Most are minor inconveniences, but in one case, an EIES member logged on and found himself receiving random packets of data from all over Telenet, an experience never explained by GTE.

User interaction is difficult to control on a network. This does not mean that secrecy is impossible; rather, it depends on the network users and not the host. As yet there are no software programs that censor. And, restricting the allowed interaction of nodes obviously restricts the power of the network. One teleconferencing system, for example, became known as "Gripenet" after some of its members took issue with IBM policy on the VM operating system.

### COSTS

Computer teleconferencing software comes in a variety of packages at a variety of prices. EIES costs rise steeply with each user added, for example, while in other systems the cost per user declines with each new member. After paying for the software, communications costs are approximately \$25 per hour.

Computer teleconferencing costs include the price of a terminal (about \$500), a communications modem (about \$100), and a time-sharing account that includes an initial one-time fee of approximately \$50 and that starts at about \$25 per hour. The cost of the software system for installed, dedicated, in-house use starts at around \$15,000,

and rental prices begin at about \$1,500 per month. For companies that already have hardware in place, teleconferencing makes sense as a way to get more mileage out of terminals, computers, processors, and communications equipment.

The labor cost of using various channels of communications may also be considered. The cost of an average business letter is now \$8.10, up 7.2 percent over the 1981 cost, according to a survey conducted by the Dartnell Institute of Business Research, Chicago. The \$14.22 price per ounce for a business letter makes such correspondence more valuable than silver in today's market. By the same standards, a message sent electronically costs about \$1. The key difference is that with computer teleconferencing, unproductive labor, paper costs, and the sender's time have all been reduced substantially. Another study has calculated the cost of each successful telephone call to be \$12.92, and the cost per 100 calls, all the busy signals, answering machines, "telephone-tag," "out of the office not availables" having been weeded out, to be \$162.67. U.S. companies now spend \$21 billion yearly for travel. It is estimated that 15 percent of it, more than \$3 billion, could be saved by the use of telecommunications and teleconferencing.<sup>24</sup>

Communications charges make up the bulk of computer teleconferencing costs, and these are directly related to the amount of bandwidth necessary for transmission. Because computer teleconferencing systems operate over normal telephone lines at 4kHz, whereas full-motion video teleconferencing requires 6mHz (see the following chart), the transmission costs of computer teleconferencing are comparatively low.

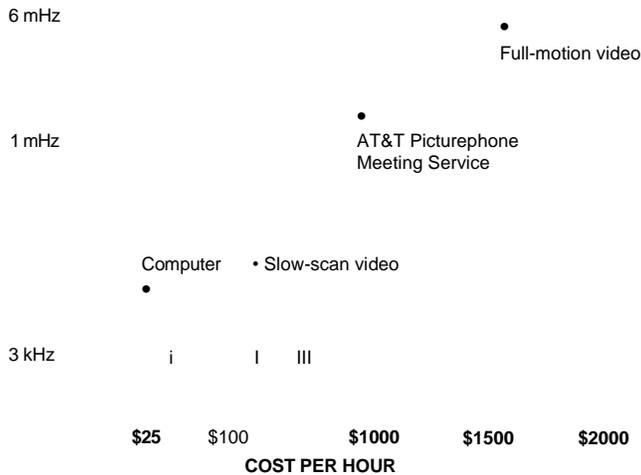


Figure 8-6 Transmission costs of computer teleconferencing.

*\*Ibid.*

## APPLICATIONS

Computer teleconferencing is especially useful for long-term projects, strategic planning and management, crisis management, education, and large-group professional seminars. Some of the successful applications of computer teleconferencing include the following:

- Emisari (the first computer-mediated communication system) was developed to monitor the wage-price crisis in 1971 by the Office of Emergency Preparedness, Executive Office of the President of the United States, and still exists as a "unique form of management information system for crisis management."<sup>25</sup>
- The organizing committee for the annual Office Automation show used Infomedia's Notepad system to integrate the task of putting the show together.
- The Western Behavioral Sciences Institute School (WBSI) of Management and Strategic Studies offers top-level executives a two-year course of study in "strategic thinking" that takes place on-line via

