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Rural school administrators' perspectives about problems and barriers regarding the utilization of computer conferencing

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The Ohio State University, 1990
RURAL SCHOOL ADMINISTRATORS' PERSPECTIVES ABOUT PROBLEMS AND BARRIERS REGARDING THE UTILIZATION OF COMPUTER CONFERENCING

DISSertation
Presented in Partial Fulfillment of the Requirements for
The Degree Doctor of Philosophy in the Graduate School of the Ohio State University

By

The Ohio State University

1990

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To my wife Shirley
and my children
Lynne, Larry, and Annette
ACKNOWLEDGMENTS

I am indebted to many people for their assistance and support during the past two years. These years have been filled with personal growth that has provided opportunities for redirection of lifetime goals and for involvement with many outstanding educators.

It is appropriate to acknowledge those who have contributed significantly to my educational growth. Sincere thanks are expressed to Dr. L. H. Newcomb and Dr. A. J. Miller for their advise and guidance. Their wisdom and integrity have been most appreciated. I am also grateful to Dr. Steven R. Acker, Dr. N. L. McCaslin, and Dr. Dewey A. Adams for their knowledge, teaching, and counsel. I would like to thank Dr. Larry R. Whiting for serving on my general examination committee. I am appreciative of all the time and effort put forth by Dr. Robert E. Norton. He provided the opportunity for me to be involved with computer conferencing activities at the National Center on Education and Training for Employment of The Ohio State University. Also, I wish to thank Dr. Ray R. Ryan and Dr. Chester O. Hansen for administrating the opportunity for me to study under the auspices of the Robert E. Taylor graduate fellowship.

I wish to express a very sincere thanks to Dr. George D. Dean for being an exemplary mentor. He was always available and willing to discuss the routines and matters of graduate study. I am deeply appreciative to my wife, Shirley, for her time and patience given while this dissertation was being developed. I am also grateful to my daughter, Lynne, for her invaluable proofreading skills. Finally, I am obliged to my entire family. They all have given love, support, encouragement, and understanding throughout this educational venture.
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CHAPTER I
INTRODUCTION

Futurists predict that the education systems of tomorrow will be drastically different from those of today. They forecast that current information about teaching and learning will proliferate and will be used more effectively because of educational technology and telecommunications. However, they add that it might take a century to bring to bear the applications of the knowledge base that is now in its genesis stage. After all, they emphasize, it took a century for our nation to develop a super highway and transportation infrastructure to support the automobile industry that evolved concurrently (English, 1989; Nickerson, 1988; Taub and Sullivan, 1987).

Whether Americans lead the world in this educational transformation or play "catch-up" with more enterprising cultures will in large measure determine whether the United States will continue to have a leadership role in the ever more competitive world of the 21st century (Perelman, 1988; Berger, 1989). Troxel and Grady (1989) write that it is ironic that a nation which leads the world in technology does not fully employ the same technology to provide for the intellectual development of its young. This phenomenon is of grave concern to business and industry leaders who are unable to acquire an adequately educated pool of employees to fill their work force needs (Perry, 1989). They place a strong emphasis on utilizing new communication technologies to help revitalize the schools toward educational productivity. This concern has been communicated through their associations' political connections with the National Governors' Association (Kolberg, 1988; Alexander, 1986).
The 1989 Presidential summit on education held with state governors concluded with recommendations that American schools need, among other things, to update education. (Miller, 1989; Some points to make, 1990). The National School Boards Association has been building an educational technology network for the past four years in order to meet this need. (Perelman, 1987; 1988). Regional and multi-state cooperatives are organizing networks to help public agencies, such as schools, to coordinate properly the use of existing telecommunication infrastructures among member states (Johnstone, 1990; Bruder, 1989).

National administrative associations, although deeply interested in the educational state of affairs, are suggesting caution rather than expedient implementation and utilization of telecommunications to "revitalize" or "restructure" American schools (Lewis, 1989; Walberg and Lane, 1989). Congress is currently preparing several major pieces of legislation to provide financial resources for educational technology and staff development in our nation's schools (Knauth, 1989; West, 1989). The federal initiative for regional development, known as Star School project, has granted funds to help isolated, rural schools on a multi-state basis and stimulated a national interest in telecommunications for distance education (Bruder, 1989).

Background of the Problem

State departments of education, according to Hixon and Jones (1990), are increasing policy and planning activities as implementation of distance learning technologies are on the increase. National expectations put pressure on school leaders to transform their operations by fully utilizing educational technology and telecommunications (Bruder, 1988; West, 1989). For example, the Western Cooperative for Educational Telecommunications (1989) was organized to help solve problems and create advantages in this regard for 14 western states. The most isolated, rural school districts in the nation are potential members. The cooperative
leadership, currently made up of university and state agency professionals, is laying plans to develop the capacity and advantages inherent in the following four procedures:

1. The opportunity to participate in deliberations or negotiations regarding national policy and regulatory issues involving educational telecommunication technologies.

2. The opportunity to equip such local educational agencies with multi-state technology connections and have representation in national telecommunication networks.

3. The opportunity to be part of a leadership group that is planning to coordinate sharing of educational telecommunication services.

4. The opportunity to have knowledgeable facilitators who can disseminate educational technology information. This will help provide related staff development services to increase their school's capacity to deliver educational telecommunication services in rural areas.

Concurrently, approximately 90 percent of the isolated, rural schools are not involved in these types of endeavors. The literature, however, suggests that a majority of educational leaders in these isolated, rural schools are desirous of taking advantage of such opportunities to restructure and revitalize their school systems. They also view telecommunication technologies as a way to replicate or create unique solutions to solve access and equity issues and are seeking ways to fully utilize telecommunication technologies (Bruder, 1989; Kurshan, 1988; U. S. Office of Technology Assessment, 1989; West, 1989).

Statement of the Problem

Rural schools and communities in isolated areas traditionally have had neither accessible nor equitable information services, as have their counterparts in urban and metropolitan areas. This no longer has to be the case, because technology has made it possible to alleviate this type of isolation. Telecommunications, particularly the
computer-mediated communication media, provides economical computer conferencing and networking options through telephone services.

The problem is finding out if educational leaders of isolated, rural schools know about these technological services, whether they can or cannot afford these services, and if any models exist which can demonstrate the installation, training, and use of such services.

**Purpose of the Study**

The purpose of the study is to determine the degree to which computer telecommunication technologies are used for administration and instructional purposes in rural school districts.

**Objectives of the Study**

The objectives of the study are to answer the following questions:

1. What computer telecommunication technologies are being used for administrative and instructional purposes in rural school districts?

2. If rural schools are not using these technologies, what are the problems and what are the barriers?

3. Do the school administrators understand the differences among E-Mail, bulletin boards, conferencing with forums, and conferencing with networking systems?

4. Do school administrators understand who controls these kinds of computer telecommunication programs and the costs involved in utilizing them?

5. Do models exist where school districts are using computer telecommunication for administrative and/or instructional purposes?
   a. If so, what are the components and characteristics?
   b. If so, where are they being used?
   c. If they are not used in rural school districts, are they applicable?
Significance of the Study

Rural demographics continue to change as the agriculture economic base declines and the information economic base increases. The organizational effectiveness of rural school districts in particular are receiving much attention in the endeavor to obtain quality public education. Rural schools have long been regarded as inferior to their counterparts. Critics warn of further deterioration as isolated, rural districts experience the pressures of new, potentially damaging demands on programs and services caused by declining enrollments, state reform initiatives, and depressed economic conditions facing agriculture and energy sectors of the economy (Stephens, Perry and Sanders, 1989).

Kalette (1989), reporting on the vanishing rural population, states that 500,000 people are leaving their rural areas annually, and ways are being sought to combat the decline. The rural people she interviewed suggested that solutions to rural "brain drain" may lie in new technology, such as fiber optics, which improves the ability to communicate with urban areas; innovative business (like gourmet mushroom farming), and education programs that link rural students with sophisticated classrooms hundreds of miles away.

Optimistically, Safire (1989) speaks to the projected growth of new towns in the country because the emerging information society is no longer dependent upon central city services. Benjamin (1989) suggests that this fact could help fulfill society’s need for smaller structures to combat metropolitan alienation and social violence. Their suggestions concur with Nesbitt’s prediction that in the next decade a significant development of technology will be in the growth of the electronic (rural) heartland in America (cited by Adkins, 1989).

The potential for application of emerging technologies in the rural areas is limited solely by the imagination of those planning and implementing them (Helge, 1984). However, according to Dillman (1985), new technologies are seldom neutral
in terms of human consequences and tend to carry with them the seeds of opposition that may stop or limit their development by those who do not accept the fact that transformations are occurring in their society. These sociological issues are important because they address policies within the domain of the scientific standards, social welfare, foreign policy matters, and the fundamental relationships of the government and the governed (Molnar, 1986). With structures being implemented now, the social science community, with knowledge and perspective to lend, is close to being too late to affect certain critical policy issues. These issues involve major problem areas such as resources adequacy, environmental quality, and institutional capacity.

Rural school leaders need to investigate the cost effectiveness of implementing alternative strategies for delivery of vocational instruction in sparsely populated areas to a limited number of students. This includes investigating whether educational telecommunication technologies provide access to a variety of educational programs that traditionally have not been offered in remote areas. This poses a challenge for educators and their communities to recognize the need for creative and unique approaches to solving some of the shortcomings of small schools (Wall and Luther, 1988; Jansen, 1988; Jones and Hendrickson, 1989).

Jansen points out that one such approach is through cooperative arrangements with other small districts for the purpose of expanding offerings, providing access to a large variety of training programs, eliminating unnecessary duplication of programs, and providing greater economic efficiency by pooling resources. This approach can be expanded by networking with a unified, multi-state infrastructure in order to maintain state-of-the-art equipment and to sustain competent services and technical staff, along with having a voice in national communication policy regulations (Western et al., 1989; Cawelti, 1989; West, 1989). Such networking can provide
stability for sustaining long-range planning with realistic goals and objectives that are set for a development period lasting from 5-15 years (Cawelti, 1989; Rogers, 1983).

The Federal Interagency Committee on Education urges research involved in the use of advanced interactive instructional technology, finding the impact of advanced technology on rural school curriculum, distance education via telecommunications, computer literacy, and technology transfer (Newlin, 1989).

School leaders wanting change are confronted with the dilemma that teachers do not have time to step out of their normal routine to take advantage of new and/or enhanced technologies to reach and educate their students in different ways (Goodspeed, 1989; St. Clair, 1989). Likewise, teacher training institutions are not initiating measures to meet the teacher computer literacy needs necessary for utilizing classrooms that are wired electronically to databases and/or distance education (Moursund, 1989).

Thomas and Peterson (1984) stress the importance of helping school leaders develop administrative strategies and leadership skills in order to address the needs of cooperating rural school districts who deem it necessary to cooperate to meet their educational needs. The leadership trend is starting to shift toward local consortia, regional cooperatives, or state projects for the benefit of strategic planning.

The challenges for rural school leaders are to learn how to best utilize area cooperatives and networks to help create various technological and educational opportunities, adjust to technological peculiarities, prepare for sociological implications, provide comprehensive long-range telecommunication plans, pool resources, offer comprehensive staff development services, understand federal communication regulations, comply with bureaucratic restrictions, and help build an intrastate infrastructure that is designed to educate the students in their charge (Western et al., 1989; Cawelti, 1989; West, 1989).
Proposals to strengthen communications suggest using electronic asynchronous computer conferencing networks (Van Horn, 1986; Olson, 1987; Nachtigal, 1990). They stress that timely use of new communication technologies and effective acquisition of information from national on-line data bases will provide intellectual advantages for school leaders who need to address these issues (DiPietro, 1990).

Definition of Terms or Concepts

Clusters constitute a group of neighboring school districts who cooperate to provide educational services for their students or constituency in order to restructure their school program to meet equity or access issues or to provide courses which they cannot otherwise provide without such cooperation (Nachtigal, 1990).

Computer conferencing network is an electronic communication system which can be expertly organized and managed by the users (Stevens, 1986). These advanced computer-mediated communication host programs allow the versatility of multiple switches whereby users can access privacy, control the flow of incoming and outgoing messages, solicit votes or polls, and other features which electronic mail, bulletin boards or conferencing forums cannot provide as front-end options.

Cooperatives can be loosely organized multistate groups made up of a mix of school districts in clusters, partnerships, consortia, associations, or networks. They could also include individual state agencies, regional educational laboratories, university centers, and/or private or local institutions (A description of the Western regional, 1988).

Networking or netweaving involves the establishment of electronic organization pathways to expertly communicate with the use of a computer conferencing expert system between agencies involved in a network (Stevens, 1986; 1989). A netweaver is an expert in organizing electronic pathways for
communicating with computer-mediated communication systems (Kucinski, 1989; Wigley, 1989).

**Telecommunications** covers the broad spectrum of technology involved in the generation, storage, and transfer of audio, video, digital, or any other electronic communications signal (Cambre, 1989).

**Assumptions of the Study**

The assumptions of this study are as follows:

1. It is assumed that the people selected as a representative sample of educational leaders will, insofar as possible, provide true information for this study.

2. It is assumed that educational leaders are engaged in a form of distance education when they engage in the following activities with computer-mediated communications:
   a. soliciting knowledge through electronic data bases
   b. consulting with resource people or peers to enhance their knowledge
   c. dialoguing in collaborative endeavors to improve instructional programs or services.

**Limitations**

The internal validity is limited to the responses obtained as they are submitted by participants providing the information for this study. This descriptive study relies on answers from school administrators who may or may not be experts in the field of computer-mediated communications. Therefore, the questionnaire is exploratory as it delves into possibilities that have recently been developed and made available for school administrators to seriously consider using as a communication tool. It is for this reason that the majority of the questions focus on administrative uses.

This study does not attempt to delve into empirical aspects of evaluation or in finding significant change resulting from experiments involving teaching and learning, nor does it attempt to provide input into the effectiveness of using telecommunication
technologies for distance learning programs. It focuses on the educational leader's perspectives of an alternative way to communicate in order to be better involved in these particular processes. The intent of the study is to portray school leaders' expectations with respect to their agency's capacity to associate with other agencies to maximize desired educational efforts and effects.

It is assumed that the individuals surveyed are leaders because they hold leadership positions or they reflect what the leadership desires for their educational unit. They may have opinions without having had actual experience with the assortment of technologies involved with educational telecommunications. This supposition is basic to discovering whether there is a felt need for cooperating and networking with other agencies and institutions. The study relies on the respondent's ability to exhibit expectations and/or reservations about whether telecommunication technologies are a viable solution to equity and access issues in their rural setting.

The major fields of school administration, educational technology, communication, vocational education, participatory management, educational change, cooperative leadership, distance education, school organization, and rural education are integral disciplines concerned with the educational leadership perspectives of telecommunication technologies. Consequently, the expertise sought will focus on those sources prominent or knowledgeable in these fields as they relate to the context of the study. This study elucidates the various barriers involved with distance education to emphasize how educational leaders in isolated, rural schools might use an electronic network to confer, educate, and facilitate mutual purposes or goals in accordance with their cluster's or consortia's mission. Thus, by explaining the various barriers school leaders are confronted with in this process, this study considers the notion that school leaders have a lot to confer about and, therefore, might be better served with an organizational communication network within the computer-mediated conferencing system.
CHAPTER II
REVIEW OF LITERATURE

This chapter provides a review of selected literature and research studies which have guided this research effort. The review of literature is divided into nine parts: introduction, computer-mediated communications, research and evaluation, telecommunication infrastructure, telecommunication policies and standards, barriers and issues, social-technical issues, transfer of technology leadership, and summary of literature.

Introduction

Ohler's (1990) quote, electronically transferred to this page without ever being retyped since it left Alaska via telecommunication media, captures the essence of this study:

"In the industrial age we go to school. In the information age, school can come to us. This is the message implicit in the media and movement of distance education." p. 1

Adopting these tools of technology to the field of education will not be an easy task according to St. Clair (1989) who explains:

"It will require time, resources, and creativity. Educators lack training in the application and forms of assistance that technology offers. The monumental problem for our schools is that the tasks of planning, curriculum, and instruction are viewed as relatively static. School people need to think about transmitting information electronically—a mind set that facilitates accuracy and effectiveness." p. 67
An example of condoning such change is a school's approval of an "electronic educational trip" taken by two brothers and their mother. They traversed the nation combining educational travel with daily school lessons in a recreational vehicle equipped with a microcomputer and modem. The venture included collaboration with teachers, computer specialists, and the principal (2,000-mile course, 1990).

Individualized instruction is happening because technology makes possible the detailed and speedy record keeping such an approach requires. Other changes enabled by technology include the growth of informal professional groupings among teachers or similar subjects; collaborative learning projects among students throughout regions and across national borders; connections between homebound students and ongoing classroom work; and "distance learning" that puts instructional experts in touch with students located thousand of miles away (Mecklenburger, 1989).

All are long-desired ideas now made feasible because technology--electronic networks, fax machines, and telecommunications via microwave, satellite, and fiber optic equipment--has conquered logistical obstacles. The movement to utilize distance education services in rural public schools is developing rapidly and becoming cheaper while the technologies become more powerful. Consequently, it has been enlisted more over the past five years to meet needs of geographically isolated schools. Rural schools are using computer-mediated communications based on video text, interactive television based on voice and video, and a variety of combinations which are based on video text, videographics, video, and/or voice. Factors influencing the usages depends on demographics, economics, and the distance (U. S. Congress, Office of Technology Assessment, 1989).

Basically, telecommunication media involve the machine, the medium, and the mode (Clark, 1988).
The following two distance education services provided by telecommunication media are categorized in the significant distinctions of supplanting or supplementing teachers:

1. The media service that supplants the regular classroom teacher.
   a. One set of examples is the Star School projects like TI-IN Network, Inc., Satellite Education Resources Consortium (SERC), and Midlands Consortium. Their major service is offering specific courses which are taught via satellite with two-way voice and video interaction (Glickman, 1988; Bruder, 1989; Mecklenburger, 1989).
   b. Another example is where a cluster of schools shares one teacher who teaches in one classroom/studio which is connected electronically to other students in classrooms equally equipped and located in other school buildings which are distances away (Valdez, 1986; U. S. Office of Technology Assessment, 1989; Gackle, 1989).

2. The media service that supplements the regular classroom teacher as a tool to enhance instruction.
   a. One example is the Star School project known as the Technical Education Research Centers, Inc. (TERC). These Centers are developing materials and computer hookups to help more than 450 schools joined in a telecommunication network. Teachers plan, organize, and conduct the teaching-learning process through the use of these technologies (Glickman, 1988; Clark, 1988; Mecklenburger, 1989).
   b. Another example is when students utilize the microcomputer (modems via telephone) to access library resources, instructional data bases, and bulletin boards. The purpose is to communicate, exchange or acquire ideas or sources of information (Kaye, 1988; McNeil, 1990; Peterson and Turkel, 1990).

However, these types of media services can fit either the supplanting or supplementing categories, depending upon the purpose for which they are utilized. For example, the supplanting example where the teacher in Classroom A is beamed into classrooms in rural district B, C, and D may be supplemental to the latter school
districts because they may not otherwise be able to offer that course without such intra-district cooperation (Bruder, 1988; Federal Engineering, 1990).

Gufstason (1989) outlined how Johnston, a pioneer in television and telecourse research, developed categories for new communication technologies as electronic learning which belong to one of the following three classifications:

1. Telecommunication technology which is a passive linear technology (one-way delivery) such as radio, audio tape, broadcast television, and videotape is classified as Level I.

2. Level II classification is for telecommunication technologies which are interactive communications (two-way communications) such as radio-correspondence, telephone; computer and modem; interactive video disks; interactive television fixed services (ITFS); two-way audio and visual via satellite or electronic mail between microcomputers.

3. Level III classified telecommunication technologies are an integration (combination) between passive linear and interactive communications such as utilizing video discs with full motion video which query and respond, one-way satellite backed by tele-conferencing or computer conferencing network with a correspondence course.

Most every rural state has schools in isolated areas utilizing one or more of these distance education technologies to provide additional educational opportunities to their students (Whisler, 1987; Benson and Hirschen, 1987; Wall, 1986; and Willis, 1989).

Distance education is a form of instruction characterized by the "physical" separation of instructor (resource person or educator) from student (leader or learner), except for the occasional face-to-face meeting allowed for some projects. It presupposes opportunities for instructor interaction, whether live or mediated, as well as for learner interaction (Zigerell, 1984). Bruder (1989) found that current definitions usually refer to a situation where the instructor and the learner use telecommunications or electronic devices (e.g. cable, satellite, fiber optics,
broadcast, video, and computer technology) to interactively follow part or all of a course program.

The U. S. Department of Education's Office of Educational Research Improvement defines it as the application of telecommunications and electronic devices which enable student and learners to receive instruction that originates from a distant location. Typically, the learner is given the capacity to interact with the instructor or program directly, and given the opportunity to meet with the instructor on a periodic basis (Garnette and Withrow, 1989).

