

# **TELECONFERENCING TECHNOLOGY and APPLICATIONS**



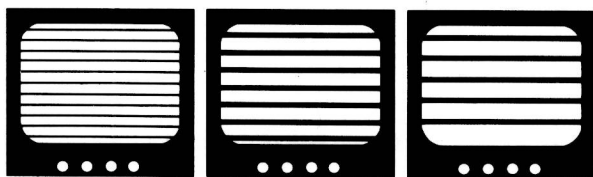
**Christine H. Olgren  
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610 Washington Street  
Dedham, MA**

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**International Standard Book Number: 08-89006-119-X**

**Library of Congress Catalog Card Number: 83-070175**

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TECHNOLOGY  
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*This book is dedicated  
to all the pioneers in teleconferencing*

## **Acknowledgments**

This book is really the result of years of endeavor, not only by the authors, but by the dedicated individuals operating teleconferencing systems, vendors, and participants who make it happen.

To their effort, creativity, and commitment, we are most indebted. To our friends and colleagues in the teleconferencing movement who have had much to do with this work, our sincere thanks.

In the course of learning about and discussing the teleconferencing systems described in this book, a great many people were contacted. Some of the selected case study applications are based on on-site visits by Anna Zornosa, who served as project assistant with the Center for Interactive Programs, and we would like to thank Kevin McNamara, a former CIP project assistant, for his efforts in compiling information on the early history of teleconferencing.

We hope, of course, that the information produced will be of interest to people who are involved in the many teleconferencing applications discussed in this book and, perhaps, even encourage further development of teleconferencing in their own organizations as well as by others.

We would also like to express our appreciation to our fellow researchers, teleconference users, and others, in the field. These include: Charles Wedemeyer, Martin Elton, Brian Champness, Don McNeil, Al Fredette, Thomas Meyer, Dick Hanson, Christopher Stockbridge, Bill Watts, Doug Kroger, Henry Hanson, Robert Zickau, John Daniel, Kathy Hansell, Richard Harkness, Jerry Powers, Daryl Braun, Glen Southworth, Robert Johansen, Elizabeth Young, Thomas Hoff, Samuel Fordyce, Roger Pye, and Edryn Williams.

A special thanks for the support from our Wisconsin colleagues, Marcia Baird, Mavis Monson, and Dennis Gilbertson.

Project support and encouragement were provided by Diane Chalgren and typing was admirably done by Cindy Arneson.

To all of these individuals and groups, our thanks.



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## **Chapter One — Introduction: Teleconferencing as a Communications Tool**

### **1.1 Its Place in a Changing Environment**

People's ability to progress culturally is linked to their ability to expand human potential through new technology. An area that is rapidly advancing today is telecommunications. This book looks mainly at one segment of the industry — teleconferencing. It examines where the technology is at present, how it is being applied, and the major trends shaping its future. It positions perceived benefits against possible barriers to growth. Ultimately, it asks: "What is the potential of teleconferencing to help people become more efficient, more productive, and more effective?"

The term "teleconferencing" refers to two-way electronic communications between two or more groups, or three or more individuals, who are in separate locations. In order to interconnect people, teleconferencing systems use telecommunications channels that range from regular telephone lines to satellite links. The only requirement is that the medium be interactive, giving people at each location the opportunity to actively participate in the meeting.

Teleconferencing is usually thought of as a new industry. In many ways it is. Although its roots — the first applications — go back to the 1930s, it has only recently been discovered, or rediscovered, by a broader public. Its emergence on a wider scale is based on the coupling of two major factors: better teleconferencing technologies and

the socioeconomic climate of our time. Teleconferencing appears to answer many of today's problems: productivity, communications, information management, decision-making, continuing education, and travel and energy costs.

In a broad context, the driving force is change. The world is changing at an unprecedented rate, affecting the structure of our societies and the way we live and work. Call it the Information Age, Global Village, Computerized Society, Wired Nation, or Third Wave, the basic premise is the same. We are rapidly moving into a new era.

Change is bringing with it a need to readjust our traditional approaches to business, education, and government. It also demands new responses to new challenges: an international marketplace with expanding competition; volatile economies on a global scale; the exponential growth of information; the rapid obsolescence of knowledge and skills; the shift to an information and service economy; the quickening pace of technological developments and computerization; shrinking supplies of traditional energy resources; and the need for rapid communications on a worldwide basis.