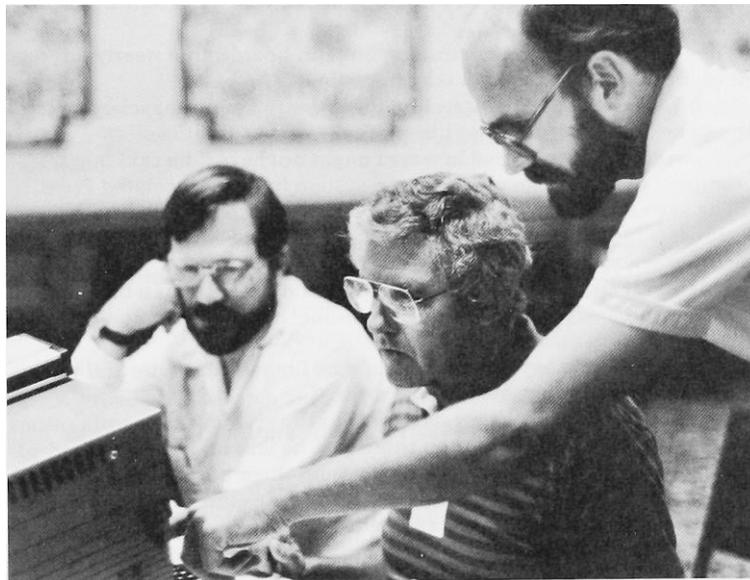


Figure 8-7 Darrell Icenogle, director of Education/Communications Systems at WBSI, instructs Van Andersen, a general manager at Westinghouse, and Gary Ginter, a managing partner of the Chicago Research and Trading Group, in the use of computer teleconferencing. (Courtesy: WBSI)

<sup>25</sup> *Ibid.*

EIES and covers topics such as resource management, political economy, social movements, and environmental issues.

- The Bechtel Corporation uses Notepad on several construction projects.
- The Joint Electron Device Engineering Councils of the IEEE have used the EIES network to develop hardware and software standards for solid-state devices.
- Notepad is used by the Institute of Nuclear Power Operators to coordinate 20 to 25 ongoing separate conferences on various aspects of nuclear plant operation.
- A Michigan lawmaker keeps in touch with his constituency via computer teleconference. (See box.)

**TABLE 8-1 Michigan Lawmaker "Talks" to Constituency via Computer**

Lansing, Mich. (AP)—A Michigan legislator has added a bit of high-technology flash to the routine mailings, speeches and handshakes politicians use to keep in touch with constituents.

Now, state Sen. William Sederburg's constituents who have access to computers can use them to chew him out, applaud his votes, tell him what they think and debate one another.

They do it through an electronic "bulletin board" that nearly anyone with a computer can tap into through telephone lines.

Glen Keeney, 50, a Michigan State University computer science instructor, said the system makes it easy for him to "talk" about politics.

"It has gotten me involved in ways I might not have," he said in a telephone call prompted by a message placed in the system by the Associated Press.

The system, called Political Forum, provides weekly updates on legislative issues, collects requests and confidential messages for Sederburg and lets him conduct non-scientific polls.

Sederburg, an East Lansing Republican, said the system, which he taps into every two or three days from his office or home, has shattered some of his notions about computer users.

"I assumed that they would generally be liberal, futuristic and young," he said. "I was wrong—they're very conservative."

Sometimes, though, the messages left in the system transcend politics.

"One person left a message on there that he was in desperate need of a girlfriend and that if anyone knew anyone, send them his way," said Sederburg, 36, a computer user since 1979. The message was deleted.

The informality, easy access and Sederburg's quick replies—usually within two or three days—have impressed some of the 70 or so people who have left messages.

"It gives us (computer users) more influence than normal," said Joel Dinda, 35, of Lansing, a clerk-typist for the state.

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# GLOSSARY

**Acoustic coupler** A device that converts electrical signals into audio signals, enabling data to be transmitted over the public telephone network via a conventional telephone handset.