The concept of learning that occurs between instructors and students separated by distance is probably as old as the practice of letter writing (McNeil, 1990). Correspondence instruction is a more formalized version of this learning process. Keegan (1985) states that the first recorded data about distance education are found in the Bible concerning stories about St. Paul's letters. His conclusion is that distance education is a little-studied area of education which is growing in importance annually. This is because, as a more industrialized form of educational provision, it is well adapted to the developments of new communications technologies and brings to education many of the strengths and dangers of industrialization.

The simplest Level II or Level III distance education system is the computer with a modem accessed to telephone lines that are operated by communication software such as electronic mail or bulletin board systems (Kiesler, Siegel, and McGuire, 1984; Clark, 1988).


Conversely, little technological knowledge or teaching effort is needed by local educators to provide purchased interactive satellite courses such as TI-IN (West,
network expert system courses require knowledgeable computer skills plus individual involvement with each student by the teacher providing the instruction (Stevens, 1986; Kiesler et al., 1984; O'Shea, Kimmel, and Novemsky, 1990).

The most economical telecommunication devices have the least appeal or novelty. They are microcomputers interacting with other microcomputers, minicomputers, or mainframe computers. The communication is based on discrete subject matter in text, computer-mediated dialogue, access to data bases, bulletin boards, or with user support libraries as a research tool (Kolberg, 1988). There are various ways to utilize electronic messages for educational purposes such as conferencing, using cross-cultured exchanges, foreign language studies and geographic explorations such as National Geographic's national elementary weather project (Kurshan, 1988).

School administrators across the nation cite many examples whereby these technological enhancements are worth the investment (Davis, 1989). School administrators have been collaborating during the decade of the 1980s to educationally capitalize these intricate telecommunication technologies (U. S. Congress, 1988; West, 1989). The U. S. Congress' Office of Technology Assessment (1989) maintains there has been a proliferation of distance learning projects in the last five years. The following examples depict how these technologies are being diffused into the educational environment of the United States' elementary and secondary schools:

1. Organizing 128 school districts in Suffolk and Nassau counties in New York to form the Long Island Telecommunications Educational Network Study (Mupo and LaMantia, 1984).

2. Receiving educational programs to supplement the high school curriculum by satellite in Wisconsin (Grover, 1984).

4. Cooperating with various telecommunication projects in Minnesota whereby microwave and other combinations of distance education technologies are delivering courses between high schools. (Valdez, 1986).

5. Exchanging courses by sharing a two-way interactive television network which combines coaxial cable, fiber optics, and microwave among eight rural schools in Illinois (Turner, 1987).

6. Sharing interactive telecommunication services between two high schools in one Nevada county by utilizing commercial cable plants, broadcast towers, and other local communication links (Havertape, 1988).

7. Communicating between rural communities with portable microcomputers and 800-access numbers for educators in Montana's state-wide partnership with U. S. West Telephone Company (Hughes, 1989).

8. Connecting four classrooms between four high schools in North Dakota with a state-of-the-art fiber optics project to increase high school offerings by sharing teachers who have critical or rare qualifications (Federal Engineering, 1990).

The United States Congress' U. S. Office of Technology Assessment (1989) research found that while distance learning initially served isolated, rural schools and some urban systems, current uses go beyond these needs. They found systems that carry advanced and specialized courses and training and seminars for educators. They link learner communities with each other and bring a wide array of experts and information to the classroom. However, their summary emphasized that if distance education is to play an even greater role in improving the quality of education, it will require expanded technology; more linkages between schools, higher education, and the private sector; and more educators who use technology well. Also, Federal and State regulatory policies will need to be revised to ensure a more flexible and effective use of technology for education.
Most satellite efforts and events five years ago included only higher education and state governments (Projects in distance learning, 1990). The survey data collected by the U. S. Office of Technology Assessment in 1989 shows that four rural schools provided such instruction in 1985. This increased to 41 in 1988. It is estimated by Miller (1989) that approximately 1,600 school districts are utilizing some form of distance education during the 1989-1990 school year. The latter projection is due mainly to the Star School programs funded by the U. S. Department of Education. It was initiated in 1988 (Bruder, 1988). Flanders (1989), manager of Kentucky's Educational Television, Lexington, KY, a Star School project, stated that 700 students from 18 states are taking the probability and statistics course. In Kentucky alone, 111 students are taking physics in one section during the 1989-1990 school year.

These projects combine the expertise of elementary, secondary, and higher education educators. Distance education for higher education figures prominently as a means of achieving the goals of providing an increase in access and equity, adding quality to the teaching and learning environment, providing more support in training and support systems, and enhancing a network system to further collaborate and cooperate in a financially feasible manner (McNeil, 1990). Integrated electronic computer systems, which connect multiple users, are divided into one of the following two distinct categories (Heuston, 1988; Lewis and Wall, 1990):

1. Using technology on campus, such as Local Area Networks (LAN), where computers are not connected to outside sources and are used for internal administrative and educational purposes.

2. Using technology globally, such as computer-mediated communication (CMC), which are connected to outside sources and used for distance administrative and educational purposes.

Although the majority of school districts across the United States and Canada use computers, only a small percentage have incorporated the use of
telecommunications. Those that do, do so on a limited and do-it-yourself basis (Hutcher, 1990).

**Computer-mediated Communications**

Entrepreneurs in charge of multinational corporations are relocating to remote areas to conduct business as usual. They use a fax machine, computer, modem, and telephone lines to operate their multi-million-dollar business out of their homes (Lemke, 1989).

Karl P. Sauvant, acting assistant director of the United Nations Center on Transnational Corporations (1989), emphasized the following in this regard:

> The point is that if you cannot see it, hear it, and are not involved in it, you have no idea as to the magnitude nor the extent to which the world is beginning to be served by instantaneous integrated interactive telecommunications. Transnational corporations use their electronic satellite systems for daily accounting, financing, banking, and inventory control/replacement. It collapses time and space for information intensive services and offers tremendous potential for multinational trade and services. If we are allowed to freely do what these mechanisms can do, we have a new range of opportunities that all can take advantage of no matter where they are in the world. p. 1

Computer-mediated communication involves utilizing computer programs with the microcomputer and/or mini-mainframe computers to transmit electronic messages (video text) with the use of a modem. It is the transfer of information from one computer to another. Participants at any number of sites can engage in live interaction by entering messages at the keyboard and reading messages as they appear on the screen. Messages can also be held by a computer host until the user checks in. Such information can be text, graphics, or data, but not audio (Schamber, 1988). The most commonly used type of computer communication is the bulletin board. There are over 600 national bulletin boards that can be accessed on line by the public, particularly from the nationwide network developed by the university and college system. This does not count the private or closed circuit bulletin boards (Randles, 1990).
Confusion in terminology is found in literature as Foell (1987) used an E-Mail program and called it "computer conferencing." Halasz (1984) explained usage of bulletin boards and accessing to data bases as "computer networking." Brochet (1986) called an expert organization electronic communication program "computer conferencing." Seymour (1988) termed bulletin board technology as microcomputer telecommunications and referred to everything else as hybrid systems (1990). Computer-mediated communications is used mainly in literature to relate to all the types of programs on the market, and computer conferencing is used interchangeably with conferencing and networking programs (Hiltz and Turoff, 1978; O'Shea et al., 1990). The computer conferencing network term used in this text is based upon Stevens' (1986, 1989) definition of "expert organization electronic communication systems."

CompuServe's Educational Forum (edforum) file labeled TELCOM.DEF edited by the systems operator contains correspondence following a meeting of educators at the Southern California Computer Using Educators' Conference. The following excerpts indicate the extent to which confusion exists concerning the appropriate terminology for this medium (Rogers, 1989):

"We lack clear definitions and appropriate terminology. Do we agree on the meanings of words "networks," "networking," and "telecommunications." Can we use those words productively outside our own clique?"

"We lack an appropriate metaphor which succinctly pictures the power inherent in electronic networking. It's not the telephone; it's not the U. S. Mail; it's not even E-Mail. Much of my time is spent trying to explain what it is that we do. For instance, I have a hard time explaining to my mother what I am trying to do with this technology."

"When I talk to computer coordinators about telecommunications, they think I'm using a computer. When I use the same word with AV people, they think I mean television, and others think of satellites, etc. The words "telecommunications," "conference," and "network" are vague and have different
meanings in other contexts. Even people who understand the technology confuse the names of different activities--databasing, private mail, public bulletins, live conferencing, and file transfer. Some people lump hard wired."

"It is imperative that we get together and come up with some terms we can all buy into and start using in a uniform way." pp. 1-2

Stephens (1986) compares this phenomena by citing terms used in the early days of the automobile, whereby all parts and concepts given terms familiar to the horse and buggy industry. He suggests that many names depicting what is being done with computer communications have yet to be created. The industry is still in its infancy (Jacobs, 1990).

Technically there are five types of computer-mediated communication programs which range in cost from a couple hundred dollars for a microcomputer host to over 50 thousand dollars for large mainframe hosts. The more expensive programs include many incoming telephone nodes to accept more users at one time and larger storage capacity to accommodate many users. They all transmit messages electronically from one computer to another computer via telephone lines, but they have the following different capabilities (Kiesler et al., 1984; Stevens, 1986; Clark, 1988; Online for Information, 1989):

1. Electronic mail (E-Mail) which stores messages on a large computer for retrieval on the receiving end at a later time like AdvocNet or BitNet. CHAT systems require on-line communications by both sending and receiving synchronously. Bulletin board systems are similar except they can be shared by many users (Saari and Martin, 1989).

2. Conferencing with programs like CompuServe's or Learning Link's forums. These are advanced bulletin board systems which can compartmentalize messages in topic categories and can be accessed like data base information (Lynd, 1990).

3. Distance learning using on-line graphic illustration such as the Electronic Blackboards. They are most often utilized jointly with telephone conversations. Like CHAT systems they are used on-line synchronously (Galvin and Bruce, 1989).
4. Data base searching involves programs like Dialog which provides instantaneously transferable data banks. Information files are stored in large computers to be retrieved whenever the user or researcher desires (Jacobs, 1990; Peterson and Turkel, 1990).

5. Networking with programs like PARTICIPATE or CAUCUS where concurrent topics can be manipulated with data base capabilities or arranged according to organizational needs. These expert systems have thorough documentation and options for topic branching, subtopics, polling, voting, read only, write only, and categorized messages which allow flexible controls among organization members (Stevens, 1986).

Computer conferencing programs like General Electric's GEnie's "Roundtables" and Delphie's "Groups and Clubs" use somewhat more limited bulletin board software than "Forum" for the exchange of information among the participants. University courses were first taught with electronic mail and bulletin board conferencing (Boston, 1989; Foell, 1987). Computer programs which have interactive networking features like PARTICIPATE are more adaptable than "Forum" for distance education (Conhaim, 1989).

Options like voting and polling provide the capability of collating true and false or multiple-choice questions selected by participants. The results can be transferred to statistical computer programs for inferential analysis. A "library" area can be used for storage of reference texts and course readings. Users are also provided with the possibility of tailoring commands and options to needs of specific groups of users such as foreign languages or corporate acronyms (Stevens, 1986).

Many corporations developed private programs to have engineer and research teams use this medium for high-level discussions. Kiesler et. al. (1984) cites examples of how the U. S. Federal Judiciary and U. S. Department of Commerce utilize this medium for management purposes. The following computer-mediated communication networks pioneered the usage of interactive simultaneous computer conferences on large mainframe computers:
1. Department of Defense's ARPANET.
2. GTE's TELENET
3. Xerox's ETHERNET
4. IBM's VNET
5. Clusterbus' Nestar System
6. Ford Aerospace's FLASHNET
7. Wang Laboratory's WANGNET

The concept was replicated from government and industry for use in the public and educational sectors (Kaye, Mason, and Harasim, 1989). Three such advanced interactive networking programs available for worldwide access are PARTICIPATE, CAUCUS, and COSY. PARTICIPATE is readily accessible by subscribing to CompuServe, a vendor located in Columbus, Ohio. It was developed by Participate Technologies Limited; now in Allentown, Pennsylvania. However, it also can be owned privately for closed circuit use like CAUCUS developed by Metasystems Design Group of Arlington, Virginia, and COSY developed by the University of Guelph in Canada (Stevens, 1986; Brochet, 1986; Baltzer, 1988).

Educational uses are found mainly in post-secondary institutions (Baltzer, 1988; Kaye, 1988; McNeil, 1990). The Educational Technology Center at Harvard Graduate School of Education developed a microcomputer-based conferencing system to reduce isolation and promote collegial exchange among high school science teachers by producing a conferencing software called COMMON GROUND (Making Sense, 1988).

Distance education pilot projects involving a computer conferencing network program have been accomplished at universities in Arkansas, Florida, Pennsylvania, and Ohio during 1989 (Hritz, 1989; Norton and Stammen, 1990). The following describes how computer conferencing networks are used in these distance educational settings (Norton, 1990):
Typically students join their classmates in a computer conference based on specific coursework. A conference is a time-sequential series of messages contributed by participants on a topic. The systems run conferences on many topics. Each note is labeled with the name chosen by the writer, the time of the message, and sometimes a brief subject heading (option of the sender).

The procedures for using computer conferencing are very simple. The student and the instructor are given accounts on the system and sign on to read messages. Simple commands allow each to write messages, retrieve past messages, and read incoming mail as it appears in the electronic mailbox. All messages are numbered within each topic for easy retrieval. A branching system allows students to create subtopics within any conference.

The conference is organized by the instructor who shapes and motivates student participation in various learning activities. Together the students and the instructor submit notes, debate issues, clarify concepts, and ask questions in a collaborative network of shared information. Also, each student can write private messages to the instructor, another student, or a group of students. pp. 1-2

The Center on Education and Training for Employment at The Ohio State University in Columbus, Ohio, sponsored these pilot projects for the Consortium for the Development of Professional Materials for Vocational Education. The first phase was training university professors involved in teacher education. The second phase involved having distance education courses offered by the Colleges of Education at the University of Arkansas and University of Central Florida. Table 1 compares evaluations conducted over the telephone by Ohio State University's Center on Teaching Excellence (Abate, 1989; Davey, Williams, and Asay, 1990) with vocational administrators who participated in the courses. The significant finding in both of these surveys was the fact that 73 to 100 percent would take another course using computer conferencing, and that 90 to 93 percent of the students recommend that others do likewise.

The Arkansas and Florida evaluations substantiate Phillips' and Pease's (1987) literature review whereby the socio-emotional needs are found to be an important consideration with electronic text communications. This is particularly evident in
response to questions about lack of face-to-face discussions whereby participants have difficulty adjusting to ways of expressing, by text, emotions such as anger, joy, frustration, and humor via computer. There is a need to have the opportunity to express feelings if true open interaction is to occur. All three reports expressed more need in attending to personal feedback and evaluation by the resource person conducting the course.

Table 1
Comparison of Evaluation Reports on Distance Education Projects using Computer Conferencing by the Education Departments at the University of Arkansas and University of Central Florida

<table>
<thead>
<tr>
<th>Interview Questions</th>
<th>Arkansas Spring 1989</th>
<th>Florida Fall 1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signed-in on a regular weekly basis</td>
<td>Yes 11 73</td>
<td>Yes 9 90</td>
</tr>
<tr>
<td></td>
<td>No 4 27</td>
<td>No 1 10</td>
</tr>
<tr>
<td>Times (Mode) per week signed-on</td>
<td>Four</td>
<td>Three</td>
</tr>
<tr>
<td>Communicate with other students</td>
<td>Yes 11 73</td>
<td>Yes 9 90</td>
</tr>
<tr>
<td></td>
<td>No 4 27</td>
<td>No 1 10</td>
</tr>
<tr>
<td>Would the availability of a course taught, at least partially, by computer conferencing entice you to take courses that you might otherwise reject because of the time and cost of travel involved?</td>
<td>Yes 11 73</td>
<td>Yes 10 100</td>
</tr>
<tr>
<td></td>
<td>No 3 20</td>
<td>No 0 0</td>
</tr>
<tr>
<td></td>
<td>Maybe 1</td>
<td></td>
</tr>
<tr>
<td>Would you recommend that others take a computer conferencing course?</td>
<td>Yes 14 73</td>
<td>Yes 9 90</td>
</tr>
<tr>
<td></td>
<td>No 1 27</td>
<td>Maybe 1 10</td>
</tr>
<tr>
<td>Aggregate positive comments:</td>
<td>Eleven N/A</td>
<td>Twelve N/A</td>
</tr>
<tr>
<td>Aggregate negative comments:</td>
<td>Three N/A</td>
<td>Three N/A</td>
</tr>
<tr>
<td></td>
<td>(n=15)</td>
<td>(n=10)</td>
</tr>
</tbody>
</table>

Source: Center on Teaching Excellence, The Ohio State University.
Keyboarding skills are a major factor because people who do not possess such skills are reluctant to participate in computer-mediated communication. However, several project reports, including those on Table 1, relate that there are active users who do not have such training and use the hunt-and-peck method successfully (Phillips and Pease, 1987; Norton, 1990).

Computer-based conferences often fail because the participants simply do not have any pressing need to belong (O'Shea, et al., 1990). Individuals who sign on to such systems without finding any new contributions related to their needs soon become disinterested in this medium. Consequently, successful projects are those which have a threshold number of participants with mutual needs and have varied means to keep communication flowing if the group is not bound by coursework (Hiltz, 1986).

Phillips and Pease (1987) focused their literary studies on staff development services provided by industry (mostly international) as early as 1978. Loneliness was discussed. As one person stressed, "It's lonely as a participant, often no one is on the system at the same time and it's like talking to a black hole." On the other hand, they found that active cliques were formed by overt communicators, while other participants took on inactive roles as passive participants. The quality of the social interaction among the seminar participants was judged as sometimes outstanding, often terrible, and fantastic when people are actively involved. The areas in which the seminars were judged to be most successful were in providing open forums for frank exchange and getting acquainted with new ideas, and for providing a communications technology by which one could gain new friends. The need for overt acceptance into a new communication situation, even if it is technically an electronic classroom with adults, was found to be very strong. Microcomputer-literate educators, prone to utilize such distance communications, tend to focus on staff
development and leadership activities rather than on educating students (Kiesler et al., 1984).

Minnesota schools had a McGraw-Hill-sponsored bulletin board system (MIX) available until it was terminated in 1989. The funding rotated to other agencies. The state had supported 800-telephone-toll charges for rural school districts to equalize the cost situation because metropolitan schools had free access if Telenet packet nodes were located in their toll-free access area. Minnesota Educational Computer Consortium (MECC) established pilot projects throughout the state with a CAUCUS computer conferencing network program. This IRIS network is private for subscribers fees set at $198 for twelve months plus $6.75 an hour for packet node access (Wigley, 1989).

The McGraw-Hill Information Exchange (MIX) guide (Telecommunication planning guide, 1988) is shown on Figure 1 to illustrate budgeting procedures for planning to use a computer-mediated communication. The costs vary because of the difference in the cost of equipment and usage charges, so an approximate figure is used. The essential equipment needed is a microcomputer, communication software, and modem. Monthly costs include phone line charges and cost of using the host computer which controls the mediated software. The computations do not include the purchase price of a computer.

Four business accounts were taken from a CompuServe billing for a period of six months to determine an average monthly cost for administrators and researchers using a computer information service known as CompuServe located in Columbus, Ohio. The average monthly ongoing subscription fee for PARTICIPATE usage on CompuServe was $44.00. With the monthly service charge being $12.50 an hour, this ongoing average is approximately 3.5 hours a month (CompuServe Billing Analysis,
### SET UP COSTS:

1. **For a modem.**  
   (Typical Cost $200-$1,000) $__________

2 a. **If purchasing an external modem, a serial port or serial card that can be dedicated to a modem is needed.**  
   (Average cost $150) $__________

2 b. **A computer-to-modem cable is not supplied with an external modem**  
   (Average cost $25) $__________

3. **High quality computer communication software**  
   (Average cost $200) $__________

4. **Access to a telephone line may be needed.**  
   (Average cost $50) $__________

5. **Information service may have one-time startup or a new member subscription fee.**  
   (Typical cost $25) $__________

**TOTAL ESTIMATED STARTUP COSTS:** $__________

### ONGOING EXPENSES:

1. **Monthly line fee:**  
   Might choose to pay the local telephone company a monthly fee for a private line.  
   (Typical cost $20) $__________

2. **Estimated long-distance costs:**  
   If dialing long distance to access the desired information service, estimate the number of hours of usage per month by the hourly fee charged by the long distance carrier by day or night depending upon time intended to be on line.  
   (Average usage is two hours a month. $__________

3. **Flat subscription fee:**  
   The information might have a flat monthly fee.  
   (Average $10) $__________

4. **Packet-switching cost:**  
   The information service might have a fee for accessing to a packet-switching network for prime or non-prime time.  
   The average monthly (two hours) times the typical node rate (Typical charge $6). $__________

5 a. **Usage fee:**  
   The information service may charge by the hour for the service instead of a flat rate.  
   Rates may be for prime or non-prime and determined by the baud rate of the modem, ie 300, 1200, 2400 etc.  
   Multiply hourly combined rate (time of day at what baud rate) by the number of intended hours of usage.  
   (Typical $44) $__________

5 b. **The information service may have a monthly minimum, so the greater amount would be used.**  
   (Typical $10) $__________

**TOTAL ESTIMATED MONTHLY EXPENSES** $__________

**TOTAL ESTIMATED FULL-YEAR EXPENSES** $__________

---

**Figure 1**

Budget Worksheet for Estimating Costs of Computer-mediated Communication System
The information provided by MIX shown on Figure 1 suggests the average is two hours a month.