Like other aspects of society, teleconferencing is in transition. It is an industry marked by new technologies, new applications, and new suppliers. Interest in teleconferencing has increased dramatically in the past two years. Spurred by socioeconomic changes, many organizations are assessing and/or implementing teleconferencing as a management tool.

Better technology is another factor drawing people to teleconferencing. Recent developments include improved equipment, more options in satellite and terrestrial channels, and the introduction of digital devices like video compression codecs. Teleconferencing is also part of the trend to extended networks that integrate information processing and communications in the automated office.

In addition, we are seeing a more competitive teleconferencing industry as new vendors enter the market. The result is not only an increase in teleconferencing products but also more companies that provide services, turn-key systems, integrated room designs, and consulting.

There is no doubt that teleconferencing has changed markedly in the past two or three years. Market projections say the industry will grow 16-fold to an \$8.6 billion market by 1990 [Strategic, 1981]. Some people share the optimism and hop aboard the bandwagon. Others look at the history of teleconferencing, with its past mistakes, and

express skepticism about its future. Much of that skepticism centers around human factors. The technologies may be advanced, but can people apply them effectively? Beyond the technology, what factors are critical to successful applications?

The implementation of teleconferencing also brings change. Changes in the way people communicate, learn, do business, access information, make decisions, and relate to others. It affects the organization and the individual. The future of teleconferencing depends not only on the technology, but also on how people respond to it and how it is integrated into the infrastructure of our organizations.

It is time to take a close look at teleconferencing. It is time to assess the technologies, the applications, and the major trends. We need to identify where teleconferencing is today and where it may be going. We also need to place teleconferencing within a broader context that includes driving forces, human factors, and possible barriers to growth.

This book attempts to provide some answers. We hope that it also raises questions which will motivate further exploration into the dynamics of teleconferencing. In many ways, today's applications are pioneering efforts. There is still much to learn.

In mapping the teleconferencing territory, we take a logical progression by beginning with the general and then following specific threads in more detail. To set the stage, Chapter 2 presents a brief overview of the major forms of teleconferencing and general applications.

To provide additional background, Chapter 3 looks at the perceived benefits of teleconferencing and how they mesh with "driving forces" — those factors that appear to be promoting the adoption of teleconferencing. These include developments in technologies, products, and services. It also summarizes some of the recent market projections of future growth.

The optimistic view painted in Chapter 3 is balanced by some sobering thoughts about possible barriers to growth in Chapter 4. It discusses the importance of several factors that must be incorporated into user applications if the field is to achieve its potential. These include the broad area of human factors — ergonomics, training, operational procedures, and other considerations.

To present more detail on the status of today's applications, Chapter 5 summarizes the results of a survey of teleconferencing users con-

ducted in 1981 by the Center for Interactive Programs, University of Wisconsin-Extension.

Chapters 6, 7, and 8 discuss in detail the primary forms of teleconferencing — audio, audiographics, and video. Included are system options, costs, technical parameters, research on effectiveness, and meeting behaviors as well as a number of case study applications in business, education, and government.

Chapter 9 gives an overview of computer conferencing as the fourth major form of teleconferencing, and Chapter 10 briefly summarizes some of the major issues and future trends in the field.

## **1.2 Teleconferencing Wisconsin Style**

### **1.2.1 ETN**

The University of Wisconsin-Extension Educational Telephone Network (ETN) is currently the largest, most sophisticated telephone-based educational delivery system in the United States. It started in 1965 with 18 listening sites around the state. The listeners might hear the lecture quite clearly one minute, then hear nothing but static the next. While it was up to the telephone company to work out the technical bugs, it was up to the ETN staff headquartered in Madison and the UW-Extension faculty to work out the program details.

The first program was a seminar for physicians, a group that needed classes in order to keep up with the latest medical knowledge, but could not afford the time to travel far from their patients. This first class was a success, and ETN was on its way. The next year, three new health programs were scheduled and the decision was made to start programs for other professionals. Lawyers, for instance, attended ETN noon lectures while they ate their sack lunches. Over the years, they have had one of the highest turnouts of any group — about 500 per program.