**Ad-hoc** Any type of teleconferencing that is set up for a special purpose (as opposed to an electronic network that is in place from day to day) and which takes place on a one-time basis. This activity generally takes place using a point-to-multipoint configuration. Also called "special event" teleconferencing.

**Add-on** A bridging device in a multiline telephone that enables the participant to call one party, place it on hold, call a second party, and then link them for a three-way conversation.

**Affiliate** A broadcast station associated with a particular network.

**Amplified telephone** The term used for a speakerphone that allows the user "hands-free" operation.

**American Telephone and Telegraph (AT&T)** AT&T is composed of AT&T-Communications (AT&T-C), AT&T-Information Systems (AT&T-IS), and AT&T-Technologies (AT&T-T). AT&T-C replaces Long Lines. AT&T-IS is the new name for American Bell. AT&T-IS is financially separate from the rest of the organization. Computer Inquiry II ordered that this marketing unit be separate because this unit is unregulated. The balance of AT&T is regulated. AT&T-T replaces Western Electric.

**Analog** A communications channel or signal that uses a continuous electromagnetic waveform to convey information.

**Asynchronous** The ability to operate in "non-real" time, which allows people to participate independently of one another's schedules, for example, the store-and-forward aspect of electronic and voice mail and computer teleconferencing that

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lets people send and receive messages when they have the time, at their own convenience.

**Audio** Pertaining to sound.

**Audiographics** Audiographic teleconferencing is the transmission of graphic and print information over a narrowband circuit such as a telephone line. Graphics are transmitted in "real time," that is, concurrently with voice transmission.

**Audio teleconferencing** Audio teleconferencing is the use of the telephone or another electronic medium to carry out two-way voice communication among people who are geographically separated. The voices of teleconference participants are transmitted through conventional telephone circuits or by microwave.

**Automatic Call Distribution (ACD)** A device that routes and balances call loads to a large number of telephone operators. Typically, ACD is found in a reservation or telemarketing organization.

**Automatic call distributor (ACD)** A switching system that automatically distributes incoming calls in the sequence in which the calls are received to a centralized group of receivers. It holds calls until a receiver is available.

**Automatic Route Selection (ARS)** The ability of a PBX or similar device to route a call over the least-cost circuit, taking into account the destination, time of call, circuit availability, priority, and other factors.

**Bandwidth** In terms of signal frequency, the range between the lowest and the highest frequencies used in a signal transmitted from one site to another. Bandwidth is a measure of an analog signal and is measured in cycles per second. Contemporary units are Hertz (one cycle equals one Hertz). The difference expressed in cycles per second between the highest and lowest frequencies of a band. Frequency ranges of 3,200 cycles/Hertz per second (the bandwidth of telephone voice transmission) is referred to as narrowband. Wider ranges, *e.g.*, six million cycles per second (the bandwidth of a television channel) are called broadband.

**Baseband** In analog terms, the original bandwidth of a signal from a device, for example, 3 kHz for telephone, 4.5 MHz for television. Also used in digital transmission to describe some local area networks.

**Baud** A data-communication-rate unit used similarly to bits per second (bps) for low-speed data. The rate is the highest number of single elements (bits) that can be transmitted between two devices in one second.

**Bell Labs** The research and development arm of the Bell system, which is now under AT&T-Technologies.

**Bell Operating Companies (BOCs)** The 22 local operating companies divested from AT&T in 1984 and reorganized into 7 regional holding or operating companies. After divestiture these companies are allowed to provide only services and no hardware or terminal equipment.

**Bird** Slang for satellite.

**Bit** An abbreviation of "binary digit," which is a computer term denoting the smallest logical piece of information, a binary digit. Bit values are 1 and 0.

**Bit rate** The rate at which data bits are transmitted over a communication path, typically expressed in bits per second (bps). This should not be confused with the data signaling rate (baud), which measures the rate of signal changes transmitted.

**Bit stream** A continuous series of bits transmitted on a line.

**Bridge** Equipment and techniques that are used to match circuits to one another,

ensuring minimum transmission impairment. Bridging is typically required on multi-point telecommunications channels such as telephone lines.