Table 2 shows another accounting example ascertained to determine ongoing monthly costs covering a three-month period involving a training center networked with two universities in a distance education project concerning vocational administrators' staff development courses.

Cost accounting factors shown in Table 2 illustrate how per-person costs vary during a three-month average between activities involving consultation, administration, and instruction. These accounts represent activity undertaken after the groups had been trained and had had at least three months' practice and experience in how to utilize computer conferencing. The consultants at the Center in Ohio had previously trained the leaders in Pennsylvania and Arkansas who in turn trained the people with whom they were corresponding in their respective states.

The results show that the administrative unit averaged 2.2 hours per month, the administrative monitoring unit in Pennsylvania averaged 4.6 hours per person each month, and the monthly average of the instructional unit in Arkansas was 6.6 hours per person. The monthly subscription fee charged by the vendor was about $12.50 per hour. The average monthly cost per person was $30.50 for the consultant and researcher accounts at the Center in Ohio. The average monthly cost per person was $58.20 for the administrative group in Pennsylvania, and the average monthly cost per person was $82.50 in the instructional project held with graduate students throughout Arkansas.

Tracking messages was not undertaken to ascertain if more students per class creates additional cost because of the opportunity for more students to interact with each other on line.
Table 2
CompuServe Billing to the Center on Education and Training for Employment for Distance Education Project funded by the Consortium for the Development of Professional Materials:

<table>
<thead>
<tr>
<th>Three-Month Computer Information Service</th>
<th>Coordinating Consultants</th>
<th>Resource Project at Pennsylvania</th>
<th>Classroom Project at Arkansas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average monthly cost</td>
<td>$122</td>
<td>$349</td>
<td>$1,485</td>
</tr>
<tr>
<td>Number participating</td>
<td>4</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>Average monthly cost per person</td>
<td>$30.5</td>
<td>$58.2</td>
<td>$82.5</td>
</tr>
<tr>
<td>Per-person hours used per month</td>
<td>2.4</td>
<td>4.6</td>
<td>6.6</td>
</tr>
</tbody>
</table>

Source: CompuServe Billing records at the Center on Education and Training for Employment, The Ohio State University, Columbus, Ohio.

These types of textual dialogue links between educators are being encouraged with federal support as evidenced by the South West Regional Educational Laboratory (SWREL) where a working model was established to illustrate computer-mediated communication (O'Shea et al., 1990).

Dr. Nolan Estes from the University of Texas at Austin provides administrators an on-line forum to participate in a guided discussion of critical issues for school leaders. It is a project developed by Radio Shack/Tandy Computers (Hutcher, 1990). Dr. William Anderson and C. Allen Green conducted a project with first-year superintendents throughout the state of Iowa. The project named the Educators' Electronic Exchange (EEE) was based out of Iowa State University during the 1988-1989 school year. This bulletin board system provided an exchange of answers to questions the participants would present on the line. They indicated that the most useful aspect was the ability to communicate with peers (Anderson and Green, 1989). NOVA University uses computers extensively to communicate with their students throughout the nation as an integral part of their external degree programs (Miller, 1990).
SchoolLink went on line January 15, 1990, and replaced its predecessor, World Link, which operated during 1988 and 1989. The new aim is to transform distance learning into an interactive experience that incorporates immediate personal feedback worldwide. The lead moderator is located in Oakland, California. The project is sponsored by GTE Education Services and Radio Shack/Tandy Computers. It currently includes 65 schools in the U.S., Canada, the United Kingdom, the Netherlands, Russia, Germany and Lithuania (Hutcher, 1990).

Learning Link Consortium links fourteen Public Broadcasting Systems in the United States (Spielvogel, 1987). In 1990, they extended their computer conferencing services to include educators. Educators within the North Central Regional Educational Laboratory (NcRel) have free access to this forum during 1990 because of a federal grant. The focus of these forums pertains to staff development programs based on a series of satellite programs scheduled each month during 1990. The U.S. Office of Technology Assessment (1988) initiated this project with NcRel. DataAmerica and IBM have partially underwritten the cost of memberships. Therefore, the cost is $95.00 a year instead of $189.00 for fifteen hours of on-line time (Learning Link, 1988).

LINC Resources, Inc., Columbus, Ohio, receives federal funds to manage and operate education forums (edforum and edresearch) for educators around the nation. The service is carried by CompuServe Information Services, Columbus, Ohio (Lynd, 1990). Inquiries can be made about any education question on the open forum, and someone around the nation is apt to answer the question. If the system operator determines there is enough interest in a particular subject, a private forum will be made in order for the participants to converse or submit documents within that particular file. The following listing, (which is pasted here and re-formatted after retrieving it from CompuServe on-line files), includes the special-interest forums pertaining to educational issues on line during May, 1990:
1. The Education Forum Libraries Menu

   a. Libraries Available:
      1) Sysop's Desk
      2) Software
      3) Computer Ed Network
      4) Special Ed & Gifted
      5) Early Childhood
      6) Parent Line
      7) Media Center
      8) Open Discussion/New
      9) Arts & Soc Studies
     10) Telecom/BBS/Online
     11) Future Talk
     12) Courses/Behav Anal
     13) Behavior Analysis
     14) Language Arts
     15) Sex Education
     16) Home/Alternative Ed
     17) Higher Education

2. Education Research Forum Libraries Menu

   b. Libraries Available:
      0) Miscellaneous/HELP
      1) A-Admin/Ed finance
      2) B-Curric. Studies
      3) C-Learning/Instruc
      4) D-Measure/Methods
      5) E-Couns/Development
      6) F-History G-Social
      8) H-School Eval/Dev.
      9) I-Ed.in Professions
     10) J-Postsec./Distance
     11) K-Teacher Education
     13) Govt. Liaison
     14) Employment Ads
     15) Early Childhood
     16) Special Education

CompuServe is the largest service of its kind. It has about 555,000 members world-wide who can choose from 1,400 data bases (Jacobs, 1990). SpecialNet is the second largest computer-mediated communication network. This bulletin board
system was developed by each state's department of public instruction to communicate with local agency special education directors (Lynd, 1989; 1990).

Local telephone companies can provide similar services. For example, a news service called VICOM Information Service has had a host program since 1985 serving about 500 residents around Chillicothe, Ohio. It is just like the national and metropolitan information services such as Dialog or Cleveland Free Net. Members can access data base services, obtain newspaper articles, or receive notes from other members (Peterson and Turkel, 1990). Members are able to interact with the newspaper staff. Cleveland Free Net has 7,000 registered users and averages between 500 and 600 calls a day on 10 incoming phone lines at a cost of approximately $80,000 a year. It is estimated that from 1.7 million to 2 million people now subscribe to these videotext services in North America (Kucinski, 1989; Jacobs, 1990).

Videotext is the commercial term referred to by the newspaper industry for commercial computer-mediated communications. It has not been profitable, as most potential customers feel it is too expensive. New York's Newsday publisher Robert Johnson, who once headed a similar experiment for the Columbus Dispatch in 1980, acknowledges that their current venture is not a profit-making venture but a long-term investment, as the industry is in its infancy. He was quoted as saying (Jacobs, 1990):

"We are also working with school systems to use videotext as a teaching tool"

Virginia's Curry School of Education's communication system called the "Electronic Academic Village," is expanding computer forums in order to serve all students and educators on campus as well as in the surrounding elementary and secondary schools. This was established through a forum network called Teacher-Link. Costs were curtailed by telephone companies with donations for implementation
(Viadero, 1990). Maricopa Community College in Phoenix, Arizona, and the New York Institute of Technology in Rochester, New York, have their campuses organized with computer conferencing networks so students, staff, and professors can utilize expert organization systems for various educational purposes (Baltzer, 1988; McNeil, 1990).

A multi-line electronic bulletin board was constructed to interconnect one-room schoolhouses. It is a simple, cost efficient, and distinctly isolated microcomputer operation project in the Western Montana College. It is called RuralNet and was funded by Mountain Bell and M. J. Murdock. Utilizing microcomputer technology and telephone lines, educators in isolated locations communicate, share educational resources, and provide their students the opportunities to communicate with peers in other areas (A description of the western regional, 1988).

Montana initiated the Big Sky Telegraph project in 1989 with a $283,000 grant from U. S. West. It is a two-year expansion of EDUNET (Odasz, 1989). It involves circuit-riding trained field representatives who help in the diffusion of this technology. They are using loaner modems at on-site demonstrations to motivate, train, and network over 100 Montana communities with local schools (U. S. Office of Technology Assessment, 1989; Hughes, 1989).

This way, each community will be interconnected to the Big Sky Telegraph state-wide system. Next, they will be connected to "Fredmail" Apple II BBS so there will be a "network" of networks across Montana. Their state legislature appropriated $500,000 for a six month professional telecommunication survey. It is being conducted to assess the state's infrastructure and expansion capability for having Big Sky become part of a much larger multi-faceted educational communication network. Packet radio technology was introduced where phones are unavailable or too costly.

Table 3 indicates that Montana's efforts show up as the only state in which a priority was set for computer-mediated communications among the 10 most rural and
isolated states (Stammen, 1988). The state board has discretion as to how
technology funds should be directed for these vocational education efforts.

Table 3
1988-1989 Vocational Education Title IIB Set-Aside Funded Programs in the Ten States which are the most Rural and Sparsely Populated in the United States*

<table>
<thead>
<tr>
<th>State (site of major grant)</th>
<th>State Agency Initiative for Major Grant</th>
<th>Local School Initiatives on RFP**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montana (Sacro and Helena)</td>
<td>EDUNET computer mediated communications</td>
<td>Curriculum and guidance</td>
</tr>
<tr>
<td>Wyoming (Powell)</td>
<td>Staff development</td>
<td>$350,000 for how Special Populations are being served</td>
</tr>
<tr>
<td>Idaho (Pocatello)</td>
<td>Satellite usage</td>
<td>$100,000 mini-grants robots, CAI, CAD, lasers, satellite dishes</td>
</tr>
<tr>
<td>South Dakota (Aberdeen)</td>
<td>Electronics education curriculum</td>
<td>Microcomputers in all schools</td>
</tr>
<tr>
<td>Alaska (N. W. Arctic)</td>
<td>Satellite distance education</td>
<td>$50,000 for each of 24 set-asides</td>
</tr>
<tr>
<td>North Dakota (Dickinson)</td>
<td>Multi-phase technical SW region project</td>
<td>$140,000 technology mini-grants</td>
</tr>
<tr>
<td>Maine (Scarbough)</td>
<td>Technical curriculum (no rural sites included)</td>
<td>Demonstration sites for curriculum</td>
</tr>
<tr>
<td>Vermont (Randolf)</td>
<td>Interactive television</td>
<td>$300,000 for microcomputers and CAD</td>
</tr>
<tr>
<td>New Mexico (Albuquerque)</td>
<td>Microcomputers</td>
<td>$300,000 match for microcomputers</td>
</tr>
<tr>
<td>Nebraska (Scotts Bluff)</td>
<td>Telecommunications Up-link facility</td>
<td>$100,000 mini-grants robots, CAI and CAD, lasers &amp; satellite dishes</td>
</tr>
</tbody>
</table>

Table 3 shows the choices local school districts were allowed by the state board to request projects among 24 categories approved by federal legislation. These local school districts submit requests for proposals (RFP) which are competitive. Alaska, Idaho, Nebraska, and Montana allocated their state agency initiative vocational funds for cooperative distance education projects. These allocations supported statewide efforts which also include funds contributed from other agencies. Vermont funded area microwave projects strategically centered at three post-secondary institutions.

Bornstein and Bolger (1987) found that rural school libraries had limited access to telephones. Table 4 illustrates why there is low telephone utilization in rural state school libraries. In 1985, 35 percent of the school libraries had telephones. There were more cable or satellite television receive only (TVRO) stations (42%) than there were telephones in school libraries. Only five percent of the school libraries had data base services for library media searches. The data shows that very few library media centers in North Dakota's public elementary and secondary schools had a telephone-modem to access to data bases.

Table 4
Presence of Media in Public School Library Media Centers in Selected Rural, Remote, Sparsely-Populated States, 1985

<table>
<thead>
<tr>
<th>Rural State</th>
<th>Telephone</th>
<th>Cable TV/Satellite (TVRO)</th>
<th>Data Base Retrieval</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Dakota</td>
<td>13%</td>
<td>36%</td>
<td>4%</td>
</tr>
<tr>
<td>Minnesota</td>
<td>51%</td>
<td>33%</td>
<td>7%</td>
</tr>
<tr>
<td>Montana</td>
<td>29%</td>
<td>26%</td>
<td>11%</td>
</tr>
<tr>
<td>South Dakota</td>
<td>17%</td>
<td>58%</td>
<td>7%</td>
</tr>
<tr>
<td>US average</td>
<td>34%</td>
<td>42%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Center for Educational Statistics, U. S. Department of Education.
However, change is occurring, as action was taken in North Dakota to provide all library media centers computer-telephone access to data bases. According to Schechter (1989), Patricia Herbel, director of elementary education for North Dakota’s Department of Education, entered into a 1989-1990 contract with a Columbus, Ohio, catalogue firm, EdLINC, to supply on-line services to all of the 300 school libraries in that state. This was the only contract where an entire state entered into a commitment for their school libraries.

Star School projects, which mainly focus on delivering courses by satellite, are incorporating computer-mediated communications for assisting educators who wish to discuss the staff development experiences or information about the programs they retrieve for their pupils. 500 schools in 39 states are involved in the Star School projects connected with network satellite instruction (Bruder, 1988; U. S. Department of Education, 1988). Foreign language is the most popular reason rural schools utilize interactive satellite instruction for high school students (Barker and Garret, 1988).

The major public and commercial interactive television satellite services provide one-way video and two-way audio and are made available through subscriptions to all schools in the United States. Star School initiatives have generated utilization of previous services under new cooperatives, as well as increased the need for collaboration between a multitude of institutions and agencies (West, 1989). The following data lists the recent developments involving a variety of telecommunications including computer-mediated or fax machine supplements which educational leaders, involved in these projects, use to communicate or coordinate distance education opportunities (Garnette and Withrow, 1989):

1. Oklahoma State University Arts and Science Teleconferencing Service (ASTS). The Midlands Consortium is a five-year project based at Stillwater, OK. Primary focus in Oklahoma, Kansas, and Missouri is producing instructional programs.
Alabama and Mississippi provide satellite downlinks, microcomputers, and teacher training (Bruder, 1988). It was a 1988 recipient of a $5.5 million Star School award (Garnette and Withrow, 1989).

2. Eastern Washington University/Educational Service District 101’s Satellite Telecommunications Educational Programming (STEP). The high school courses offered are pre-calculus, Japanese, advanced senior English, Spanish I and Spanish II. Staff development programs are also offered to educators via satellite, and services are provided for community education (Talbot, 1988).

3. Texas's Ti-IN's United Star network at the Region 20 Education Service Center in San Antonio, TX. It was a 1988 recipient of a $5.6 million star school award. They are provided with assistance from California State University-Chico, Western Illinois University, Mississippi State University, the North Carolina Department of Public Instruction and Region 20 Education Service Center in San Antonio, Texas. Public Schools being served at the beginning of the grant were Alabama, Arizona, California, Colorado, Illinois, Montana, Mississippi, Minnesota, Nebraska, North Carolina, North Dakota, Nevada, Oregon, South Dakota, Texas, and Washington (U. S. Department of Education, 1988).

4. Satellite Educational Resources Consortium (SERC). The primary agency is the Southern Educational Communications Association, Columbia, S. C. Courses are offered for high school students, inservice training, graduate credit courses, and a pilot basis for elementary science students in grades 1-4. It was a 1988 recipient of a $5.6 million Star School award. The administration is located with the Satellite Project, Kentucky Educational Television, Lexington, KY. The fourteen states served include Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Nebraska, New Jersey, North Dakota, Pennsylvania, South Carolina, Texas, and Wisconsin. The public television station and local school districts in Cleveland, Ohio and Detroit, Michigan, are also participating (U. S. Department of Education, 1988).


6. Instructional Technologies, Utah State Office of Education, Salt Lake City, provides the accelerated learning Spanish project via satellite television. It is also sponsored by the Bonneville International Corporation and the IBM Corporation. They serve
subscribing schools in the western and mid-western part of the United States.

7. Technical Education Research Centers (TERC) focuses on development of "hands-on" science programs, Starnet, for secondary students in the Northeast and on the East coast. It was a 1988 recipient of a $2.4 million Star School award. Those involved in this consortium include the Minnesota Educational Computing Company, University of Michigan, University of Virginia, City College of New York, Tufts University, Boston Museum of Science, Pepperdine University, Arizona State University, Northwest Regional Laboratory in Portland, Oregon, and the Biological Sciences Curriculum Study Training Center in Denver, Colorado. TERC is serving students in Massachusetts, Michigan, Minnesota, New York, Virginia and adjacent states (Garnette and Withrow, 1989).

TERC is one example which illustrates the collaboration of partnerships. The project focuses on computer-mediated communication (Bruder, 1989). The strategy is to involve students in cooperative hands-on projects with access to telecommunication resources to plan projects, obtain expertise, learn techniques, and share results and data among other students, mentors, and scientists worldwide. The educators involved in the process with students and in the staff development projects are able to communicate through the Public Television's computer conferencing forum called Learning Link (Spielvogel, 1987; Learning Link, 1988).

The University of Colorado in conjunction with the New York Institute of Technology and Western Colorado University developed a computer-mediated forum called MicroNet in an attempt to provide assistance to science educators in their secondary schools. It was also designed to help uncertified educators study for courses they needed to acquire certification. The difficulty discovered with this service was that it does not work with students who learn better with traditional ways. A printed newsletter is needed to communicate in order to keep the system working effectively. A threshold number of participants are needed to keep the interest going with the forums (O'Shea et al., 1990).
Schamber (1988) relates that information systems which integrate computers with new technologies are rapidly being developed. For example, microcomputers can be linked to laser readers that access information on optical disks. Optical disks such as CD-ROM, can store large databases, and interactive video disks allow manipulation of still and moving video images along with data, text, and graphics. Fiber optics technology is expected to provide computer-mediated communication expert systems the capability to access these type of services (Douglas and Bransford, 1990).

Research and Evaluation

The nationwide literary research conducted by the U. S. Office of Technology Assessment (1989) found that many questions have been raised regarding effectiveness, methodology, and design due to the implementation of distance learning projects during the decades of the 1980s.

Moore (1989) helped summarize distance education literature for the U. S. Office of Technology Assessment and found distance learning appears to be as effective as on-site, face-to-face instruction in the classroom. However, this extensive literary research pertained to applications for adult learners in nontraditional programs and for training of professionals in business, industry, and the military. These findings confirm that most applications to date have been with academically advanced high school students and independent adult learners--those who already possess strong study skills, high motivation, and discipline.

The single greatest problem facing a systematic assessment of the impact of the microcomputer revolution on teaching and learning is the lack of sufficient numbers of studies in key areas. Findings, in all aspects of its usage for education, indicate that computer applications have an important role to play in the future of education, but the exact nature of that role has only begun to be explored (Roblyer, 1989).
Galvin and Bruce (1989) reviewed audio-graphic computer telecommunication projects. These projects utilized the Optel-electronic blackboard system which provided two-way audio and two-way computer graphic/text illustrations. They specifically reported on an advanced placement course selected among 42 Board of Cooperative Educational Services (BOCES) in rural New York. The results indicated students did as good or better in their final examination. This analysis was in terms of how successfully the project worked as an instructional medium. The problems facing the planners in these BOCES are not exclusively technical involving computer hardware, software, and phone lines, but rather social organization which centers around scheduling, standards, and staffing between cooperating schools.

Barker (1988) held interviews to obtain user response to the TI-IN Network live interactive television courses for high school students and staff development in rural or small schools. He reports favorable responses from school principals and students. However, he found that students would prefer regular classroom instruction if available. It is more difficult to keep pace with satellite courses than with most regular high school courses.

The biggest benefit found for isolated, rural schools is the chance to take a foreign language. Such schools in 15 states have from three to five students taking German from Oklahoma State's satellite program. Other benefits cited were exposure to culture, technology, and excellent materials with quality instruction, along with opportunities for self-motivation involved in independent study (Barker and Garret, 1988). The negatives involved broadcast scheduling time, turn-around time for proper feedback, and absence of a real teacher. Maintaining student interest and motivation was difficult. The principals felt that students needed to be provided with more subject matter background and have an increase in the interaction between students and the teacher in the television/satellite studio.
Barker (1988) cites the following benefits for satellite television instruction:

1. Providing equity and increased quality of educational opportunity for small or isolated high schools.

2. Providing access to subject-matter experts or career role models not available in the local communities.

3. Providing interaction and joint activities with students in other schools.

4. Providing increased access to information and instructional resources.

5. Providing opportunities for teachers to acquire staff development courses and inservice training.

Hobb and Osburn (1989) compared German by satellite services beamed in from Oklahoma to high school students in Missouri and North Dakota. They found, by comparing traditional measures of school success—grades received and achievement tests scores earned—North Dakota students, along with students in Missouri districts, having purchased their own equipment, consistently out-performed those students in Missouri schools having leased the satellite equipment. Course implementation practices of leasing and purchasing were very different. The owners spent more time having coordinators trained and having someone totally involved with the students while they were taking the course. In leased situations the coordinators did not require or facilitate student software use or see to it that it was available for the students. This particular course uses microcomputer software to supplement the teaching received by satellite. The study focused on levels of interaction and participation between the three comparison groups.