Soon programs were offered for the general public as well as professionals. These programs included law for the laymen, a course on venereal disease, a discussion of the effect of TV violence on children, and another on how to become a better homemaker. Most classes are non-credit, although some credit courses are offered each semester.

In recent years, ETN classes have even been offered in photography and music. In photo fundamentals, for example, students mail their

class assignments to their instructor who critiques and returns them.

Music was harder to adapt to the system, since it requires a higher level of sound quality than a lecture. The test came in the spring of 1973 with a forum for piano teachers. Artists from as far away as Texas and New York performed via the telephone lines and listeners were surprised at almost concert hall quality sound. Teachers demanded an encore, and music programs have been offered every year since then.

Today, as the Wisconsin ETN celebrates its seventeenth anniversary, there are over 2,000 program sessions offered each year to more than 35,000 students. Each of the 200 individual locations is equipped with Darome Edu-Com speakers and four microphones connected to a standard telephone facility.

To accommodate other locations and programs, a "meet-me" teleconferencing bridge was installed in 1978 to link 20 sites via direct-dial telephone calls. The ETN and meet-me systems are also used for administrative and staff meetings in addition to educational programs.

### 1.2.2 SEEN

A new dimension was added to the ETN idea in 1969, when images were first transmitted along with the telephone lecture. In fact, an additional system was designed, called SEEN, or the Statewide Extension Education Network. With the first generation of SEEN equipment, the images appeared on a screen at the listening site at the same time that the lecturer drew them on an electrowriter. SEEN made it possible for UW-Extension faculty to teach calculus, for example, because they could transmit equations and formulas.

The electrowriter was retired in 1982 when the university launched the world's largest dedicated freeze-frame videoconferencing network.

Through the use of leased telephone lines (making a private, or dedicated, network), SEEN students and instructors can communicate with each other while viewing visual material designed by the instructor.

Freeze-frame equipment, which is also referred to as slow-scan, gives an instructor more flexibility and a broader use of visual materials. Using a standard closed-circuit television camera, still images of

objects, photographs, slides and schematics, for example, are transmitted over a telephone line to a black-and-white television monitor in the classroom.

The videoconferencing system also facilitates administrative meetings, which often deal with budget and planning issues. With the new equipment, UW-Extension administrators can show visual information such as charts and graphs to supplement the discussion.

An additional feature is the unit's two-frame memory capability. The instructor can send two messages, or frames, to the remote site; one is held in storage while the other is displayed. Instead of the usual 30-second delay in transmitting frames, the instructor can show the second frame immediately after the first or switch between the two. A third frame can also be sent to replace the first.

The success of teleconferencing in Wisconsin, in general, is based on an early recognition that effective applications are the result of a good technical system and creative planning for the human factors. Training, marketing, support services, public relations, and working with site coordinators and users are viewed as integral components of system operation. For example, extensive training materials on teleconference techniques have been developed, based on user experience and appropriate research in other disciplines. They range from simple pamphlets to videotapes and day-long workshops that provide a flexible approach to training. Training is also viewed as a tool to increase acceptance of teleconferencing and to promote its use.

As a leader in teleconferencing since 1965, the University of Wisconsin-Extension continues to examine new developments in the field, including advances in technology and system options, research, training techniques, software design, and other issues affecting applications.

## **Chapter Two — Technologies and Applications: The General Picture**

### **2.1 Major Forms of Teleconferencing**

In general, there are four major forms of teleconferencing: audio, audiographics, video, and computer conferencing. These four methods differ in complexity and cost but have several factors in common:

1. They use some type of telecommunications channel and technology;
2. They link individuals or groups of people at multiple locations;
3. They are interactive, providing two-way communication;
4. They are dynamic and live, involving the active participation of people.

Beyond these factors, which contribute to a shared definition of teleconferencing, the methods begin to diverge and take on unique qualities. Each type of system is described in detail in later chapters. Here, we give only an overview to set the stage.