**Broadband** A communications channel with a large bandwidth or capacity that transmits frequencies of about 3 million cycles per second (Hertz) to about 6 Hertz. Generally, any channel wider than voice grade is considered to be a broadband channel. Also referred to as wideband.

**Broadcast** To send messages or communicate simultaneously with many or all points on a circuit.

**Business telephone instruments** All telephones located on a business premises, including phone sets associated with Centrex, PBX, and Key systems as well as single-line installations.

**Byte** A computer term denoting the number of bits of information representing a character, number, or other digit.

**Cable television (CATV)** A television system that uses a coaxial cable (a cable with a single wire at the center surrounded by an insulator and then another solid or woven copper conductor) to transmit or distribute the TV signal. Most CATV systems have the capability for two-way transmission in addition to broadcast television.

**Carrier** A provider of transmission capabilities available to the general public, sometimes referred to as a "common carrier" or "regulated carrier," as it is regulated by the Federal Communications Commission (FCC) or state commissions.

**Cathode ray tube (CRT) display** The television monitor usually associated with a computer terminal, which displays text, and graphic and visual information.

**Centrex** Service providing a business customer with direct inward dialing to its telephone extensions and direct outward dialing from them. Central office (CO) Centrex switching equipment is provided in the central office and CO Centrex is on the customer's premises.

**Channel** A band of frequencies allocated for communications.

**Character generator** A special-effects generator that electronically produces letters and numbers directly on the television screen or keys them into a background picture.

**Circuit** An electrical connection between electric or electronic components.

**Circuit, four-wire** A communication path in which four wires (two for each direction of transmission) are presented to the data communications equipment. Typical of all leased lines.

**Circuit, two-wire** A metallic circuit formed by two conductors insulated from each other. It is typical of dial-up lines.

**Closed-circuit television** A private system for transmitting television signals.

**Coaxial cable** A metal cable that consists of a conductor and is surrounded by another conductor in the form of a tube that carries broadband signals by guiding high-frequency electromagnetic radiation.

**Codec** The abbreviated form of coder/decoder. It is an electronic device that converts analog signals to digital form and vice versa. A codec is generally made up of a central processing unit (CPU) and memory.

**Common carrier** An organization (such as a telephone operating company) that provides communication services to the general public at nondiscriminatory rates, without control of message content. Such an entity is regulated by a state or federal agency.

**Communicating word processors** Word processors that can transmit and receive document information between one another through the use of telephone channels.

**Communications satellite** A satellite used to receive and retransmit data, including video and audio signals. Communications satellites must be in geostationary, or geosynchronous, orbits that are located 22,300 miles above the equator.

**Compressed video** Video images that are processed to remove redundant information in order to reduce the amount of bandwidth required to send them over a telecommunications channel.

**Computer graphics** Images generated as a result of interaction between a computer and its user. These range from simple token selection and display to manipulations of tokens to the generation of images using an interactive programming language.

**Computer teleconferencing** Interactive group communication via computers that have store-and-forward capabilities to receive, hold, and distribute messages among participants. The teleconferencing participants communicate using keyboards to transmit written messages to one another. Communication may be synchronous, for example, interactive in real time, or asynchronous, for example, messages are stored in a central computer until retrieved by their intended recipients.

**Conference call** A dial-up, operator-assisted telephone call that connects two or more individuals. Conference calls require operators to call out to the participants, but in a "meet me" conference call the participants call into the conference.

**Continuous-presence video** A type of video teleconference that provides simultaneous and continuous pictures of all participants, usually close-range shots of the group that can be viewed on a monitor or large screen.

**Data base** A collection of information with a structure such that various pieces can be accessed in any order or randomly.

**Dedicated lines** Leased telecommunications circuits arranged between two or more (multidrop or multipoint) specific locations.

**Dial tandem network** A private network in which the caller must route him- or herself through the network to his or her destination by dialing a sequence of access codes to string together the correct trunks.

**Dial-up lines** Switched or nondedicated telephone lines available through telephone companies, for example, the public switched telephone network.