The Division of Curriculum Studies of the Department of Education in Queensland, Australia, developed a distance education trial which utilized a variety of media or forms for presentation to eight 6 year students in eight different homes in an isolated, rural area. They started the production of learning packets early in 1985.
and finished in late 1986. The teacher was involved in this early planning and helped development along with a supporting project team (Research Services, 1987).

A microcomputer was linked with each homebound student. They shared the teacher who also communicated with them over the radio while they were doing their daily lessons. This information exchange was made possible via a satellite. Every two weeks a live television program was transmitted to the children by professional communicators. This high-cost coordinated learning system provided positive effects on the children and their families. Although technical breakdowns were frustrating, the overall detailed evaluations provided significant effects, especially in areas of confidence, verbal skills, critical thinking skills, interest, and motivation.

Computer-mediated distance programs in Europe evolved from mail-ordered correspondence courses (Sewart, Keegan and Holmber, 1983). This was also the case in Canada where full courses were developed with mainframe computers extending out to mini- and micro-computers in rural areas over the telephone lines (Cowper, Godfrey, Hart, and Sterling, 1987). China replicated these Canadian programs because of the difficulty for their populace to travel across cities like Shanghai to attend classes (Godfrey, Gong, Hart, and Smit, 1987). Consequently, findings in all these reports reveal no significant difference from correspondence courses as was the case when comparing to regular classroom courses reported by both Barker and Moore whose research was commissioned by the U. S. Office of Technology Assessment (1989).

Gee (1989) developed a group of distance education projects for rural students living in remote and isolated areas in the Canadian province of Alberta. After three years of development and implementation, he recommends that the best mix of technological delivery systems is the one that technically and economically fits the particular geographical location. One example involves many distance education teachers who work from their homes as tutor/markers, where they receive students'
assignments by fax machine, and use teleconferencing, and computer conferencing with computer-aided communication technology to teach their students located in isolated areas near the Northwest Territory.

The French government-owned telecommunications monopoly has put in place what most experts agree is the only video text network in the world that is a truly popular success. It is a gateway to 12,000 electronic information services in 18 percent of the French households. Through Teletel's "Minitel" terminals, which France Telecom distributes free of charge, 5 million telephone users can manage their finances, schedule airline and hotel reservations, and varied other novelties. This network is also linked to personal computers (Wright, 1990).

Pelton (1988) constructed a world map which graphically indicates 65 countries actively participated in satellite education exchanges. Most are one-way telecourses. The entire Western Hemisphere is covered. The Soviet Block nations are the only vast areas on the Eastern Hemisphere's map graphically left blank. India is one of the most active nations. Mody (1989) provides advice garnered from her active research and involvement in India. The following is a synthesized version which covers generic guidelines to the various modes of telecommunication media, but more specific to telecourses broadcasted with satellite or transmitted with microwave:

1. Understand the technology delivering the telecommunications.
2. Understand how to tailor-make and customize for special groups.
3. Understand the capacity of the endeavors undertaken.
4. Understand how to work the content for the programs.
5. Understand that education is a political and economic context.
6. Understand that the active dimension of programming for an audience is simplicity with an active audience asking questions.
7. Understand that telecommunications takes formative research, segmentation, and augmentation.

8. Understand that telecommunications offers an opportunity to rewrite and reconsider content in order to not give more of the same with a new media.

These research findings about satellite distance education services, provide strong inferences to computer-mediated distance education services, particularly because both satellite and cable delivery systems have the capability of suppling one-way digital text information which can be retrieved by computers. Accordingly, cable companies have long provided options for schools seeking televised educational information. The Learning Channel, formerly the Appalachian Community Service Network, has offered educational cable television for 20 years. The following two innovative commercial news-education programs were initiated during 1989 for secondary schools throughout the United States (Douglas and Bransford, 1990):

1. Whittle Communications Channel One, which provides free satellite-retrieving equipment to subscribing schools.

2. The Discovery Channel by Turner Broadcasting, which is delivered to schools through local cable services.

A wide variety of options are emerging for schools planning telecommunication projects, especially if they demonstrate an openness to divergent technologies (Hezel, 1990).

**Telecommunications Infrastructure**

An adequate rural telecommunications infrastructure is critical to all types of rural business activities, including agriculture and manufacturing, and particularly critical for the service sector, where most new job growth is expected to occur. The latter needs single-party access to the switched telephone network, high-quality transmission lines for reliable facsimile document and data transmission, equal access to competitive long-distance carriers, local access to value-added data networks,
mobile telephone service, and other new communications and information services (Parker, Hudson, Dillman, and Roscoe, 1989).

Digital telecommunications allow voice, data, image, and graphics to be combined. They can be compressed, edited, stored, and transmitted more efficiently and thus more cheaply than existing analog telecommunications systems, which have limited capacity and slower transmission rates. Digital switching equipment helps greatly reduce the costs of long-distance telecommunications and thus has immense implications for rural economies. Most of rural United States is expected to have digital switches by the year 2000.

Broadbent (1989) supports Dillman's (1985) view that rural areas must utilize new technologies to the fullest to acquire an economic advantage. The entire process involves more than policy change, equipment, and service. It includes utilization skills, motivation or desire to use technologies, and proper management. The telecommunication policies affect costs, capacity, and types of services available to schools wanting to use distance education (U. S. Office of Technology Assessment, 1989).

As educators begin to learn more about being served by the communication industry, they must exercise caution in order to evaluate the relationship between technological "innovativeness" of schools and the social components of the school system; human resources, management, and organization. This will help to more accurately understand how changes in technical structure precipitate and demand changes in social structures and vice versa. (Perelman, 1988).

The interconnectedness of complex (telecommunication) systems in and out of the educational circles, and particularly within the corporate world, enhances national and global interdependence between multi-ethnic and multi-cultural societies (Benjamin, 1989).
As familiarity with technology becomes commonplace, it will be easier and more enjoyable to travel around the world due to communications, micro-electronics, and transportation. This will create a global interconnected world in which biological, psychological, social, and environmental phenomena are all interdependent. In the past, the cumulative increases in the rate of change due to knowledge has been the decisive factor in the making of the present modern world. Knowledge itself undergoes rapid restructuring and will continue to as it doubles and doubles again as it has during the 20th century.

These opinions are relative to the perceptions regarding ruralness and do not relate to isolated, rural, remote areas or the agriculture economy. Tweeten (1987) points out that computers and related telecommunication technologies will contribute less to the value of agriculture output than what they cost in time and money in these rural areas. He views them only as a consumption good rather than a productive farm tool. This does not, in his opinion, mean such purchases are unwise. It merely means that most of the value of the computers and related telecommunications is the pleasure it provides farm operators, as well as putting isolated, rural areas and their schools more in touch with the rest of the world and reducing socioeconomic uniqueness.

Social consequences in regard to the evolving information age are not based on locality. The future electronic “unbound” geographical influences may become a dominant influence on individual behavior. This implies that changes occurring in those interactions may not simply be extensions of the mass society trend, as has been the case in recent decades, but the move might be to satisfying wants with customized products and media. New technologies are seldom neutral in terms of human consequences and tend to carry with them the seeds of opposition that may stop or limit their development by those who do not accept the fact that transformations are occurring (Dillman, 1985).
Rural information infrastructure must contain a telecommunications system with equalized capability and service. Fiber optics is likely the most important feature in order for all to have the ability to use the available network signals. Rural people will support the system if they have the capability to use the available technologies effectively (Dillman, 1985).

**Telecommunication Policies and Standards**

The sociology of information is an important concern because the information policy issues involve scientific, social welfare, and foreign policy matters as well as the fundamental relationships of the government and the governed (Molnar, 1986). With structures being laid now, the social science community, with knowledge and perspective to lend, is close to being too late to affect certain critical policy issues. These issues involve dominant problem areas such as resources adequacy, environmental quality, and institutional capacity (Dillman, 1985).

The U.S. Office of Technology Assessment (1989) cites that telecommunication policies can be barriers to implementation or they can expedite development. The main issue involves spectrum allocation. This is because the telecommunication industry is undergoing a complete transformation with the advent of new technologies and changing governmental policies and regulations. This puts education at a disadvantage in a deregulated telecommunication marketplace.

These issues have to be dealt with by both national and individual state leadership groups interested in turning policy in favor of education. The Office of Science and Technology Policy is behind a high-performance computing bill that would set up a three-billion-bit-per-second (3 giga bytes) network called the National Research and Education Computer Network (NRECN). This technological enhancement would link higher education with facilities in government and industry and create a directory of users and resources. Natives of computer networks say this is desperately needed (Wright, 1990). This kind of legislation would help expedite the
notion of the electronic rural heartland of America (Adkins, 1989). According to Acker (1989), this type of spectrum allocation would allow faster and more powerful technology like high-density television (HDTV) or interactive services digital network (ISDN) to pass through the telephone lines.

The heart of rural telecommunications is the local telephone companies and cooperatives, usually called local exchange carriers (LECs). There are approximately 1,400 LECs in the United States including 22 Bell operating companies (BOCs). Although the latter are in urban areas, they connect rural LECs to American Telephone and Telegraph (AT&T) and other long-distance carriers. BOCs serve about 80 percent of the telephone households in the United States, but most rural areas are served by 1,400 independent (non-Bell) telephone carriers. Consequently, seven different national associations plus a number of state associations exist and are concerned with the politics of policies, standards, and rates (Parker et al., 1989).

There are also strong federal regulatory authorities exercising influence on policy in both the executive and legislative branches. The Department of Agriculture's REA is a source of financial assistance and technical advice on standards and equipment for rural carriers. The Federal Communication Commission (FCC), National Telecommunications and Information Administration (NTIA), along with various congressional committees, all exercise great influence on national policies affecting educational telecommunications. For instance, a NTIA report, called Telecom 2000, recommends a goal of universal information service by the year 2000 and recognizes that special policy action will be required to ensure that telecommunications and information services are available to rural areas in the United States (Parker et al., 1989).

Educators express that it is politics, power, complexities of the technology, expense, time and money which conspire against acceptance and implementation of instructional networking technology (Rogers, 1989). However, school leaders in
America have it relatively easy with policies and regulations as compared to difficulties their peers have in many other countries. While the United States Congress provides legislation with financial enticements, there are other countries who have legislative and political hurdles to overcome in order for education to have minimal access to the media. Bureaucracy, in some countries, also provides a barrier to the transfer of this technology since telecommunications often involves the decision and authorization of several ministries and the military establishment (Broadbent, 1989).

The regulatory standards for compatible equipment are having trouble keeping up with the technological advances. When the International Standards Organization finally agree on standards for equipment for world telecommunication compatibility, new technology has already outdated the new standards (Yoder, 1990).

Policy makers at all levels of government will need to focus their attention on four closely related areas (U. S. Office of Technology Assessment, 1986):

1. expanding the amount and capability of technology in schools;
2. providing training and support for teachers;
3. encouraging innovation in educational software; and
4. supporting research, development, demonstration, and evaluation, with emphasis on ties between research and the classroom.

Telecommunications policy affects costs, capacity, and types of services available to distance education. Congress must review and shape policies to reflect the Nation's educational needs. Where no clearly stated educational technology policy exists, planning tends to be scattered, and technologies are often implemented more haphazardly. However, where technology planning is unified by policy, the likelihood of unified funding and cost reduction is enhanced (Hezel, 1990).
**Barriers and Issues**

Primarily, barriers fall within the following three categories for both local area networks and distance computer-mediated communications (Lewis and Wall, 1990; McNeil, 1990):

1. **Technical barriers:** This covers the lack of standards, incompatibility between hardware and software, lack of proper instructional software and instructional requirements. For distance learning, there are two inherent problems: providing the student with sufficient educational resources, and providing timely feedback from the teacher to the student. Other technical barriers involve the pace of change, inequitable access to telephone service, access to computing, inadequate software design, and complications with support services.

2. **Structural barriers:** This includes budgeting policies, lack of incentives, lack of training or technical support, poor support service, software development, financial resources, access or disproportionate access, extra time it requires to use technology, and underutilization. For distance education there is a need for collaboration regarding rules and regulations, particularly transmission across state boundaries, access to libraries, and lack of accessing skills.

3. **Attitudinal barriers:** This involves focusing only on mechanical or hardware aspects instead of human aspects and various forms of faculty resistance. For distance education they cite barriers pertaining to faculty resistance to public exposure and off-campus learning, plus poor marketing orientation.

States, localities, the Federal Government, and the private sector all have roles to play in planning, funding, and implementing distance education. The government report contended that future development will require involvement of these sectors in four major issues or barriers (U. S. Office of Technology Assessment, 1989):

1. telecommunications policy;
2. research, evaluation and dissemination;
3. the teacher's role; and
4. the infrastructure for distance learning.
Acker (1989) and Perelman (1987) reveal these issues and barriers should also include the following aspects:

1. the role of the learner, and the social-technical phenomena;
2. the social-technical phenomena involved in leadership.

Hezel (1990) approaches this same concern by explaining how policy leadership responding to such issues may arise predominantly at the local level, at the state level, or at the national. Nationally active groups are the U. S. Department of Education, Council of Chief State School Officers, other such central organizations, and various federations of interested individuals. Issues he stressed which are not included in the above listings are the following:

1. economic and funding considerations,
2. technology planning and implementation policies and guidelines, and
3. individual state governance issues.

Solutions for these issues might be easier if priorities were established for a coherent federal policy which supports and assists states in planning and funding technology development. These priorities include state supported projects where aggregate institutions share and cooperate innovatively with an openness to divergent technologies. Also, where they demonstrate an affirmative commitment to evaluation followed by an interest in sharing research data and results. These priorities also include encouragement of expanding consortia, establishing publications, and holding dissemination meetings for further adoption of technology and telecommunications (Hezel, 1990).

Social-technical Issues

Earlier works of Johnston, Chu, and Schramm, pioneers in instructional television evaluation, affirmed that research has established that media can teach (Gustason, 1989). Carlisle (1987) conducted a case study involving interviews with 158 teachers, school administrators, and media coordinators or library media
specialists in 70 communities located in 12 mid-western states. His findings, based on this sample, provided in-depth insight into how school library media centers are adequately utilizing a variety of "stand-alone" technologies for supplementing classroom instruction. His study implied that this expertise serves as a prerequisite to venture into utilizing "network" technologies that reach beyond the classroom. Educators' knowledge and subsequent use of microcomputers precedes most endeavors to utilize telecommunications technologies that extend beyond the classroom. As this technology movement is entering into the second decade of computer use, educators and researchers can benefit by looking more closely at what educators are using computers for, how they are using them, and what has happened as a result (On line, 1988).

The mid-1980's surveys of pre-collegiate use of computers found enough hardware in the (public) schools to have a significant impact on instruction (Lewis, 1989). Figure 2 illustrates the percent of schools reporting the use of videotape recorders (VCRs) and comparing with the percent of schools reporting the use of computers (U. S. Office of Technology Assessment, 1989). The increase during six years has been comparable for both technologies from 40 and 30 percent in 1982 to 95 and 90 percent, respectively, by 1987. Figure 2 shows a typical curve denoting normal diffusion patterns (Rogers, 1983). The microcomputer inventory in schools doubled from 1984 to 1985 to reach 1.2 million (Troxel and Grady, 1989). Estimates for 1989 are about 2.8 million in the United States schools (On line, 1989).
According to the first National Assessment of Educational Progress report on computer competence, based on 1986 data, the average American (secondary) student has little more than a passing acquaintanceship with the computer beyond word processing (Martinez and Mead, 1988). Congress's office of Technology Assessment (1988) reported that those students who do, use computers little more than one hour a week to reinforce traditional teaching practices. The National Assessment found that computers are seldom used in subject areas such as reading, math, or science; rather, use of computers in schools is largely confined to computer classes. They also report that many computer coordinators have minimal training in computer studies and rate themselves as mediocre in their ability to use computers.
One-third of the nation's public school teachers have not completed 10 hours of computer training. Most of that training concerned learning about computers, not how to teach with them (Lewis, 1989).

Ten of the 15 largest American colleges of education require the students to complete a computer literacy course. Brigham Young University and the University of Northern Colorado offer an undergraduate degree in computer education. Graduate schools across the nation, for the most part do not have the resources to keep current with the rapid changes in technology (Troxel and Grady, 1989; McNeil, 1989). Moursund (1989) reviewed the undergraduate programs of the nation's colleges of education and found the majority of educators graduating from college are computer illiterate.

Current estimates pertaining to American teachers actively using technology to any significant degree as part of their instructional program have the following range:

1. According to the National Education Association, the estimate is less than 15 per cent (Goodspeed, 1989).

2. According to the American Federation of Teachers, the estimate is less than 20 per cent (Goodspeed, 1989).

Overcoming fear is at the heart of the problem of adopting education technology in American Education (Troxel and Grady, 1988). Computer anxiety is still part of the problem associated with understanding technology in education (Bracey, 1989). Marcoulides (1988) reported a very strong correlation between computer achievement and computer anxiety. Computer anxiety is highly related to computer aptitude in a negative way: the higher computer anxiety, the lower the aptitude.

Kerr (1989) delves into these barriers further by illustrating the characterization of educational technology and teaching, considering each field from
two perspectives—that of the technologist, and that of the teacher. His research shows how their views are framed in response to the current state of the movement to radically restructure education. The technologist's vision of technology and the teacher's vision of technology contrast significantly. This is because teachers do not view their job as creating or inventing instructional designs and development, but rather as selecting such to meet their classroom objectives or compliment their planned classroom activities (Cambre, 1984).

Most educators do not want to become technologists in addition to being educational professionals (Heuston, 1988). Educators, like all people, will turn away from what appears too complicated or too demanding of their time and talents. They perceive the material or task too demanding relative to their perceived self-efficacy in response to demands on their time and energy (Solomon and Leigh, 1984; Beentjes, 1989).

To most educators, "educational technology" still implies devices—hardware and associated software—not the process approach of instructional development. There is a variety of research showing that when teachers confront the technologist's vision of precisely engineered materials, controlled experiences, and measured outcomes, they may not react with enthusiasm but with rejection. The teacher's world is substantially limited by powerful social and administrative pressures to teach in particular ways with little opportunity in a day's schedule to do otherwise (Kerr, 1989).

These restraints were substantiated in a case study consisting of a six months' tour where researchers visited 25 randomly selected small-town school districts west of the Mississippi River. They found little evidence showing that school administrators have active dialogue to change education from teacher lecture and seat work. Schmuck and Schmuck (1989) wrote:
"We drove the 'Blue Highways' of America in search of democratic participation, i.e., citizen involvement, administrators and teachers sharing influence, teacher collaboration, student voice, and cooperative learning in classroom. For the most part we found only superficial forms of democracy in our small-town schools." p. 3

They cited few instances where students had learning activities in discussion groups and made no mention of participating in learning activities involving technology. One historical and social barrier based on an old, deeply rooted scholastic inheritance is that teaching is telling, learning is accumulation, and knowledge is facts, strung together by rules of procedures (Cohen, 1988).

After initial bursts of enthusiasm, educators have begun to awake to the difficulty of meaningfully integrating computers into a school curriculum and instructional program. And they have, on occasion, even been known to refer to microcomputers as a technology in search of an application (Molnar, 1986).

Innovations do succeed at the core of public education, but they tend to be superficial. Many have swept across the nation's schools, quickly finding thousands of adoptions but disappearing equally quickly, leaving few traces of their existence (Cohen, 1988). The best current case is effective schools programs or renaming school libraries to "media centers" with some new technology filed inside. Cohen cited that Dewey also used this rationale in 1938 in the following passage:

The reform failures are due to the materials of the reform itself: inadequate curriculum, insufficient teacher preparation, too little time, or not enough money. This has long been a popular explanation, perhaps because it permitted reformers and partisan investigators to chalk the persistence of old patterns up to teachers' perversity or stupidity, or to the absence of good alternatives in curriculum or instruction. But these explanations are no longer easy to accept, for as Larry Cuban and others have pointed out, the old patterns of teaching have persisted through the provisions of many of the alternative curricula and instructional improvements that reformers demanded. They have persisted as well through dramatic improvements in the education of American teachers. This suggests that the barriers to instructional reform are either located elsewhere or are more deeply rooted. p. 244
Confusion about technology's role in education is widespread. Many administrators view computers as "another" technology rather than a source of artificial intelligence capable of interacting with students in a private instructional mode, a mode which, many believe, extends a teacher's capacity to help children learn with the machine as the third team member. On the other hand, some school officials are so enamored of technology that they miss the centrality of the computer as a stand-alone work station within a classroom capable of instructional core tasks. Nor do some make a distinction between that and its capability of assisting with other telecommunications and technologies such as video disks, CD-ROM, cable television, transmissions, and national satellite instructional networks. In other words, the confusion means that there is no single focus or plan to utilize "stand-alone" or "network" technologies or both (Heuston, 1988).