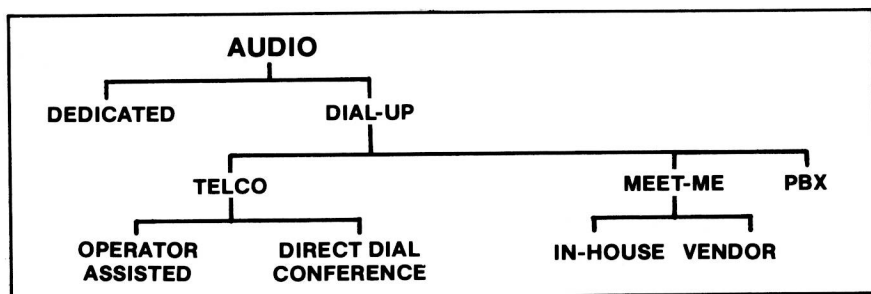
#### **2.1.1 Audio Teleconferencing**

Audio teleconferencing is voice-only communication. It links people in remote locations via ordinary telephone lines. Audio systems include telephone conference calls as well as more sophisticated systems that connect multiple locations — from a handful to over 200 — via a central bridge that ties all the lines together.

Although audio teleconferencing lacks a visual dimension, it has some major strengths in its favor:

1. It uses a readily available and familiar technology — the telephone;
2. There are about 400,000,000 telephones in the world that can be used for audio conferences;
3. Conferences can be set up on short notice and with less planning than other forms of teleconferencing;
4. It is relatively inexpensive to use;
5. It can interconnect large numbers of locations for a meeting.

There are a variety of approaches that one can take to establish an audio teleconference.



*Fig. 2-1*

A dedicated network is one in which locations are permanently wired together via leased telephone lines. These systems tend to be large, averaging 25 sites or more, and the sound quality is generally better than dial-up conferences. They may connect ordinary rooms, or the rooms may be specially designed for teleconferencing.

Dial-up teleconferences use what is known as the public switched network, also called POTS — plain ol' telephone system. This is the network we use when we pick up the telephone to call Grandmother on her birthday. It is the network that connects those 400 million telephones around the world.

Most people are familiar with the telephone conference call that is operator-assisted. You dial "O" and ask for the conference operator. You then give the names and phone numbers of the participants and the date and the time of the call. The operator notifies each participant and, when the time for the meeting arrives, calls each individual one at a time to interconnect them. While this system works for



a small number of locations, such as six or eight, several difficulties arise when the number increases. It takes more time to get everyone on-line, causing waiting periods for those contacted first; noise levels also increase as more sites are added; and, people need to be at a predetermined telephone number in order to be reached by the operator.

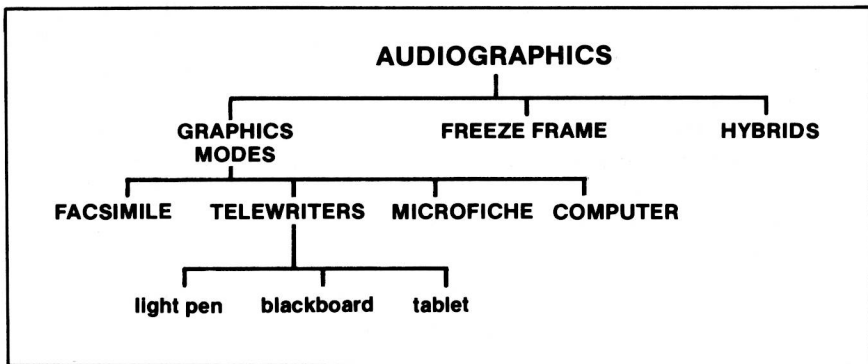
For these and other reasons, several private companies began to offer a new type of service a few years ago called "meet-me" teleconferencing.

In meet-me conferences, each participant calls a conferencing center. If everyone calls in promptly, a large number of locations can be interconnected and ready to conference in five minutes or less. Because participants initiate the call, it means they can be at any convenient location. This gives people the flexibility to move around, a factor especially beneficial for sales representatives, for example. Meet-me conferences also control noise levels for better audio quality.

An audio teleconferencing option that is being tested by Northwestern Bell in Minnesota is the Direct Dial Conference. With this system, a person can set up his or her own telephone conference through the use of a touch-tone telephone. This system may become available in other cities in the near future.

### 2.1.2 Audiographics

Information other than speech can be sent over telephone lines. This includes an array of audiographics systems that can be used in combination with audio teleconferencing to provide written and



*Fig. 2-2*