**Digital** A method of representing information using a sequence of ones and zeros for storage and interpretation by a computer. In digital transmission, analog signals that are originally in a continuous form are converted to discrete signals of zeros or ones to be transmitted to a receive site, interpreted, and used to reconstruct the original analog signal.

**Digital compression** A process by which a wide bandwidth signal, such as video, is converted to a narrower bandwidth usually by removing redundant or unnecessary information (air). TASI (Time Assigned Speech Interpolation), for example, removes the air in pauses and between conversations to compress audio signals.

**Digital video** A television system that transmits video information as a digital signal (ones or zeros like a digital watch) in place of the original analog signal (waveform or like a traditional watch with hands).

**Digital voice** The digital representation of an analog voice signal. The present standard sampling rate is 64,000 times a second.

**Diplexer** Combines two signal transmissions over one line without mixing.

**Direct distance dialing (DDD)** The North American telephone dial system. The

accessing of telephones tied to the public switched network through the use of an area code (NPA), exchange (NNX), and local telephone number. DDD, which is the same as message telecommunications service (MTS), differs from WATS in that with DDD the user receives an itemized accounting of each call, whereas with WATS there is no accounting.

**Disk (disc)** A recordlike, magnetic-coated piece of material that can store digital information. It can be either a hard disk or a floppy disk.

**Disk storage system** A magnetic device that stores voice, video, or other originally analog information in either analog or digital form. Usually used to refer to digital storage devices that use flat platters that rotate and allow access through the use of a stylus similar to that of a normal record player.

**Distance sensitive** A term used to describe the situation in which the transmission costs of a signal are directly related to the distance which the signal travels.

**Distributed data processing (DDP)** A term used to describe a particular computer configuration where at each distant location there is a computer that then talks to the central or home computer.

**Document transmission** The electronic transmission of information shown on the surface of a flat document. Often referred to as facsimile, as the original document stays in one location while a facsimile of that document is printed at the receive sites. Also includes high-speed document scanners that are used in video conferencing rooms.

**Earth station (terminal)** Ground equipment used for reception and/or transmission of signals to and from a satellite.

**Electronic blackboard** An audiographic system used for sending written messages over a normal telephone line. As the sender writes on a normal-looking chalkboard, the writing appears at the distant location on a television monitor. Used by AT&T-IS for its Gemini 100 product.

**Electronic mail** A system of electronic communication in which written messages are entered through a keyboard and distributed to individuals or groups subscribing to the service. Messages are generally stored on a computer and forwarded to recipients when they request messages through the use of a data terminal or other keyboard device.

**Electronic slate/tablet** An audiographic teleconferencing device that utilizes a special surface and stylus or electronic pen for producing graphic images at the origination site that are then transmitted via normal telephone lines to the receive sites.

**Encryption** A system for coding or scrambling signals for signal security.

**End loop** A communications circuit that extends from the customer to the local switching center, which is also referred to as the "last mile."

**Ergonomics** Consideration of human factors in the design of a machine to achieve a "user friendly" human-machine interface.

**Face to face** The generally accepted meeting format where all parties are physically in the same place at the same time.

**Facsimile** A device that electronically transmits written or printed information. Generally used to convey images (facsimiles) of typewritten forms, printed figures, or hand-drawn diagrams to other sites participating in a teleconference. At the receive site, the image is reproduced on a sheet of paper. Transmitted images are high-contrast monochrome. Facsimile devices are commonly referred to as fax, telecopiers, or datafax.

**Fiber optics** A laser-based communications medium that uses a fiber, or threadlike material, that carries light.

**Footprint** The area on earth within which a satellite's signal can be received.

**Foreign exchange (FX)** A service by which a telephone or PBX in one city is directly connected to a Central Office (CO) in a distant city via a private line instead of being connected directly to a central office in that city. To callers, it appears that the telephone or PBX is actually located in the distant city.

**Freeze-frame video** See slow-scan video.

**Frequency** The rate at which a current alternates on a telecommunications medium, measured in Hertz (cycles per second).

**Frequency division multiple access (FDMA)** An access method to a common channel by a population of communicating devices that allocates a portion of the capacity of the channel on a pair-by-pair basis using frequency division multiplexing (FDM).