White (1989) provides insight into the phenomena of the hype some educators place on technology by using the simile; "We have tigers in technology with insects in instruction." One of her examples is a school that has a laser disk hooked to a computer and a remote control for instant retrieval of still and motion films, tape, text and sound. But the instructional content to utilize this technology is lacking, thus exemplifying that new communication developments are often touted more than the educational benefits. Locatis, Letourneau, and Banvard (1989) explain this versatility in the same context with the conclusion that such hypermedia has strengths and weakness and that it may become merely hyped media unless good teaching applications are developed to better utilize its capabilities.

Along with providing some significant uses of technology in educational settings, White emphasizes that the following questions must be addressed when deciding to use such technological tools (White, 1989):

1. What is the educational value?
2. What type of information is best presented through which medium?

3. How will we get more tools for education that combine quality technology with quality education?

Landauer (1988) supports White's concern by writing, "It does not involve so much how education will be changed by technology as how the wisdom of education ought to influence technology."

Although it is essential for schools to share resources, the involvement in the decision-making process, among layers of school officials, often creates major roadblocks which are usually political, not technical. Another issue compounding the technological utilization dilemma is that some school leaders have a difficult time understanding the magnitude of the changes which have already taken place outside of the school environment (Wall, 1986). They often are skeptical or have rejected the ideas without taking the proper time to fully inform themselves as to how these electronic machines can be utilized as tools for education (St. Clair, 1989).

St. Clair, speaking for secondary school principals, feels there is a very practical explanation as to why teachers are not properly adapting technology in their classrooms. It is simply because they lack not only training in the applications and forms of assistance that technology offers, but they do not have the time, resources, or desire to take time to explore their creative capabilities. Thus, during the time the information revolution is closing in and around our nation's public schools, technology, although existing and in place in the public schools, is largely unused and/or underemployed (Troxel and Grady, 1989). Teachers are at the heart of the teaching and learning process, and before schools can realize full potential, teachers will have to rethink their roles. The knowledge explosion is too much for any one person to handle without accurate assistance from telecommunication technology (White, 1989).

Many students are not lazy; they merely prefer the certainties of mechanical learning to the risks of more adventurous work; so teachers think students are
allergic to it. And teachers must take on a large agenda, must wean students away from the safety of rote learning to the hard work of framing and testing hypotheses, and build a climate of tolerance and curiosity about unusual answers (Cohen, 1988).

Teachers who take this path must work harder, concentrate more, and embrace larger pedagogical responsibilities than if they only assigned text, chapters, and seat work. They also must have considerable additional knowledge and skills to pull it off effectively. They must, for instance, deeply understand the material and grasp how students think about it. They must be able to comprehend students' interpretations of problems, their mistakes, and their puzzles. And when they cannot comprehend, they must have the capacity to probe thoughtfully, tactfully, and then present in ways that engage students' minds in order to help students frame fruitful hypotheses and discard unfruitful ones. None of this is needed if teachers rely on texts and worksheets. If they proceed in this standard instructional format, they can rely on the authority of text or official position in disputes with students, or when uncertain about how to proceed (Cohen, 1988).

The most important barriers to this technological revolution will not be technical or economic, but conceptual and organizational; and unless controlled, the outcome of these changes may be undesirable. Educators must begin shaping the uses of these emerging tools now if we are to have a bright educational future (Dede, 1989).

Educational leaders should not be trying to supplant the models and practices that teachers have developed to cope with the uncertainties of their world, nor should leaders assume that that world can be radically altered over the short term with models created under ideal, not real life, conditions. Instead, leaders should try to develop (jointly with teachers) models of teaching with technology (in a sense of using tools, materials, and process) that recognize those difficulties, seek to alleviate their impact, and provide at the same time the opportunity for educators to expand their
thinking about what is possible in the classroom (Kerr, 1989). The crucial question for educators to focus on is, knowing as little as we do about how people learn, how can we best harness the power of technology in service of learning (Nichols, 1986)?

Telecommunication media as distance education tools are ideal for individual criterion-referenced (heuristic) learning and class norm-reference (agogic) learning. Although there is a difference regarding time and expense between these alternative educational performance-based paradigms, modern telematic technology is intrinsically and progressively heuristic—it both facilitates and demands heuristic learning (Perelman, 1987). The ultimate goal is for learners to become teacher-independent thinkers, learners, and problem solvers. The general aim is to create tools that enhance the chances that learners adopt a self-aware transfer state of mind, and that they be provided with the transfer-relevant access skills and heuristic strategies, and a sufficiently rich taxonomy of problem types for each domain of study to make the application of such search heuristics worthwhile (Pea, 1988).

The greatest challenge facing education is not technology, not resources, not accountability—it is the need to discover with our students a new way of thinking. Perhaps by understanding and taking advantage of the concepts of "cognition enhancers" and "artistic use of hypermedia" one can combine computer and telecommunication (information) technologies to achieve this end. Cognition enhancers combine the complementary strengths of a person and an information technology (Crowell, 1989). They provide ways to empower the environment and simulate long-term memory within the hypermedia capabilities of storage and retrieval (Dede, 1989).

The heart of this technological revolution is not technological, it is intellectual as it is a new tool for the human mind (Dede, 1989). The essence of these new information technologies is that they can change how we carry our mental operations, how we represent information, view a problem, analyze problems, and subsequently
make decisions. This affects long-range planning, predictions, publishing, and enhances the mental tool of imagery to the status of a new language. This implication poses the question as to, "how shall imagery be taught as a powerful tool of the mind?" (White, 1988)

The essence of technology is the human interaction which has created a social impact resulting from the widespread adoption of the information technologies. That is technology which allots speed, capacity, fidelity, miniaturization, capability, range, and ability to select along with its relative importance of telecommunication transmissions. Included are also the impact of its (potential) ability through artificial intelligence to conceptualize problems and possible solutions in ways beyond individual human capabilities (Dillman, 1985)

Technology-based education has generally substituted individualist goal structures and removed the teacher as an authoritative source of information. Acker and Hashim (1989) propose that computer-based instruction based on collaborative goal structures may be an effective educational approach in many situations. Acknowledging the cost involved, particularly with computer-aided instruction, they realize a concern that faculty will resist being "demoted" to the role of assessing the work of a machine. Admitting that such instructional media may promote social isolation, they promote the argument for considering group-use of media-based technologies in certain contexts with both individualistic and cooperative learning environments as beneficial, with one being the more appropriate depending on the pedagogic goals and situational constraints.

Socio-technical theory is emerging as an alternative to the systems-efficiency model, methods time management, or the Taylorism model. The "Socio part" refers to the humanistic part of individuals, whereas the "technical part" brings in the connotation of technical efficiency models as being out of touch with the personal, subjective, creative aspects of human reality (Perelman, 1987). In other words,
people do not want to be subservient to machines and systems. The remedy is to create a work process that increases worker autonomy, initiative, and collegial collaboration (Wirth, 1980).

Perelman (1987) cites Trist's work on socio-technical systems, as does Wirth (1980) when focusing on origins of this theory which in essence recognizes that technological change and social change are interdependent and inseparable. A direct opposite is the issue of automation, particularly the assembly line scientific model called Taylorism after Fredrick Taylor who refined the model in the 1910 to 1920 era (Acker, 1989).

Trist's "socio-technical systems" approach to industrial automation has been applied successfully to plants in Britain, Scandinavia, Japan, and elsewhere in the world for over 30 years, but only recently has been "discovered" by American companies. The payoff so far for industrial firms that have switched to the socio-technical approach to planning innovation is plants that are 30 percent to 50 percent more productive. The key is collaborative teamwork and participatory management (Perelman, 1987).

**Transfer of Technology Leadership**

Change is effective when there is choice and commitment by the people involved, particularly if all the people affected by the change can participate (Pochowski, 1990). The effort must focus on the process which intends to change student learning. Both Rogers (1983) and Rieber (1989) provide insight into what it takes to implement long-term change, particularly regarding innovation and/or technology. This entails the process where people involved or affected gain knowledge by being exposed to the function the device or process contributes. This helps form attitudes and provides them with a basis to either accept or reject the new technology or innovation. Once the decision is made to adopt and implement it for actual use, there must be continued use or collaboration to reinforce the decision before it
becomes a real part of the environment. This latter stage of reinforcement or usage could last from three to five years or more depending upon the nature, utility, or gravity of the technology or innovation.

However, in regard to recent transfer of technology in schools, Moursund (1990) alleges that not only is there more change, but change is occurring at a faster rate than ever before in school situations. For educational leaders, one result of this change is an exhilarating but potentially frightening challenge to our educational system. Leaders should understand that the information age means understanding problem-solving and higher-order thinking skills.

Educational leaders initially involved their schools with technology due to short-term state or federal funding sources backed by local donations. In many localities schools acquired computers or satellite retrieval dishes from fund drives or gifts from business or corporations because of promotional advertising and income tax benefits. Rogers (1985) found that getting microcomputers as gifts, not the intended educational value, was the deciding factor for early adoption in the San Francisco area. Teachers are often left stranded to find ways to utilize the technology in their classroom, while others gradually left them sitting in the classroom unused (Alexander, 1986; Kennedy, et al., 1986).

Perelman (1987) emphasizes that this is exactly the crux of the problem regarding technology transition. Most often technology has been purchased as a supplement rather than for making a change in the process of teaching and learning, thus acquired as an add-on to the existing program, without any significant training for proper utilization. Wolman (1988) speaks to the underutilization of available technology by clarifying that it is not unique to the educational instructional leaders. It is evident throughout the nation that the array of technology purchased is not being used to its capability or capacity; that is, technology is under-used. It is a widespread phenomenon that time and resources are often not used efficiently in
training people on the equipment. Thus, non-training is a waste of financial resources, especially because the trend is to not invest in proper training to properly utilize the technology.

The desire to have rural schools become totally involved with computers, satellite instructions, and videodisc technology is substantiated by a national survey of rural school board presidents. Eighty-four per cent of those surveyed felt one of the most important requirements for hiring a superintendent was full awareness of current research practices and innovations along with a desire to use technology as part of the instructional process for students in their school districts (Kennedy and Barker, 1986).

Bruder’s (1990) longitudinal survey among computer coordinators (2,000 nationwide) ascertained the five most common grievances they have regarding their position working with teachers and administrators. Their duties involve purchasing and evaluating hardware and software, maintenance on both, and providing staff development and training in school districts. The findings were the following, supported by a typical remark some respondents noted during the survey:

1. Lack of time and staff to accomplish the task: "I have added coordinator responsibilities and [teach] the same number of classes as always...Even one more person to help with the load would be appreciated."

2. Lack of administrative support. "There is a complete lack of use of technology in education by administrators!"

3. Lack of teacher interest: "Our teachers have little or no computer literacy skills, but expect to be experts without putting in time to learn, leading to interruptions in my schedule to answer their questions, and interruptions in the class time..."

4. Lack of Budget: "I am tired of grant-writing, contests, and outright begging!"

5. Lack of additional compensation and appreciation: "It's frustrating...no monetary compensation for the extra effort put in by the coordinators." p. 29
The study's most disheartening exposure of this year's survey is the delicate state of budgets for hardware, software, maintenance, and training. In school districts with under 1,000 students (26% of the respondents), the average annual budget is $22,500. Problems are also occurring in school due to delays in installation of telephone lines, turnovers in superintendencies, budget cuts, and constraints at the local and state levels, all of which impose hardships on programs, teachers, and students (Garnette and Withrow, 1989).

Most of the crucial problems involving educational technology include problems with people and administrative organizations. Thus, Thomas and Peterson (1984) emphasize that special attention should be focused on helping administrators develop leadership skills. Their experience in Minnesota found that the need is compounded among cooperating rural school districts. Because regional distance education services cover vast areas, administrators must try to convey a sense of ownership and retention of a high degree of autonomy and flexibility among those who are cooperating. However, this type of cooperation is difficult to maintain because each school district's independence can serve as a barrier to total cooperation in such clusters. This loosely coupled organization among local schools gives rise to the view that reform will not succeed unless schools are reorganized (Cohen, 1988).

One reason for this is that most schools are not clear about their goals with technology and therefore cannot command any collective economic power or extend beyond parochial social institutions within the communities in which they reside (Nichols, 1986). There is an emergence of organized cooperatives that expands beyond state boundaries for compatible school districts. Two examples cited in this report are the Western Regional Educational Telecommunications Cooperative (1989) in the western United States and the Association for Supervision and Curriculum Development throughout the nation (Cawelti, 1989). Although they are adhering to the
principle of strategic planning between local leaders and their patrons, they are also exhibiting a collectiveness of being a part of a picture bigger than a state or region.

The leadership trend has now shifted to consortia or state leadership through the benefit of strategic planning. The idea is to center upon a sound educational plan involving leaders, educators and patron. (Western et al., 1989; Cawelti, 1989). Educational utilization of technology is a part of the plan in ASCD's High School Futures Planning Consortium. The consortium involves 25 high schools across the nation. The idea parallels Perelman's suggestion that from five to 15 local school systems should commit themselves to developing and implementing a comprehensive strategy from socio-technical transformation over a period of at least six to ten years. The plan initiated by the Association of Supervision and Curriculum Development (ASCD) focused on developing principles for total school organization, entire school curriculum, staff development, and then technology.

Legislation for the Perkins-Hawkins Applied Technology Act, which is a reauthorization of the Carl D. Perkins Vocational Education Act, earmarks funds which could proliferate such consortia or cooperative ventures (West, 1989). Likewise, there are provisions in the Rural Economic Development and Partnership Act to provide incentives for rural community and area economic development under large scale cooperation (U. S. Congress, H. R. 381, 1990; U. S. Congress, H. R. 4576, 1990).

Commonalties found among all these educational telecommunication technology projects is that the formation is based on collaboration and cooperation made possible though collective endeavors of school leaders who created communication-management networks. Such networking consists of loosely organized multi-state groups made up of a mix of school districts in clusters, partnerships, consortia, associations, or cooperatives. They also included individual state agencies, regional
educational laboratories, university centers, and/or private or local institutions (Nachtigal, 1980; Nachtigal and Hutchins, 1984; Nachtigal, 1990).

Some school administrators are streamlining the flow of information within schools and school systems to collaborate relationships with businesses and with other community agencies. This change is coming about because of technological innovation driven by the ideas about education; technology merely makes these ideas possible (Mecklenburger, 1989).

The Star School projects are required to build such collaboration through consortia to bring together local education agencies to maximize the infrastructure for distance education (Glickman, 1988; Bruder, 1989; U. S. Office of Technology Assessment, 1989).

Stevens (1989) portrayed this emerging phenomena by developing the concept "cotechnology," which has the following working definition:

It is any technology used by people jointly, especially if used by man or in a group; any hardware, software, groupware, or techniques the purposes of which are beneficial results for all participants; networking technology to support coordination, cooperation, collaboration, and conflict management, especially within competitive companies and pre-competitive consortia that do basic research, organizing of export markets and training of regional workforce; a wide range of solo-to-group, group-to-group, solo-to-many, group-to-many, and many-to-many technologies, usually involving computers and sometimes multi-media telecommunications of text, graphics, images, video, audio, models, simulations, smart documents. p. 2

The emphasis within this context recognizes economic and marketplace pursuits which complement partnership endeavors that are conducive to vocational education workplace needs, particularly the research and instructional facet apparent to isolated schools and their communities. Principal Jarvis, who condoned the family "electronic educational trip," exemplifies this in expressing the belief that partnership programs should be organized into three broad areas that tend to the vocational, human, and academic needs of students (Administrators anxious, 1990).
Intellectual productivity is the key to a strong national economy. The past 30 years has witnessed a tremendous advance in technologies that relate to knowledge transfer; and although these technologies are often perceived as mathematics, technical or computational, they are in truth related more closely to libraries than adding machines. It is a first cousin to a book. However, these new information technologies provide ways to access the knowledge base which are not dependent upon time and place constraints; as are libraries. Such electronic information transfer is affordable and vital to the intellectual productivity enhancement business. It can be shared via networks with a comprehensive strategy for proper and long-range management of information (Van Horn, 1986).

Rationale for larger scale state-wide consortium follows similar lines of thought to better utilize administrative resources on the need to share the costs and benefits for using telecommunications. The incentives for cooperation are compelling when considering the following options (Olson and Morrison, 1987):

1. shared costs, lowering each "unit's" level of financial commitment,
2. development of a superior network, both in its technological capacity and programmatic possibilities,
3. lowered leasing and production costs on a per-unit basis,
4. shared production of electronic and print materials,
5. shared promotion and marketing goals, fostering a shared vision of the system of education in the state,
6. increased potential to raise alternative funds,
7. opportunities to provide "electronic consolidation" of educational delivery systems,
8. opportunities to provide the businesses with both a strategic and competitive advantage in the marketplace.
Such types of consortia, as outlined by state boards of higher education and their affiliations, (A description of the Western regional, 1988) have responsibilities which will plan, design, and implement a telecommunications network to meet the needs of students, business, industry, and the professions. A statewide model should have the following direction (Olson and Morrison, 1987):

1. The development of feasibility studies for the utilization of telecommunications in vocational centers, school districts, post-secondary institutions, Bureau of Indian Affairs schools, Tribal Colleges, and other non-traditional educational settings such as business, industry and continuing education programs. Needs assessments would substantiate cooperating members’ collective educational needs that could be met while utilizing a statewide telecommunication network.

2. The development of feasibility studies for cooperation with the Economic Development Corporations and state promotional associations. This would help assess the potential of a statewide telecommunications network to enhance the state’s economic development and provide strategic and competitive advantages to business and industry.

3. The development of a system to identify and recruit "loaned executives and specialists" from telecommunication industries in order to provide technical assistance to fulfill the responsibility of conducting a technical feasibility study. This would help identify existing resources and several alternative technical designs and/or options along with associated costs, capabilities, advantages, and disadvantages. This would focus on providing the best match of needs of the state, technological capabilities, and funding possibilities.

4. Plans would have to be developed for growth and expansion, with a long-range architecture for consortium members to develop future plans. The vision would include ways to identify and obtain alternative funding.

5. The consortium would submit a statewide telecommunication plan to each governing agency in the consortium, as well as the Governor and Legislature. Written and oral presentations would be given to each governing agency in the consortium, the Governor’s office, Office of Management and Budget, and appropriate Legislative Committees.
6. An organizational structure would be developed for detailing the management and maintenance of the consortium system, along with identifying and coordinating the resolution of policy issues associated with the utilization of a statewide telecommunications network by a divergent group of constituents.

7. Provisions would be established for final bidding specifications for the entire system which involves bidding processes, ordering, obtaining FCC licensure, and developing and overseeing construction timelines.

8. The consortium would also identify key pedagogical issues and coordinate consortium efforts for faculty development and the purchase and development of electronic courses and/or programs.

Educational consortiums and cooperatives must work, like their counterparts in industry, on new forms of cooperative work, collaboration, and conflict management, and competitiveness that directly affect their mission (Stevens 1989).

Texas and North Dakota have legislative-appointed committees charged to study a proposal which can eventually implement such concepts in phases during a period of years. The final phase calls for computer-mediated communication networks (DiPietro, 1990; Federal Engineering, 1990). This coincides with a strategy to form a rural school and community development based on collaborative support from a multitude of support agencies. The idea is to develop clusters (voluntary alliances) made up of rural school districts which recognize community economic development as part of the survival endeavors to strengthen the rural educational system. Entrepreneurial and other efforts to meet the changing workplace needs would be a basic component of this endeavor for rural areas (Wall and Luther, 1988; Nachtigal, 1990).

These clusters would have their member schools work together to address common problems with the assistance of such support agencies as higher education, state agencies, related professional agencies, consultants, and the following two
support structures which initiated this concept for a pilot in the state of North Dakota (Nachtigal, 1990):

1. Organizations Concerned About Rural Education (OCRE), a consortium of national, primarily Washington, D.C., based organizations which will represent the national presence for the project and provide assistance in securing funding from foundations and through state and local affiliates.

2. Mid-continent Regional Educational Laboratory (McRel) whose jurisdiction includes North Dakota in its capacity to provide such educational services under a grant from the U.S. Department of Education.

Within the concepts for restructuring the school organization to support a variety of learning groups, citizens, regardless of where they live in the state, should have access to formal education. Thus, as electronic networks expand across the state, courses could be available in rural communities even though they are miles from the closest college or university. The telecommunications capability which would provide courses throughout the school cluster could also become an access point for the broad range of social services serving the communities. Therefore, Nachtigal (1990) recommends that in order for clusters of schools and communities to move ahead with this project, "policy exemption zones" will need to be created, freeing the participants to move beyond the limits of existing rules and regulations.

Principles which could aid in developing such programs in rural settings for school and community would have to include the following involvement (Meyers, 1989):

1. Focus on a central purpose, broadly defined by the school and community;
2. Emphasize long-term rather than short term goals;
3. Avoid defining the problem in deficit terms except as deficits apply to student outcomes;
4. Allow for long-term development like three to five years;
5. Emphasize intra-district collaboration and networking;
6. Facilitate cost-savings in staff development by collaborating with other districts; and
7. Balance "trickle-down" solutions with "bubble-up" approaches to problem solving.