**Frequency division multiplex (FDM)** A modulation technique that divides the total capacity of a communication media into channels, with each channel assigned a specific frequency band.

**Full-duplex** A telecommunications channel that allows both transmission and reception in two directions at the same time, for example, a four-wire circuit.

**Full-motion video** Provides interactive group communications through the use of continuous motion television images, although they are not necessarily of broadcast quality (6 megaHertz). Some systems operate at 3 megaHertz, 1.544 megabits per second, or less.

**GigaHertz** One billion cycles per second. Abbreviated GHz.

**Half-duplex** A communications channel, for example, a two-wire circuit, over which both transmission and reception are possible but in one direction only at one time.

**Hard copy** Data or information printed on paper copy.

**Hardware** Any of the components of a system that have a physical substance as opposed to software (which is analogous to "music" for the piano).

**Hertz (Hz)** Named after Heinrich Rudolph Hertz, a German physicist. A measure of frequency, one cycle or complete oscillation of a radio waveform per second. A unit of frequency equal to one cycle per second or (CPS). 1 kHz = 1,000 CPS, 1 mHz = 1 megaHertz or 1,000,000 CPS.

**High-resolution graphics** A system that provides a greater resolution than the standard 525-line video image and typically refers to a system with a resolution of 1,000 lines.

**Information resource management (IRM)** A term generally used to describe an organizational structure and a "high-tech" approach to managing new technology.

**Integrated services digital network (ISDN)** A digital telecommunications channel that allows integrated voice, video, and data transmission.

**Interactive media** Telecommunications channels that allow two-way exchange of information.

**Interactive telecommunications** Applications involving either two-way, person-to-person interaction through an electronic medium, or if there is no person-to-person interaction, user-initiated communication.

**Interface** A component that acts as a translator between circuits and other components of a system or other systems.

**IXC** Inter- or intra-exchange carrier. A term used to describe a telephone or telecommunications company providing voice, data, or image communications between LATAs or local access transport area. In other words, a new term for a telephone company.

**Key system** A local telephone system in a small office complex or home providing immediate access to all users by pressing one or two keys. All users may obtain access to lines on the public network and may communicate with each other without the services of an operator.

**Key telephone** Multiline telephone designed to provide pushbutton selection of a specific line from several incoming lines.

**Kilobyte** One thousand bytes of digital information.

**Kilocycle** One thousand Hertz or cycles per second.

**KiloHertz (kHz)** One thousand Hertz (cycles per second).

**Land lines** Transmission channel that does not utilize satellite technology. This may be a telephone company copper circuit (local loop or local area network) or short-link microwave.

**LATA** Local access and transport area. A term used to describe a telephone calling area after the AT&T divestiture. BOCs are allowed to operate only within a LATA while AT&T and the other common carriers are allowed to operate between LATAs.

**Least cost routing** See Automatic route selection.

**Light pen** A pen that contains a photosensitive cell and small aperture lens that produces or detects an electronic signal in audiographic teleconferencing.

**Long Lines** See AT&T-Communications (AT&T-C).

**Main station line** A telephone instrument connected directly to the central office and having its own unique telephone number.

**Meet-me bridge** A type of telephone bridge that can be accessed directly by calling a certain access number. All members of the conference dial the same number and are "bridged" together.

**Megabyte** One million bytes of digital information.

**MegaHertz (mHz)** One million Hertz or cycles per second.

**Menu** A list of functions that can be selected on a computer system.

**Message telecommunications service (MTS)** FCC term for long-distance telephone calling.

**Microcomputer** A computer that uses a microprocessor chip (integrated circuit) as its central processing unit.

**Microprocessor** An integrated circuit using semiconductor technology that incorporates all the elements for performing arithmetical operations and manipulating data.

**Microwave** The electromagnetic transmission of audio, video, or data communications at high radio frequencies. A clear line of sight is required from transmitter to receiver.

**Modem** An abbreviation for modulator/demodulator. It is a device used to accept digital signals and add them onto, or modulate them on, analog signals for transmission between sites via telephone lines. A modem acts not only to convert digital signals to be transmitted in analog form but also to demodulate the signals.

**Modulation** The process of adding information in the form of an analog signal to

an existing signal carried by a transmission medium. The added signal effectively "rides along" the transmission signal.

**Multi-to-single** Transmission of signals from a number of sites to a single location.

**Narrowband channel** A narrowband facility or normal telephone line, by definition, handles a bandwidth of 20 kHz or less. Generally refers to a telephone circuit capable of handling 3000 Hertz.

**Network** An interconnected and coordinated system of geographically dispersed communications devices (terminals) so that signal transmission to or among any of the devices is practical and reliable.

**Off-line** Not connected to a central computer, or using a personal computer without being connected to a host mainframe computer or distance computer system.

**Off-premise extension (OPX)** A telephone number from a PBX or Centrex system generally located away from the main building location.

**On-line** A term derived from the computer industry that means to be in direct communication with a central computer. Used commonly in computer teleconferencing to indicate that a site is active and that participants are able to receive and/or transmit during a teleconference.

**Open microphone** An active microphone that detects and transmits sound on a continuous basis.

**Original equipment manufacturer (OEM)** A term used to describe the manufacturer who created the product regardless of whose name is on the product.

**Other common carrier (OCC)** A term generally used to describe telephone service companies other than AT&T but now includes AT&T. See SCC.

**Packet switching** A communications network technique that divides the data traffic into small packets or boxcars, each of which has a maximum length. Also a technique, usually digital, in which input information—voice or data—is broken into short "packets" allowing high-capacity, high-speed transmission.

**PCM** A pulse modulation technique in which sample pulses of varied amplitudes from the baseband signal are converted at regular intervals to a digital code to represent the absolute amplitude of each pulse.

**Picture element (pixel)** One of the many dots that comprise a television picture.

**Plotter** A computer output device that draws lines and curves on paper.

**Point-to-multipoint** A telecommunications configuration that allows information to be communicated from one point to many. There is typically a single transmitting site and many receiving sites that are located independently of one another.

**Point-to-point** A telecommunications configuration that allows only two sites to communicate with one another.

**Port** A circuit in an electronic network for the input or output of signals.

**Press-to-talk microphone** A microphone that is activated by depressing a bar or button.

**Private branch exchange (PBX)** Small local office telephone system connecting telephone extensions in a business complex and providing access to the public network. Also known as EPABX, or electronic private automatic branch exchange. The term CBX is generally used for nonmechanical or computerized or digital electronic systems.

**Real time** A simultaneous occurrence regardless of location and time. The immediate connection of all participants.

**Scan converter** A device used in slow-scan video that converts video frequency signals to audio frequencies and vice versa.

**Signal security** Scrambling or coding of signals to block electronic eavesdropping. Also known as encryption.

**Single-line installation** A PBX or key system directly connected to the telephone network, as opposed to an "extension" or key system located behind a PBX or Centrex system.

**Slow-scan video (SSTV)** Telecommunications via a device that transmits and/or receives still-video pictures over a narrowband or mediumband telecommunications channel. Also called freeze-frame video.

**Software** Custom or packaged, produced as either data, video, or audio cassette that contains information that can be presented or processed.

**Speakerphone** An amplified telephone, allowing "hands-free" use.

**Specialized common carrier (SCC)** A term used to describe long-distance suppliers other than Bell.

**Speed dialing** A device that can be programmed automatically to dial telephone calls by simply dialing a single or double digit. Station speed dialing is accomplished at the telephone set, whereas system-wide speed dialing is provided by the PBX or telephone equipment.

**Station message detail recording (SMDR)** Provides a record of the calling station or attendant number, starting time, call duration, all digits of the called number and the specific trunk or trunk group used for outgoing calls. Different manufacturers take various approaches to providing this service, and may or may not include a terminal device for printouts or a processing service to manipulate the recorded data in order to produce a variety of management reports and summaries. In almost all cases, this data is accumulated on magnetic tape or similar storage medium; however, a few systems bypass any storage steps and provide a line printer for a written record of outgoing calls as they occur.