Rural, remote areas have a very thin or almost nonexistent level of bureaucracy. Their organizational structure is informal, non-specialized, self-sufficient, personal, and tightly linked, with an emphasis on quality where most everyone easily responds to the environment (Meyers, 1989). Rural, remote areas can be at the leading edge of creating institutions that are more humane (Nachtigal, 1990). Which, according to Moss (1989) can be made possible through the process of leadership which encourages influencing those involved by noncoercive means. This is accomplished by persuasion and example in the efforts which strive for goal-setting and goal achievement to establish the purpose for working together.

This type of influential leadership is based upon an influence relationship among leaders and followers who intend real changes that reflect their mutual purposes. Accordingly, it is essential in such a relationship that the process is based on the following factors (Rost, 1989):

1. The influence relationship is multidirectional and noncoercive.
2. The followers are actively engaged in leading roles in a process with an influential leader.
3. The leaders and followers intend real change or changes that are purposeful.
4. The changes the leaders and followers intend reflect their mutual purposes or common goals.

Such participatory management is not permissive management, it is involvement towards an end (Peters as cited in Bulletin Special, 1989). This process facilitates, empowers, and focuses on those people who are ready to move and are turned on with a high acceptance to change. It is based on two-way communications
which are essential to the proper function of the leader/follower relationship (Gardner, 1988). Cotechnology within the context of organized computer conferencing networks, expertly netweaved, provides an option for these kinds of leadership environments for people separated by distance. Various computer-aided decision-making techniques, such as a Delphi research method, are designed to increase decision quality by removing status and other social cues. They address time pressures, non-regulated feedback, dramatical weakness, and depersonalization factors (Kiesler et al., 1984). Stevens (1986) explains that this media can be similar to Quaker-style contemplation before responding to a serious question.

An organization like a school's is generally more effective when its employees can carry out their tasks with varying degrees of autonomy and independence while being keenly aware that their efforts are part of the overall mission. Educators and politicians are gradually beginning to understand that innovation and performance improvements cannot happen to any significant extent until various policies and structures which empower teachers, students, and parents are in place (Wigley, 1989). This is fundamental to the cotechnology theory which can be put to practice when all participants utilize the communication possibilities afforded, when distances apart in computer conferencing networks or local area networks (Stephens, 1989).

A recent survey found that educational leaders around the world are interested in a wide span of distant education topics. The main interests included team teaching a course, cost of course production, funding, planning and costing out programs. Interest was also expressed in systems organization and management, as well as information on cooperative aspects of distance education programs. Linking with industry and finding out about problems unique to the private sector were among the topics listed. Computer conferencing was listed as an interest by teachers, but not by administrators (Sherman and Nedza, 1990).
Summary of Literature

Perhaps the most important facet ascertained in the review of literature is that, due to the newness of telecommunication technologies, very little empirical research has been conducted. There was none found regarding administrative or instructional uses of computer telecommunications in school districts. The literary search found that such research to date pertains to applications for adult learners in nontraditional programs and for training of professionals in business, industry, and the military.

The Star School program, TERC, demonstrated the educational capabilities of computer-mediated communications by introducing classroom applications in schools across the nation. This medium is being used by professional educators in several projects which are funded by state or federal funds.

These findings confirm that most applications to date, May 1990, have been with academically advanced high school students and independent adult learners—those who already possess strong study skills, high motivation, and discipline.

In general, the research of literature found the following answers to the research questions posed for this study:

**Question 1:** What computer telecommunication technologies are being used for administrative and instructional purposes in rural school districts?

The literature search found few groups in the United States that have organized electronic networks for distance communication among school leaders; those that do, show minimal use, because any type of distance educational technology is not yet viewed as an integral part of the educational process in the United States' schools. Nor was it found that any significant number of educational leaders have adopted computer conferencing network expert systems as a significant part of their daily administrative communication life-style.
There are only a small percentage of schools that have implemented computer telecommunication as a part of their instructional program. Most of those that do are involved in a project sponsored by vendors.

**Question 2:** If rural schools are not using these technologies, what are the issues and what are the barriers?

The literary review found that approximately 10 percent of the schools in the nation are involved in some type of distance education. Most of these projects involve subscribing courses or programs from satellite or cable services. The literature also substantiates that school leaders have an abundance of issues to solve and barriers to overcome regarding utilization of educational telecommunications in rural school districts.

Most of the barriers confronting the implementation of distance education are human. The attitudes and lifestyles of educators center around social organizations which resists socio-technical changes. The majority of educators do not want to abandon traditional procedures that are perceived as tried and true. This dilemma is compounded by the fact that teachers are not given enough time to be thoroughly trained to use these technologies.

Barriers exist because of the lack of proper planning, long-range goals, and a coherent philosophy or vision of the place new communication technologies have in education. The Star School projects have increased diffusion of many programs in rural schools and have developed a base of information with many examples school leaders can utilize in future replication efforts in the 90 percent of the schools not involved in such distance education endeavors.

The infrastructure for proper utilization of new communication technologies is lacking in the rural areas. However, it is slowly developing as educators inform the communication industry of their needs and vice versa. There are many issues involving policies, regulations, standards, certification, and funding.
Leadership issues for the proper transfer of technology involve the knowledge of changing attitudes. Change is effective when there is a choice and commitment by the people involved, particularly if all the people affected by the change can participate. Computer-mediated communications is one accessible and economical medium which has much potential to enhance this type of participation. The knowledge explosion is too much for any one person to handle without accurate assistance from telecommunication technology.

Question 3: Do the school administrators understand the differences among E-Mail, bulletin boards, conferencing with forums, and conferencing with networking systems?

The literature did not provide information which could answer whether school administrators did or did not have knowledge on the different types of computer-mediated communications. There was a significant amount of evidence that confusion exists as to which one of the four kinds of services is called computer conferencing.

Question 4: Do school administrators understand who controls these kinds of computer telecommunication programs and the costs involved in utilizing them?

Only a few projects found in the literature review spoke to the costs involved in utilizing computer telecommunication technologies. These costs are relative in relation to location and type of equipment being used. However, it was emphasized by various authorities that computer-mediated communications are the most economical and cost effective among all the telecommunication technologies used for distance education. The review of literature did not reveal whether or not school administrators understood who controls the kinds of computer telecommunication programs or the costs involved to utilize them. However, in all cases found in literature, the projects were funded by either federal funds, state appropriations, private vendors, or a combination of these three sources.
Question 5: Do models exist where school districts are using computer telecommunication for administrative and/or instructional purposes?

Only one project was found in the literature research pertaining to a pilot project exclusively for educational administrators. This model was a guided discussion using a forum.

Several instructional models are being piloted throughout the nation for teachers. Most are forums. One new state-wide pilot is a conferencing network system. There are several authorities contending that computer telecommunications projects are putting isolated, rural schools more in touch with the rest of the world and reducing socioeconomic uniqueness. The data illustrated a need for these schools to pool their expertise in a cooperative such as a statewide consortia, rural school clusters, or regional cooperative. Good learning applications need to be developed so educators can better use telecommunication media to address educational value, quality content, and assure that quality technology is combined with quality education.

Educators can utilize computer conferencing expert networks as a means to this end. It is recommended by the National School Boards Association.

Empirical research was not found pertaining to computer-mediated communication networks organized for administrative purposes between clusters consortia, or cooperatives for school district leaders. However, there was a considerable amount of data describing the utilization of computer-mediated communication for staff development coursework.

Mody's principles based on application and the evaluation reports from Barker (1988), and others, substantiate the theory put forth by Cohen (1988) that educators who choose to utilize telecommunication technologies to reach learners distances away must work hard, concentrate on more areas and techniques, and embrace larger pedagogical responsibilities.
Mecklenburger (1988), speaking for the National School Boards Association, called for strong leadership, both local and federal, to include all manner of video, distance communications, curriculum management systems, administrative networks, and more at home and in communities, as well as in school. The state-of-the-art is not yet perfected for total hypermedia and multimedia over telephone lines or cable because presently allowed spectrums cannot accommodate ISDN or HDTV. Computer-mediated communication networking with an expert organization system is a step toward this direction in that it prepares leaders for such a technology lifestyle.

Likewise, Cawetti (1989) outlines a long-term model with a national perspective for administrating cooperative development, as does the Western Cooperative (1988) in a regional perspective. Olson's and Morrison's (1987) consortium model provided insight into the leadership scope of work necessary on a state-wide endeavor. Within the scope and sequence of these types of suggestions lies the potential to cooperate and collaborate electronically by computer conferencing networks, especially when taking into account that schools can replicate Stevens' (1989) concept of cotechnology.

Both Meyers (1989) and Nachtigal (1990) contend rural schools must form clusters to accommodate the new telecommunication technologies being developed for schools. Nachtigal (1990), Olson and Morrison (1987), and Van Horn (1986), all educators who are not technicians, take it for granted that computer telecommunication networks will be a part of the administrative communication lifestyle of the future.
CHAPTER III
METHODOLOGY AND PROCEDURES

The primary objectives of this study are to find out if computer telecommunication technologies are being used for administrative and instructional purposes in rural school districts and what barriers or problems are being raised where rural schools are not utilizing such telecommunication technologies for distance education. Another objective is to find out whether educational administrators understand the types and costs of such services, who controls these kind of computer telecommunications, and if any models exist where school districts are using these technologies for administrative and/or instructional purposes.

This chapter describes the methodology and procedures used to address the research objectives stated in Chapter I. Presented in this chapter are the sections pertaining to research design, population, instrumentation, data collection, and data analysis.

Research Design

The design of this study is descriptive. The intent is to utilize data obtained in the survey in order to ascertain the extent to which computer telecommunication technologies are being utilized in rural school districts within counties among four rural states. It is also an intent to assess the perspectives of school administrators and their schools' capacity to utilize these technologies for administrative and instructional uses. Consequently, a survey questionnaire was constructed as an appropriate means to collect data for this research.
Advantages of survey questionnaires are that the format is conducive to framing responses for ease in statistical analysis, it is self-administered, and it is appropriate for a large number of subjects (Ary, Jacobs, and Razavieh, 1985). However, a major concern of surveys is that of gathering reliable and valid responses (Kerlinger, 1986; Dillman, 1978). Therefore, every attempt was made to assure the collection of valid and reliable data so that the study can be replicated.

A mail questionnaire was used for this study. Dillman's (1978) Total Design Method was adapted and implemented. The respondents understood that their time requested to answer the questions was voluntary. They were also informed that their participation would add to the professional knowledge of education, and they were offered a report of the final research findings. The letter and form contained assurances that confidentiality of data collection and reporting would be maintained.

**Population**

The target population for this study consists of all counties in North Dakota and tiers of counties which border or are near the borders of the state of North Dakota. One school administrator was selected from each of these counties to represent the population unit. The following states and number of counties make up this study's population of 101 counties:

1. North Dakota counties 53
2. Northeastern Montana counties 17
3. Northwestern Minnesota counties 15
4. Northern South Dakota counties 16

Total population of counties 101

The majority of these counties have more than one elementary or secondary school district. Therefore, the administrator residing in the school district where the county seat is located was designated to speak for that county. This area of 101 counties represents a segment of the rural United States which is not only isolated,
but encompasses a vast geographical area of small schools which conceivably could benefit from a telecommunication technology medium such as computer conferencing.

There was no need to utilize any random sampling techniques because the entire population was included in the survey. The population of counties are listed in Appendix A. No attempt will be made to generalize beyond the accessible counties; however, it may be argued that the 101 rural school districts may be similar to other rural school districts in these states and their neighboring western states.

**Instrumentation**

In order to obtain the information needed for this study, a survey questionnaire was designed to collect data about demographic information and the level of the school administrators' understanding about computer conferencing and services. The instrument was also designed to inquire about their perspectives concerning barriers and problems regarding the utilization of computer conferencing technologies.

In order to establish validity, a panel of experts at the Ohio State University (see Appendix B) was used to improve the questionnaire. The panel's purpose was to ensure that instructions were clear, items measured what they were intended to measure, items would be interpreted the same, and items did not reflect undue biases. Their comments and suggestions were taken into account in preparing the questionnaire for the field test.

A field test was conducted with other school administrators from the target population. They were attending educational administrative summer courses at the North Dakota State University. Six school administrators participated in the pilot testing of the questionnaire. Ideas were taken from these administrators who participated in the pilot test, and they were incorporated into the final questionnaire. Reliability tests were not run to determine Cronbach's alpha quotients for this field test. This was because of the exploratory nature of the survey and further inquiries into the target population might pollute the study. The survey also had many questions
pertaining to specific demographic situations. The desired statistical result of this study is to determine Cronbach's alpha reliability quotients for each group of questions.

Minor adjustments were made to these questions at the suggestion of the administrators who participated in the field test. The instrument was subdivided into sections pertaining to user interests, time considerations, financial aspects, infrastructure requirements, regulations and policies, access issues, equity concerns, socio-technical perspectives, management and leadership, consortia and cooperatives, and support resources. Two open-ended questions were used to close the questionnaire and provide space for the administrators to make spontaneous comments about the general context of telecommunications.

The questionnaire was based on literature which spoke to the barriers and problems that the authors felt impede its implementation or utilization. This survey questionnaire was designed so that if instrument reliability was established, the findings would describe a reliable data base. One-third of the questions were written in the negative sense so agreement would ratify a problem or a barrier. The same responses effectuated another third of the questions written in the affirmative by directly addressing a problem or barrier. However, another third were written in a positive nature, whereby disagreement meant they were a problem or a barrier. Sixty-three of the 86 questions were developed for the first portion which focused on ascertaining barriers and problems.

The first portion of the questionnaire was developed according to 11 categories found in the review of literature. The six questions in the users' interest section are based on reasons why computers are not used for conferencing. The next six questions focused on the extent to which time is a barrier in using computers to communicate.
Four questions were developed to determine whether financial aspects are problems or barriers. Six questions were posed to delve into what is presumed to be infrastructure regarding the use of computers for conferencing. Four questions were constructed about regulations and policies pertaining to legislative and corporate controls on capacity, costs, and services.

Five questions were designed around access issues pertaining to the challenge involved in acquiring available services for everyone. Seven questions were asked about equity concerns in regard to the challenge involved in ensuring everyone obtains services that are available through the utilization of computer conferencing.

Ten questions are based on socio-technical perspectives the literature research suggests are important to people who are confronted with new technologies. They centered around a general definition that people do not want to be subservient to machines and systems. Five questions were established to relate to management and leadership problems. This category was defined as the school administrators and others who make things happen in their district. This category was followed by five questions pertaining to the potential role consortia and cooperatives might play in utilizing this technology. They were briefly defined as clusters of schools and/or institutions uniting for a common purpose.

Finally, four questions were asked about support resources. This inquired if consultants, experts, and mentors are around when needed to help in the implementation of computer conferencing.

Thus, 11 categories were constructed to ask 62 questions. A Likert-type scale for rating the response to the questions was used with (1) equal to strongly disagree, (2) equal to disagree, (3) equal to agree, and (4) equal to strongly agree. The scale appeared in the questionnaire as follows:
Two open-ended questions were developed to provide the respondents with a chance to offer any opinion they may have felt was not asked of them by the constructed questions. They focused on telecommunications by asking, "If your school district were deciding to improve communications because of pending telecommunications opportunities, what is the area of greatest need or concern?" And, "What problems might telecommunications solve for you and your district?"

The second section in the questionnaire pertained to background information on knowledge of computer conferencing. It contained 14 questions. They were constructed to find out what the respondents know about computer communications and, if they know about it, the extent of experience they have in using it. Ten questions were asked of those respondents who indicated they were using computer conferencing. These questions pertained to the type being used, names of programs in use, where the host is located, the organization or cooperative in control, what group is primarily being served, and inquiries into the various costs involved.

The third and final section asked two questions; one regarding the respondents' highest degree obtained, and one regarding administrative experience. They also were asked to indicate if they wanted a copy of the survey results.

**Data Collection**

The data collection was carried out in early summer of 1990 using a mail survey questionnaire. One school administrator representing the county seat school of each selected county of the population was asked to complete a questionnaire. In six situations, the county seat was a city with a school district student population exceeding 2,500 pupils (K-12). In these cases, the school district nearest the county seat or the county superintendent representing the rural schools was asked to
complete the questionnaire. This helped maintain a rural perspective for this study. The data collection procedures were consistent with the survey collection procedure recommendations suggested by Dillman (1978).

Between June 20 and June 21, 1990, surveys were mailed to the respective counties. A cover letter that described the purpose of the study was attached to each questionnaire (see Appendix D). Completed surveys were returned by the individual school administrators by an addressed, stamped envelope provided with each questionnaire. Fifteen days after surveys were mailed to the school administrators, a reminder letter was sent to those who had not responded (see Appendix D). Questionnaires returned after July 23 were not included in the data analysis.

A treatment for handling the nonresponse error was to compare early and late respondents. According to Miller and Smith (1983), late respondents are often similar to nonrespondents. Therefore, a statistical comparison of late respondents with early respondents was made. The respondents of this study were classified by whether they were in the first wave (first 10 days after delivery), or in the second wave (from Day 11 to Day 25 after the first delivery). Depending on the state, the respondents in the first wave filled out the questionnaire between June 26 and July 6, 1990. Respondents in the second wave filled out the questionnaire between July 7 and July 20, 1990. The first wave, or early respondents, were statistically compared with the second wave, or late respondents, on demographic and scale scores.

This study is exempt from review by the Ohio State University Human Subjects Review, since it met exemption criteria. In order to meet the exemption requirements, studies using human subjects must (1) inform the participants that the participation will be voluntary; (2) ensure anonymity to respondents; (3) make no attempt to deceive the participants; and (4) make no attempt to expose participants to discomfort or harassment.
Data Analysis

Data for this study was analyzed using a personal computer. Statistical analysis was accomplished by using the computer Statistical Package for Social Science (SPSS*PC) (Nie, Hull, Jenkins, Steinbrenner, and Bent, 1983) provided by the Instruction and Research Computer Center at the Ohio State University. This package was specially designed to process data for social and behavioral research.

Each school administrator's responses to the different instrument measures were added and divided by the total number of construct items to produce the mean scores. The mean scores were used as perceived measures for most demographic data and computer conference usage inquiries. The questions used to ascertain these perceptions were based on the literary research completed for this study. The focus of this study is on the existing barriers and problems which impede the usage of computer conferencing in rural schools. These inquiries were quantified by using a four-level Likert scale. Consequently, Cronbach's alpha quotients were ascertained to illustrate the reliability of these descriptive measures.

The responses regarding name of computer-host programs, location of system operators, and name of the organization in control had to remain as quantitative data. This quantitative data acquired was collated according to nominal group techniques. Thus, editing, combining, and rewording condenses the findings into criteria which best describes the situation for the target population surveyed. However, if an administrator answered these questions, a quantitative mark of 1 was given as a rating in this section. If the question was left unanswered that is, left blank a rating score of zero was given; this way, a quantitative measure is obtained from each entry. A zero placed in the Part 2 from Question 67 to Question 84 signifies the respondent did not have knowledge about those specific areas.
CHAPTER IV
ANALYSIS OF DATA

The primary purpose of this study was to determine the degree to which computer telecommunication technologies are used for administration and instructional purposes in rural school districts. New communication technologies have made it possible for rural school districts to use alternative ways to communicate and access information instantaneously or asynchronously by using the microcomputer with the telephone system. However, there are questions as to whether these technologies are going to be used for these purposes. No known attempts have been made to determine the perspectives of rural, isolated school district administrators regarding the problems and barriers concerning the implementation of computer conferencing.

The questions used in the first part of the survey were derived from the research of literature. They represent problems and barriers which the authors believe impede the utilization of telecommunication technologies in education. This data was then categorized into areas pertaining to user interest, time considerations, financial aspects, infrastructure requirements, regulations and policies, access problems, equity concerns, support resources, and socio-technical perspectives. In addition, questions were developed from related literature which focused on management, leadership, and the role consortia and cooperatives play in utilizing this technology. The respondents were given a chance to express their views in two open-ended questions which were prepared to elicit what they may deem important in this regard.
The second portion of the questionnaire delved into background information concerning the respondent's knowledge and experience, if any, about computer conferencing. Two demographic questions were asked; one was about the respondent's degree earned, and the other was the number of years of experience as a school administrator.

This questionnaire was constructed to help develop a data base in a new and emerging educational technology. Therefore, it was an instrument used to explore and describe a new phenomenon. Thus, the findings statistically describe whether a reliability exists among respondents based on the questions posed in the instrument and the responses provided by the school administrators.

The target population for this study was the school administrators of 101 counties located in the rural, isolated, northern plains of the United States. One school administrator per county was selected in the state of North Dakota, the northeastern counties of Montana, the northern counties of South Dakota, and the northwestern counties of Minnesota. Descriptive statistics were used to analyze the data collected on the questionnaire. This chapter is divided into three sections to analyze the results of this research. These sections pertain to characteristics of respondents, analysis of instrument data, and description of the findings.
Characteristics of Respondents

During the last week of June, 1990, a questionnaire was sent to 101 school administrators who comprised the target population of this study. A summary of the questionnaire returns is presented in Table 5. A total of 74 (73% of the population) respondents returned their questionnaires by July 23, 1990. There were 42 returned in the first wave and 32 returned in the second wave.