**Still frame** A slow-scan video image similar to one slide.

**Switched network** A network that allows any site connected to it to communicate with any other site connected to the same network. The public toll telephone network or message telecommunications systems (MTS) is referred to as the "public switched network."

**System** Refers to an entire PBX, key, or Centrex installation, including all individual telephone instruments, wire, cable, and common equipment (switch for PBX and main distribution frame for key).

**T-1 carrier** A method of multiplexing or combining 24 voice signals together for long-distance transmission purposes. The speed of this U.S. digital transmission is 1,544,000 bits per second. Using T-1 can reduce long distance carrier charges and provide for end-to-end digital transmission.

**Telecommunications** Communications over distance using electronic means. The different types of telecommunications channels include twisted pair telephone lines, coaxial cable, microwave, satellite, and fiber optic cable.

**Teleconferencing** The use of an electronic medium to communicate interactively by individuals or groups who are located remotely from one another for the purpose of conferring with one another.

**Telecopier** See Facsimile.

**Telemeeting** Generic term used to describe electronic communications among three or more people at two or more locations.

- Telemetry** A means of remote-device control or monitoring.
- Teletext** A broadcasting service using several otherwise unused scanning lines between frames of television pictures to transmit information from a central data base to receiving television sets.
- Terminal** Any device capable of sending and/or receiving information over a communications channel.
- Tieline (tie trunk)** A trunk between two PBXs that permits extension in one PBX to be connected to extensions on the other PBX.
- Time division multiple access (TDMA)** An accessing technique that allows separate communications sources to share the same telecommunications channel. Each user site has a time slot allocated during which data for that site may be transmitted or received.
- Time division multiplexing (TDM)** The complement of time division multiple access. The technique by which data from several sources can be sent via the same telecommunications channel by allocating a time slot for each sending source. Other systems provide for space or frequency division multiplexing.
- Time-shared computer** A computer system that provides multiuser access at a rapid rate under control of the computer operating system.
- Transmission line** The means by which a signal is sent and received.
- Transponder** Device on a satellite that receives signals from an earth station, amplifies them, and then transmits them to earth. Commercial satellites now in use are equipped with either 12 or 24 transponders, each of which can handle one television signal or about 600 two-way audio signals.
- Transportable earth station** A fully mobile unit capable of sending signals to and receiving signals from a satellite.
- Tum-key supplier** A vendor or contractor that supplies all components and installation services required for an operational teleconferencing system.
- TVRO** Television receive-only earth station.
- Two-wire circuit** A telephone circuit that is typically used between a central office and a customer's premises that takes both the send and receive signals on a single pair of wires.
- Uniform call distribution (UCD)** See Automatic call distribution.
- Videodisc** A hard disc that stores audio and video information and provides up to approximately 50,000 frames of information to be stored and retrieved.
- Video teleconferencing** Full-motion video communications using broadband technology.
- Voice actuated** The ability of a piece of equipment to become activated in response to the sound of a voice.
- Voice grade channel** A telephone circuit that carries signals in the voice frequency range of 300 to 3,000 Hertz.
- Voice grade line** A communications circuit that generally delivers 3-4 kHz of analog bandwidth. Typically used for telephone conversations or graphic or data communications devices requiring narrowband circuits.
- Voice-switched microphone** A microphone that generally allows only one person to speak at a time and that is activated by sound.
- Western Electric** See AT&T-Technologies (AT&T-T).
- Wide Area Telecommunications Service (WATS line)** An offering by AT&T Communications whereby a discount rate is offered on long-distance charges to users for not receiving the billing of each telephone call.

**Wideband** Typically used to describe a signal that has a bandwidth of 20 kHz or more. When used in describing switches, typically implies a system capable of switching circuits at 4 kHz or higher.

**Word processor** A dedicated device, or a software package on a computer, that allows sophisticated text editing of documents stored on an electronic medium, such as a floppy or hard disc.

**Work station** A location at which an individual works; generally used to denote electronic, usually computer-linked, devices that an individual uses in the course of his or her job, in an automated office setting.

**X.25 capability** A data communications interface protocol that lets data transfer to outside communications networks or packet-switching systems without further translation.

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