Table 5
Frequency and Percent of Questionnaires Returned

<table>
<thead>
<tr>
<th>Questionnaires Returned and Nonresponse Data</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Wave of Returns</td>
<td>42</td>
<td>41.6</td>
</tr>
<tr>
<td>Second Wave of Returns</td>
<td>32</td>
<td>31.7</td>
</tr>
<tr>
<td>Questionnaires not returned (Nonresponse)</td>
<td>27</td>
<td>26.7</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>101</td>
<td>100.0</td>
</tr>
</tbody>
</table>

In order to handle the nonresponse problem, the respondents in this study were classified by whether they were in the first wave or in the second wave. The two waves of returned questionnaires were compared statistically on demographic and instruments score. No substantial difference was found in the responses between these two groups; therefore, the nonrespondents of the target population can be generalized to the data of the returned questionnaires (Miller and Smith, 1983).
Respondents were summarized by state and presented in Table 6. There were more school administrators responding from the accessible population of North Dakota (70%) than Montana (9.5%), South Dakota (9.5%), or Minnesota (11%). The second part shows that 98 percent of the targeted population in North Dakota (n=52) returned the questionnaires. Montana had the least returned, with 41 percent (n=7).

Table 6
Frequency and Percent of Surveys Returned by State

<table>
<thead>
<tr>
<th>Respondents by State</th>
<th>f</th>
<th>%</th>
<th>cum. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counties in northeast Montana</td>
<td>7</td>
<td>9.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Counties in North Dakota</td>
<td>52</td>
<td>70.2</td>
<td>79.7</td>
</tr>
<tr>
<td>Counties in northern South Dakota</td>
<td>7</td>
<td>9.5</td>
<td>89.2</td>
</tr>
<tr>
<td>Counties in northwest Minnesota</td>
<td>8</td>
<td>11.0</td>
<td>100.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>74</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surveys returned</th>
<th>Targeted Population</th>
<th>Accessible Population</th>
<th>% Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counties in northeast Montana</td>
<td>17</td>
<td>7</td>
<td>41</td>
</tr>
<tr>
<td>Counties in North Dakota</td>
<td>53</td>
<td>52</td>
<td>98</td>
</tr>
<tr>
<td>Counties in northern South Dakota</td>
<td>16</td>
<td>7</td>
<td>44</td>
</tr>
<tr>
<td>Counties in northwest Minnesota</td>
<td>15</td>
<td>8</td>
<td>53</td>
</tr>
<tr>
<td>TOTAL</td>
<td>101</td>
<td>74</td>
<td>73</td>
</tr>
</tbody>
</table>
Respondents were classified by their highest formal education level achieved, and this data was summarized in Table 7. Seventy-six percent (n=56) of the school administrators had a master's degree as their highest level of education.

<table>
<thead>
<tr>
<th>Highest Education Level</th>
<th>f</th>
<th>%</th>
<th>cum.%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor's degree</td>
<td>1</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Bachelor's degree plus graduate work</td>
<td>2</td>
<td>2.7</td>
<td>4.1</td>
</tr>
<tr>
<td>Master's degree</td>
<td>56</td>
<td>75.6</td>
<td>79.7</td>
</tr>
<tr>
<td>Specialist's degree</td>
<td>8</td>
<td>10.8</td>
<td>90.5</td>
</tr>
<tr>
<td>Doctorate</td>
<td>7</td>
<td>9.5</td>
<td>100.0</td>
</tr>
</tbody>
</table>

TOTAL 74  100.0  100.0
Respondents were also questioned about their administrative experience. A summary of administrative experience is contained in Table 8. Only four administrators surveyed had five years or less of administrative experience. Most of the administrators' total experience was in the range of 16 to over 20 years.

Table 8
Administrative Experience of All Respondents

<table>
<thead>
<tr>
<th>Experience</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 years or less</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6 to 10 years</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>11 to 15 years</td>
<td>20</td>
<td>27</td>
</tr>
<tr>
<td>16 to 20 years</td>
<td>20</td>
<td>27</td>
</tr>
<tr>
<td>More than 20 years</td>
<td>19</td>
<td>26</td>
</tr>
<tr>
<td>TOTAL</td>
<td>74</td>
<td>100</td>
</tr>
</tbody>
</table>
The respondents were asked the approximate hours of formal training and/or instruction they had relating to computer conferencing skills or operations. Thirty-six percent (n=26) indicated they had none, and 47 percent (n=34) indicated they had very little. Thus, 73 percent (n=60) had less than 10 hours of training and/or instruction in this medium.

Table 9
Approximate Hours of Formal Training and/or Instruction Relating to Computer Conferencing

<table>
<thead>
<tr>
<th>Experience</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None (0 hours training and/or instruction)</td>
<td>26</td>
<td>36</td>
</tr>
<tr>
<td>Very Little (1-9 hours training and/or instruction)</td>
<td>34</td>
<td>47</td>
</tr>
<tr>
<td>Moderate (10-20 hours training and/or instruction)</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Extensive (21 or more hours training and/or instruction)</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>73</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 10 was constructed in order to illustrate whether the administrators surveyed understood computer conferencing. Fifty-eight percent (n=42) have a fair understanding.

<table>
<thead>
<tr>
<th>Understanding</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No understanding</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Not clear, find it confusing</td>
<td>21</td>
<td>29</td>
</tr>
<tr>
<td>Fair, but need more help</td>
<td>42</td>
<td>58</td>
</tr>
<tr>
<td>Excellent, I know what I'm doing with computer conferencing</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>73</td>
<td>100</td>
</tr>
</tbody>
</table>
The number of respondents who indicated they were familiar with each specific type of computer-communicated host program is illustrated in Table 11. This information illustrates that 8 percent (n=6) of the respondents were aware of computer conferencing having advanced networking capabilities.

<table>
<thead>
<tr>
<th>Familiarity with Computer Conferencing</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not familiar with any of the programs</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Electronic Mail (E-Mail)</td>
<td>22</td>
<td>30</td>
</tr>
<tr>
<td>Bulletin Boards</td>
<td>20</td>
<td>27</td>
</tr>
<tr>
<td>Computer Conferencing with Forums</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>Computer Conferencing with Advanced Networks</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>74</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
The respondents were asked what type of computer conferencing program they were using in their school systems. Table 12 summarizes this data and shows that 74 percent (n=55) of those responding to this question do not use computers for communicating.

Table 12
Frequency of Respondents Using Computer-Communication Host Programs for Conferencing

<table>
<thead>
<tr>
<th>Respondents using Computer Conferencing</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not use computers for communicating</td>
<td>55</td>
<td>74</td>
</tr>
<tr>
<td>Electronic Mail (E-Mail)</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Bulletin Boards</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Computer Conferencing with Forums</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Computer Conferencing with Advanced Networks</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>74</td>
<td>100</td>
</tr>
</tbody>
</table>


Table 13 compares levels of administrative experience with the number of administrators using computer conferencing systems in their school district. There are not enough samples in each of these levels to suggest that such usage might vary because of experience levels.

<table>
<thead>
<tr>
<th>Levels of Experience</th>
<th>Respondents</th>
<th>Total Using Computer Conferencing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n</td>
</tr>
<tr>
<td>5 years or less</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>6 to 10 years</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>11 to 15 years</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>16 to 20 years</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>More than 20 years</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>74</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>
Among the respondents stating they were utilizing such services, only five listed the name of their host program. Eight respondents listed the locations of their systems operator, and five provided the names of the organization in control of the service. Ten respondents provided the names of groups or institutions being served, and only three listed information about the cost of such services.

The respondents were asked what types of computer-communication host programs they were using. The nonduplicate tally of host programs in use according to each state is listed in Table 14.

Table 14
Types of Computer-Communication Host Programs Used by Respondents

<table>
<thead>
<tr>
<th>Type of Host Program</th>
<th>Montana Counties</th>
<th>North Dakota Counties</th>
<th>South Dakota Counties</th>
<th>Minnesota Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTICIPATE</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CAUCUS</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>EDUNET (E-Mail)</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FORUM</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BULLETIN BOARD</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
The various types of computer-communication services being used by the respondents are illustrated in Table 15. This illustrates that the utilization is nil among those responding.

Table 15
Types of Computer-Communication Services Respondents are Using

<table>
<thead>
<tr>
<th>Type of Host Program</th>
<th>Montana Counties</th>
<th>North Dakota Counties</th>
<th>South Dakota Counties</th>
<th>Minnesota Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIS (CompuServe)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>IRIS (Minnesota Dept. of Ed)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>BIG SKY TELEGRAPH</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LEARNING LINK (NcRel)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BULLETIN BOARD</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

The various groups being served by computer conferencing, according to the school administrators surveyed, are indicated in Table 16. This is a nonduplicated accounting. However, there were no more than three respondents from any one state who provided this information.

Table 16
Groups being Served by Computer Conferencing Systems or Networks

<table>
<thead>
<tr>
<th>Groups being Served</th>
<th>Montana Counties</th>
<th>North Dakota Counties</th>
<th>South Dakota Counties</th>
<th>Minnesota Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrators</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Teachers</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Business</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>General Public</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Students</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
The respondents who indicated they were using computers for communicating long distances were asked to indicate the approximate cost of operating their computer conferencing networks. The results summarized in Table 17 show only 4 percent of the respondents (n=3) provided such information. As it was to be an approximate cost, the information may not be accurate; however, results show few are aware of the costs of these types of services.

Table 17

<table>
<thead>
<tr>
<th>Host Program</th>
<th>Subscription Fee</th>
<th>Monthly Charge</th>
<th>Membership Fee</th>
<th>Other Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRIS (Forum - MECC)</td>
<td>$00.00</td>
<td>$00.00</td>
<td>$129.00</td>
<td>$00.00</td>
</tr>
<tr>
<td>South Dakota Library Service</td>
<td>$20.00</td>
<td>$00.00</td>
<td>$20.00</td>
<td>$75.00</td>
</tr>
<tr>
<td>Big Sky Telegraph (EDUNET)</td>
<td>$00.00</td>
<td>$11.00</td>
<td>$00.00</td>
<td>$18.00</td>
</tr>
<tr>
<td>Barrett Associates</td>
<td>$3,000.00</td>
<td>$166.66</td>
<td>$00.00</td>
<td>$00.00</td>
</tr>
</tbody>
</table>
Analysis of Instrument Data

In order to ascertain a reliability measure for this instrument, the mean and standard deviation for each category were summarized and shown in Table 18. The Cronbach's alpha was calculated for the data collected in each of these 11 categories. Seventy-four school administrators completed the instrument scales.

This statistical analysis revealed the lowest reliability quotient was an alpha of .443 for the five statements in the access problems group. The six statements in the equity concerns group had the highest reliability, with an alpha of .918.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Item</th>
<th>Cronbach's Alpha (1-disagree &amp; 4-Agree)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users' Interest</td>
<td>6</td>
<td>.669</td>
<td>2.3</td>
<td>.344</td>
</tr>
<tr>
<td>Time Consideration</td>
<td>6</td>
<td>.500</td>
<td>2.6</td>
<td>.223</td>
</tr>
<tr>
<td>Financial Aspects</td>
<td>4</td>
<td>.840</td>
<td>2.6</td>
<td>.243</td>
</tr>
<tr>
<td>Infrastructure Requirements</td>
<td>6</td>
<td>.896</td>
<td>2.3</td>
<td>.167</td>
</tr>
<tr>
<td>Regulations and Policy</td>
<td>4</td>
<td>.706</td>
<td>3.1</td>
<td>.117</td>
</tr>
<tr>
<td>Access Problems</td>
<td>5</td>
<td>.443</td>
<td>2.9</td>
<td>.149</td>
</tr>
<tr>
<td>Equity Concerns</td>
<td>7</td>
<td>.918</td>
<td>3.2</td>
<td>.081</td>
</tr>
<tr>
<td>Socio-technical</td>
<td>10</td>
<td>.586</td>
<td>2.5</td>
<td>.409</td>
</tr>
<tr>
<td>Management and Leadership</td>
<td>5</td>
<td>.507</td>
<td>2.1</td>
<td>.223</td>
</tr>
<tr>
<td>Consortia and Cooperatives</td>
<td>5</td>
<td>.798</td>
<td>1.8</td>
<td>.171</td>
</tr>
<tr>
<td>Support Resources</td>
<td>4</td>
<td>.483</td>
<td>2.5</td>
<td>.395</td>
</tr>
</tbody>
</table>

n = 62
Table 19 provides information about problems involving the use of computers as an administrative and informational tool for long-distance conferencing. The majority of respondents, 73 percent (n=55), indicated their school districts do not have clear goals for using technologies like computer conferencing.

Possessing the necessary computer-accessing skills for searching and retrieving electronic data was an evenly divided issue, with 51 percent (n=38) indicating it was a barrier. Fifty-nine percent (n=45) of the respondents indicated that confidence in their ability to use computer conferencing effectively was not a barrier to its usage.

The administrators responding to this survey indicated that their school districts have a desire to use computer conferencing for administrative and instructional purposes. In this category, 82 percent (n=68) felt it was not a problem. Likewise, 80 percent (n=60) responded that their administrative style and routine were compatible with using computers for distance communication. Table 19 also shows that a lack of keyboarding skills is not a problem among 70 percent (n=52) of the respondents.
Table 19
Reasons Computers are not used for Long-Distance Conferencing

<table>
<thead>
<tr>
<th>User Interest (UI)</th>
<th>Problem or Barrier (Disagreed)</th>
<th>(Agreed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(UI 1) No desire to use for administrative or instructional purposes</td>
<td>82%</td>
<td>18%</td>
</tr>
<tr>
<td>(UI 2) Not part of daily administrative style or routine</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>(UI 3) Administrators not confident of ability to use effectively</td>
<td>59%</td>
<td>41%</td>
</tr>
<tr>
<td>(UI 4) No clear goals for using these technologies in the district</td>
<td>27%</td>
<td>73%</td>
</tr>
<tr>
<td>(UI 5) Lacking computer-accessing skills for searching and retrieving</td>
<td>49%</td>
<td>51%</td>
</tr>
<tr>
<td>(UI 6) Lacking necessary keyboarding skills to use computers</td>
<td>70%</td>
<td>30%</td>
</tr>
</tbody>
</table>

(n=74) Mean=2.3 Standard Deviation=.344

Table 20 shows that a substantial majority of the respondents, 85 percent (n=63), felt that turnaround time to provide timely feedback for certain messages is a problem that can be resolved with computer conferencing systems.

Among the administrators responding, 62 percent (n=46) indicated that lack of time was a barrier in implementing computer conferencing. Fifty-nine percent (n=44) indicated time was also a barrier for properly training people to use a computer. Likewise, 57 percent (n=42) agreed that the majority of administrators do not have the time to explore computer conferencing.

Fifty-three percent (n=39) indicated that keeping up with the pace of technological change was not a problem in their schools. Sixty-eight percent (n=50) did not agree voting and polling options on advanced computer conferencing programs would save administrative time.
Table 20
The Extent to which Time is a Barrier in Using Computers to Communicate

<table>
<thead>
<tr>
<th>Time Considerations (TC)</th>
<th>Problem or Barrier (Disagreed)</th>
<th>(Agreed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(TC 7) Lack of time is a problem in properly training people how to use computers</td>
<td>41%</td>
<td>59%</td>
</tr>
<tr>
<td>(TC 8) Lack of time is a problem in properly implementing computer conferencing</td>
<td>38%</td>
<td>62%</td>
</tr>
<tr>
<td>(TC 9) Schools cannot keep up with the pace of technological change</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>(TC 10) Turnaround time to provide timely feedback for certain messages is an issue that can be resolved with computer conferencing</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>(TC 11) Administrators do not have time to explore computer conferencing</td>
<td>43%</td>
<td>57%</td>
</tr>
<tr>
<td>(TC 12) Voting and polling options on advanced computer conferencing programs will save administrative time</td>
<td>68%</td>
<td>32%</td>
</tr>
</tbody>
</table>

(n=74) Mean=2.6 Standard Deviation=.223
Table 21 provides information about how the respondents perceive certain financial aspects as problems or barriers in implementing computer conferencing systems in their school districts. It is shown that 73 percent (n=54) felt funds would not be a problem if it was accepted that computer conferencing enhanced certain communication tasks or reduced current long-distance telephone costs. In other words, operating expenses would be justified if the system was proven to be cost effective.

However, the three other inquiries show that a majority of the respondents believe funding is a problem or barrier in implementing these technologies.

Table 21
Importance of Financial Problems in Implementing Computer Conferencing Systems

<table>
<thead>
<tr>
<th>Financial Aspects (FA)</th>
<th>Problem or Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>(FA 13) Financial support is available to acquire computer conferencing equipment</td>
<td>(Disagreed) 43%</td>
</tr>
<tr>
<td></td>
<td>(Agreed) 57%</td>
</tr>
<tr>
<td>(FA 14) Financial support is available to cover the costs of long-distance telephone</td>
<td>(Disagreed) 36%</td>
</tr>
<tr>
<td>charges for computer conferencing</td>
<td>(Agreed) 64%</td>
</tr>
<tr>
<td>(FA 15) Funds would be made available if it was accepted that computer conferencing</td>
<td>(Disagreed) 73%</td>
</tr>
<tr>
<td>enhanced certain communication tasks and reduced current long-distance telephone costs</td>
<td>(Agreed) 27%</td>
</tr>
<tr>
<td>(FA 16) Budget cuts and related constraints have prevented any usage of computer</td>
<td>(Disagreed) 43%</td>
</tr>
<tr>
<td>conferencing</td>
<td>(Agreed) 57%</td>
</tr>
</tbody>
</table>

(n=74) Mean=2.6 Standard Deviation=.243

Table 22 shows that respondents are somewhat satisfied with the rural telephone industries' infrastructure. In other words, the available equipment and service are sufficient to use for communicating with computers. It shows that 79 percent (n=57) of those responding indicated service was not lacking for single-party
access to the switched telephone network. Likewise, 67 percent (n=48) indicated their telephone service provided the necessary communication and information services needed for computer conferencing.

Sixty-three percent (n=45) indicated their telephone companies provide digital switches, and 64 percent (n=46) indicated they are provided with high-quality transmission lines for reliable data transmission. Fiber optics is installed in 58 percent of the rural areas included in this study. Half of the respondents report the telephone infrastructures in their counties contain a telecommunications system with equalized capability and service for computer conferencing.

Table 22
Respondents' Understanding of Facilities Needed to Use Computers for Long-Distance Communication

<table>
<thead>
<tr>
<th>Infrastructure Requirements (IR)</th>
<th>Problem or Barrier (Disagreed)</th>
<th>(Agreed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our rural school district's telephone company is lacking in the following areas:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(IR 17) Service for single-party access to the switched telephone network</td>
<td>79%</td>
<td>21%</td>
</tr>
<tr>
<td>(IR 18) High-quality transmission lines for reliable data transmission</td>
<td>64%</td>
<td>36%</td>
</tr>
<tr>
<td>(IR 19) Lack of communication and information services necessary for computer conferencing</td>
<td>67%</td>
<td>33%</td>
</tr>
<tr>
<td>(IR 20) Lack of digital switch to accommodate full usage of services like computer conferencing</td>
<td>63%</td>
<td>37%</td>
</tr>
<tr>
<td>(IR 21) Lack of information infrastructure that contains a telecommunications system with equalized capability and service for computer conferencing</td>
<td>51%</td>
<td>49%</td>
</tr>
<tr>
<td>(IR 22) Lack fiber optics necessary to use all available network signals</td>
<td>58%</td>
<td>42%</td>
</tr>
</tbody>
</table>

(n=74) Mean=2.3 Standard Deviation=.167
The respondents agreed with factors indicating the extent to which legislative and corporate involvement monopolizes national regulations and policies affecting educational technology. Table 23 shows that a substantial majority of the respondents, 94 percent (n=69), agree that there is a need for collaboration among administrators regarding these regulations. Likewise, 89 percent (n=64) agreed with the statement that policy makers at all levels of government are not giving enough attention to expanding the amount and capability of computer-conferencing technology in schools.

The respondents agree by a substantial margin that Congress must review and shape policies to reflect the nation's educational needs in light of the possibilities created by new computer conferencing technologies.

<table>
<thead>
<tr>
<th>Regulations and Policies (RP)</th>
<th>Problem or Barrier (Disagreed)</th>
<th>(Agreed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(RP 23) Spectrum allocations* are not being dealt with properly</td>
<td>21%</td>
<td>79%</td>
</tr>
<tr>
<td>(*Allowable quantity and quality of data or band width being transmitted over the telephone line)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(RP 24) There is a need for collaboration among administrators regarding regulations for using technologies like computer conferencing</td>
<td>6%</td>
<td>94%</td>
</tr>
<tr>
<td>(RP 25) Congress must review and shape policies to favor education</td>
<td>16%</td>
<td>84%</td>
</tr>
<tr>
<td>(RP 26) Current policy makers are not giving issues enough attention</td>
<td>11%</td>
<td>89%</td>
</tr>
</tbody>
</table>

(n=74) Mean=3.1 Standard Deviation=.117
Table 24 addresses the respondents' level of agreement pertaining to the problems involved with providing access in the rural areas. A substantial majority, 90 percent (n=67), of these respondents agree that their school district buildings should have dedicated telephone lines to access computer conferencing. Eighty-four percent (n=62) of the school administrators indicated that school district offices have a need for technologies like facsimile (fax) machines. A majority also agreed that administrators do not have access to computer conferencing services; that their rural schools have inequitable access to telephone services; and that rural areas need access to competitive long-distance carriers such as Sprint or MCI.

Table 24
Problems Involved in Providing Access in the Rural Areas

<table>
<thead>
<tr>
<th>Access Problems (AP)</th>
<th>Problem or Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>(AP 27) No dedicated telephone lines in each of the school buildings</td>
<td>(Disagreed) (Agreed)</td>
</tr>
<tr>
<td>(AP 28) There is a need for a fax machines in the district.office</td>
<td>10% 90%</td>
</tr>
<tr>
<td>(AP 29) Rural areas have inequitable access to telephone services</td>
<td>16% 84%</td>
</tr>
<tr>
<td>(AP 30) Rural areas need access to competitive long-distance carriers</td>
<td>24% 76%</td>
</tr>
<tr>
<td>(AP 31) Administrators do not have access to such conferencing services</td>
<td>20% 80%</td>
</tr>
<tr>
<td>(n=74) Mean=2.9 Standard Deviation=.443</td>
<td></td>
</tr>
</tbody>
</table>

Table 25 shows that a substantial majority of the respondents overwhelmingly indicated agreement with the problems pertaining to equity concerns in rural, isolated school districts. Overall, nine out of every ten respondents agreed with these seven problems.
Table 25
Equity Concerns Pertaining to Computer Conferencing Technologies in Rural, Isolated School Districts

<table>
<thead>
<tr>
<th>Equity Concerns (EC)</th>
<th>Problem or Barrier (Disagreed)</th>
<th>(Agreed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(EC 32) Subject-matter experts not available in local communities</td>
<td>3%</td>
<td>97%</td>
</tr>
<tr>
<td>(EC 33) Career role models not available in local communities</td>
<td>10%</td>
<td>90%</td>
</tr>
<tr>
<td>(EC 34) Interaction and joint activities with peers in other schools and locations</td>
<td>6%</td>
<td>94%</td>
</tr>
<tr>
<td>(EC 35) Additional resources needed for acquiring information and instruction</td>
<td>4%</td>
<td>96%</td>
</tr>
<tr>
<td>(EC 36) Additional staff development courses should be provided</td>
<td>4%</td>
<td>96%</td>
</tr>
<tr>
<td>(EC 37) Equity of educational opportunity should be provided</td>
<td>7%</td>
<td>93%</td>
</tr>
<tr>
<td>(EC 38) Equal access should be provided to increase quality of services</td>
<td>4%</td>
<td>96%</td>
</tr>
</tbody>
</table>

(n=74)  Mean=3.2  Standard Deviation=.081

Table 26 shows that the respondents in this survey had varied reactions to concerns posed in the section pertaining to socio-technical perspectives about technology. For instance, 93 percent (n=69) indicated disagreement with the statement that computer conferencing is becoming one of the needs of the workplace. Seventy-eight percent (n=64) of the respondents disagreed with the statement that computer networking skills should be taught in vocational education courses. Sixty-nine percent (n=51) disagreed with the suggestion that educators fear using computers, and yet 85 percent (n=63) indicated educators are reluctant to learn because of computer anxiety.

When asked if educators feel "educational technology" implies devices, rather than a process approach to instructional development, 86 percent (n=64) indicated
agreement. Likewise, 84 percent (n=62) agreed that the knowledge explosion is too much for anyone to handle without the assistance of long-distance telecommunication technology. The respondents did not provide a clear distinction between levels of agreement in four other questions involving socio-technical aspects.

Table 26
Respondents' Level of Agreement Regarding Socio-Technical Perspectives

<table>
<thead>
<tr>
<th>Socio-Technical Perspectives</th>
<th>Problem or Barrier (Disagreed)</th>
<th>(Agreed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ST 39) Computer networking should be taught in vocational education.</td>
<td>78%</td>
<td>21%</td>
</tr>
<tr>
<td>(ST 40) Computer conferencing is becoming one of the needs of the workplace</td>
<td>93%</td>
<td>7%</td>
</tr>
<tr>
<td>(ST 41) Educators resist off-campus electronic communications and distance education learning</td>
<td>49%</td>
<td>51%</td>
</tr>
<tr>
<td>(ST 42) Educators are often reluctant to learn to use computer conferencing because of computer anxiety</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>(ST 43) The majority of educators have a fear of using computers</td>
<td>69%</td>
<td>31%</td>
</tr>
<tr>
<td>(ST 44) Teachers are reluctant to become technologists in addition to being educational professionals</td>
<td>32%</td>
<td>68%</td>
</tr>
<tr>
<td>(ST 45) To most educators, &quot;educational technology&quot; still implies devices, not the process approach of instructional development</td>
<td>14%</td>
<td>86%</td>
</tr>
<tr>
<td>(ST 46) Many local educators feel compelled by powerful social &amp; administrative pressures to teach in particular ways, so they limit their opportunity to utilize computer technologies</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>(ST 47) Computers are perceived as &quot;another&quot; technology rather than as a mode that extends an educator's capacity to help people</td>
<td>45%</td>
<td>55%</td>
</tr>
<tr>
<td>(ST 48) The knowledge explosion is too much for anyone to handle without the assistance of long-distance telecommunication technology</td>
<td>16%</td>
<td>84%</td>
</tr>
</tbody>
</table>

(n=74) Mean=2.5 Standard Deviation=.409
Table 27 shows that school administrators who responded did not consider any of the five management-and-leaders aspects a problem. A substantial majority expressed disagreement with two of these aspects. Ninety-six percent (n=71) of the administrators felt teachers must be provided with the opportunity to expand their thinking about using telecommunication technologies for instructional purposes. Ninety-three percent (n=69) did not agree that educational leaders in their regions should develop skills for computer conferencing nationwide. Likewise, 82 percent (n=61) did not agree that turnover of key teachers is a barrier to the implementation of computer conferencing technologies in their region of the state.

<table>
<thead>
<tr>
<th>Management and Leadership</th>
<th>Problem or Barrier (Disagreed)</th>
<th>(Agreed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ML 49) District leadership is not motivated by its peers to join a computer conferencing network</td>
<td>61%</td>
<td>39%</td>
</tr>
<tr>
<td>(ML 50) Administrator turnover is a barrier to implementation of computer conferencing</td>
<td>69%</td>
<td>31%</td>
</tr>
<tr>
<td>(ML 51) Teacher turnover is a barrier to implementation of computer conferencing</td>
<td>82%</td>
<td>18%</td>
</tr>
<tr>
<td>(ML 52) Administrators need not provide teachers with opportunity to expand their thinking about use for instructional purposes</td>
<td>96%</td>
<td>4%</td>
</tr>
<tr>
<td>(ML 53) Educational leaders should develop skills for computer conferencing nationwide</td>
<td>93%</td>
<td>7%</td>
</tr>
</tbody>
</table>

(n=74) Mean=2.1 Standard Deviation=.223
Table 28 illustrates that a substantial majority of administrators did not take issue with questions pertaining to how consortia and cooperatives might involve computer conferencing technologies. For example, 93 percent (n=66) support using consortia and cooperatives as a way to develop long-range strategic plans so rural schools can better use computer-communication technologies.

Ninety-three percent indicated (n=69) that a cluster of cooperating school districts are ideal for developing an administrative computer conferencing network. The majority, 92 percent (n=68), did not support the notion that existing consortia and cooperatives do not need computer conferencing for administrative, coordinative, and instructional development activities.

Table 28
Utilizing Computer Conferencing with Consortia and Cooperatives

<table>
<thead>
<tr>
<th>Consortia and Cooperatives</th>
<th>Problem or Barrier (Disagreed)</th>
<th>(Agreed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(CC 54) Consortia and cooperatives are not ways to develop long-range strategic plans to use computer-communication technologies</td>
<td>93%</td>
<td>7%</td>
</tr>
<tr>
<td>(CC 55) A cluster of cooperating school districts are not ideal for developing an administrative computer conferencing network</td>
<td>93%</td>
<td>7%</td>
</tr>
<tr>
<td>(CC 56) Existing consortia and cooperatives do not need computer conferencing for administrative, coordinative, and instructional development activities</td>
<td>92%</td>
<td>8%</td>
</tr>
<tr>
<td>(CC 57) There is no need to have computer conferencing among localschool districts, state educational agencies, and other institutions</td>
<td>84%</td>
<td>16%</td>
</tr>
<tr>
<td>(CC 58) Existing local organizations and associations sufficiently handlecommunication needs without the aid of a computer</td>
<td>77%</td>
<td>23%</td>
</tr>
</tbody>
</table>

(n=74) Mean=1.8 Standard Deviation=.171
Table 29 provides information concerning the school administrators' responses pertaining to problems involving support services available for schools located in rural areas, especially those which might be enhanced through the use of the computer conferencing medium. The results show that a substantial majority of these respondents, 90 percent (n=67), felt computer conferencing is a way to access experts, consultants, mentors, and other support resources.

Seventy percent (n=52) agreed rural schools lack sufficient support personnel to properly utilize computer conferencing. Sixty-one percent (n=45) agreed that resources are not used properly to train people in how to use the computers. Likewise, 60 percent (n=44) of the respondents agreed that personnel are not available in rural areas to help explore educators' creative capabilities with computer conferencing.

Table 29

<table>
<thead>
<tr>
<th>Support Resources</th>
<th>Problem or Barrier (Disagreed)</th>
<th>(Agreed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(SR 59) Rural schools lack sufficient support personnel to properly utilize computer conferencing</td>
<td>30%</td>
<td>70%</td>
</tr>
<tr>
<td>(SR 60) Resources are not used properly to train people in how to use the computers</td>
<td>39%</td>
<td>61%</td>
</tr>
<tr>
<td>(SR 61) Personnel are not available to help explore educators' creative capabilities with computer conferencing</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>(SR 62) Computer conferencing is not a way to access experts, consultants, mentors, and other support resources</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>(n=74) Mean=2.5 Standard Deviation=.395</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 30 shows that among the 96 handwritten comments, 27 percent (n=26) focused on concerns about funding educational telecommunications. Nineteen percent
(n=18) expressed a need for this medium to help provide staff development opportunities. Sixteen percent (n=16) wrote about the need to obtain higher-level courses or new courses that would enhance the curriculum.

Other concerns were about needs for administrative and educational networking. There was interest in interactive video or television telecommunication technologies that would enrich the classroom. Fourteen administrators did not respond. There were six other responses, covering such areas as statewide uniform software, instructions on installation, time to implement, community enrichment, need for increasing the number of computers, and need for information on how to access technology to all schools.

Table 30
Summary of First Open-Response Question on Needs or Concerns

Question: If your school district were deciding to improve communications because of pending telecommunication opportunities, what is the area of greatest need or concern?

<table>
<thead>
<tr>
<th>Responses</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need for the availability of funding or financial support</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>Need for in-service or staff development services</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>Need for advanced and additional curriculum for new courses</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Need for administrative communication network</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Need for educational/instructional networking</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Need for interactive telecommunication media</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Need for classroom enrichment and enhancement</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Other comments nonrelated to above</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>96</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 31 shows that about two-thirds (n=55) of the respondents want solutions from the telecommunication medium that will help broaden and expand curriculum and offer advanced coursework and courses for both students and adults. It is also shown that respondents expect problems to be solved by sharing, collecting, or accessing data.

Saving time and money were factors listed by 12 percent (n=13) of the respondents. Seventeen respondents did not comment.

Table 31
Summary of Second Open-Response Question on Needs or Concerns

<table>
<thead>
<tr>
<th>Statements</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A broadened, expanded curriculum offering more courses</td>
<td>32</td>
<td>29</td>
</tr>
<tr>
<td>Opportunity for advanced coursework for students and adults</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>Access to new ideas, interactions, or enhanced information</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Sharing, collecting, and/or accessing instructional data</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>A way to save time traveling and going to meetings</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>A medium that would save money</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>A way to improve communication and provide prompt data</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>A way to expedite administrative information and conversations</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Other comments nonrelated to above</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>109</td>
<td>100</td>
</tr>
</tbody>
</table>
Description of the Findings

The findings show that 74 (73%) of the 101 respondents returned the surveys for this research project. Fifty-two of the fifty-three (98%) North Dakota representatives responded. The typical respondent was an administrator with a master's degree (76%) having over 10 years (80%) of administrative experience.

The research objectives will be met by describing the findings according to the following research questions posed in this study:

**Question 1:** What computer telecommunication technologies are being used for administrative and instructional purposes in rural school districts?

Nearly three-quarters (74%) of the respondents do not use computers for communicating long distances. Among those that do, only three (4%) have used computer-communicating programs that fit into the advanced computer conferencing description. Sixteen (22%) have had bulletin boards and electronic mail used for communicating in their school district; however, they are not being used for instructional or administrative purposes.

Three respondents, one each from the states of Montana, South Dakota, and Minnesota, indicated there were computer conferencing systems available for teachers. The one from South Dakota mentioned a bulletin board system which can be provided by a vendor and installed in the school district. The one from Montana told about an E-Mail system for teachers, and the one from Minnesota mentioned a statewide computer conferencing system.

The computer conferencing program, CAUCUS, was reported by the Minnesota respondent as being available through IRIS, a service being promoted by the Minnesota Department of Education. A Montana respondent and one from North Dakota noted that Montana's EDUNET (E-Mail) service was for teachers. A district bulletin board
system for administrators, teachers, students, and parents was reported as operational in one of the North Dakota school districts.

Question 2: If rural schools are not using these technologies, what are the problems and what are the barriers?

With 62 questions focusing on school administrators' perceptions about telecommunications technologies, the answer to this question is extensive. The attempt was to establish instrument item reliability in order to help judge the data base ascertained in this study. Consequently, Cronbach's Alpha reliability quotients were computed for each of the questions as well as each of the 11 categories.

The respondents indicated that 34 (55%) of the 62 statements in the survey were problems or barriers impeding the usage of computer conferencing technologies in North Dakota rural schools and those counties in other states bordering North Dakota. The following research findings are ordered according to the category having the highest reliability quotient:

**Equity Concerns**

The responses indicated that the set of questions pertaining to the problem of equity concerns had the highest reliability quotient, which was .92. Respondents agreed that rural schools should be provided with equitable telecommunication services. The overall mean of 3.2 reflects this agreement. All the following aspects were considered problems that can be resolved through the use of technologies in the rural areas:

1. The need for subject-matter experts to be available in local communities.
2. The need for career role models to be available in local communities.
3. The desire to have interaction and joint activities with peers in other locations.
4. The need for additional resources to acquire information and instruction.
5. The opportunity for additional staff development courses.
6. The need for equity of educational opportunity in rural, remote areas.
7. The opportunity to have equal access and to increase quality of services.

Infrastructure Requirements

The responses indicated that the set of questions pertaining to the problem of infrastructure requirements had the next highest reliability quotient, which was .90. The overall mean is 2.3. The following was the only factor judged by the respondents as a problem among the six in this group:

8. Rural schools lack a system with equalized capability and service.

Financial Aspects

The responses indicated that the set of questions pertaining to the barriers of financial aspects had the third highest reliability quotient, which was .840. The overall mean is 2.6. A substantial majority indicated that the following factors would not be a problem if computer conferencing was proven to be cost effective:

9. Support is not available for computer conferencing equipment.
10. Support is not available to cover long-distance charges.
11. Budget cuts and constraints prevented previous usage.

Consortia and Cooperatives

The responses indicated that the set of questions pertaining to the issue of consortia and cooperatives had the fourth highest reliability quotient, which was .798. The overall mean of 1.8 indicates that most respondents were in concert that these items did not pose any problems for rural schools. The percentage figures were also high on the disagreement side.
Regulations and Policy

The responses indicated that the set of questions pertaining to the problem of regulations and policy had the fifth highest reliability quotient, which was .706. With the overall mean of 3.1, this group had a high percentage of respondents in agreement that the following were problems or barriers:

12. Spectrum allocation regulation issues are not being dealt with by either national or individual state leadership groups who should be interested in changing policy in favor of education. (This question was not understood by some respondents. Others may not have fully comprehended how these allocations are controlled by the Federal Communication Commission. It refers to the quantity and quality of bandwidth the FCC allows to be transmitted over the telephone lines.)

13. There is a need for collaboration among administrators regarding regulations for using technologies like computer conferencing.

14. Congress must review and shape policies to reflect the nation's educational needs in light of the possibilities created by new computer conferencing technologies.

15. Policy makers at all levels of government are not giving enough attention to expanding the amount and capability of computer conferencing technology in schools.

Users' Interest

The responses indicated that the set of questions pertaining to the issue of users' interest had the sixth highest reliability quotient, which was .669. The overall mean of 2.3 indicates that this aspect was overwhelmingly considered a problem. The only aspect viewed as a problem in this group, according to 73 percent of the respondents, was the following:

16. School districts do not have clear goals for using technologies such as computer conferencing.

Socio-technical Perspectives

The responses indicated that the set of questions pertaining to the problem of socio-technical concerns had the seventh highest reliability quotient, which was .586.
The overall mean of 2.5 resulted from varying levels of agreement. The percentages of those agreeing and disagreeing varied from question to question. One aspect was not deemed a problem by 93 percent, whereas two other aspects were considered problems by over 80 percent. The respondents rated the following six out of the ten aspects as barriers:

17. Educators are reluctant to learn because of computer anxiety.
18. Teachers are reluctant to become technologists.
19. To educators, "educational technology" implies devices, not the process approach to instructional development.
20. Many educators feel compelled to teach in particular ways, so they limit their opportunity to utilize computers.
21. Computers are perceived as "another" technology rather than as a mode that extends an educator's capacity to help people.
22. The knowledge explosion is too much for anyone to handle without the assistance of long-distance telecommunication technology.

Management and Leadership

The responses indicated that the set of questions pertaining to the barriers of management and leadership had the eighth highest reliability quotient, which was .507. The overall mean of 2.1 indicates what the percentages show, and that is, administrators were united in indicating that none of the statements in this group posed problems for their schools.

Time Consideration

The responses indicated that the set of questions pertaining to the problem of time considerations had the ninth highest reliability quotient, which was .50. The overall mean was 2.6, and percentages were mixed. The respondents considered the
following four of the six aspects in this category about time considerations as problems or barriers:

23. Schools lack time to properly train people how to use computers.
25. Turnaround time and timely feedback of information is a problem.
26 Administrators do not have time to explore computer conferencing.

Support Resources

The responses indicated that the set of questions pertaining to the problem of support resources had the tenth highest reliability quotient, which was .483. They indicated that three out of the four were problems, and overwhelmingly rejected the fourth as a problem. This overall mean was 2.5. These three were the ones perceived as problems and barriers impeding the utilization of telecommunications in rural areas:

27. Rural schools lack sufficient support personnel to properly utilize computer conferencing.
28. Resources are not used properly to train people in how to use the computers.
29. Personnel are not available to help explore educators' creative capabilities with computer conferencing.

Access Problems

The responses indicated that the set of questions pertaining to access problems had a reliability quotient of .443. One aspect in this set was rejected as a problem by 84 percent of the respondents. The administrators agreed there is a need for a fax machine in the district office. With an overall mean of 2.9 and an extremely large percentage of respondents agreeing with the others, the following four were the ones considered to be barriers pertaining to access for rural schools:

30. Dedicated telephone lines in each of the school buildings.
31. There is a need for fax machines in the school district offices.
32. Rural areas have inequitable access to telephone services.
33. Rural areas need access to competitive long-distance carriers.
34. Administrators do not have access to such conferencing services.

Question 3: Do the school administrators understand the differences among E-Mail, bulletin boards, conferencing with forums, and conferencing with networking systems?

A set of basic information questions in the survey focused on finding the level of understanding each respondent had about communicating long distances with the microcomputer. They were asked about their training, education, and familiarity with four different types of communication programs. Twenty-six (38%) noted they did not have any training or education relating to computer conferencing. Thirty-four (47%) noted they had very little instruction, less than nine hours.

Thirty (41%) administrators indicated they either had no understanding, were not clear, or found it confusing. Thirty-nine (58%) indicated they have a fair understanding. Only one administrator indicated an excellent understanding. Sixty-eight (92%) were not familiar with advanced conferencing networking systems. Only thirteen (18%) of the administrators knew about computer conferencing with forums. Forty-two (57%) indicated they were familiar with bulletin board and electronic mail systems.

Question 4: Do school administrators understand who controls these kinds of computer telecommunication programs and the costs involved to utilize them?

The majority of the school administrators indicated they did not have an understanding of who controls computer telecommunication programs or what it costs to utilize them. Three respondents provided cost figures for operating a system.

Among the 11 reporting usage of a system, five gave the name of the program being used, eight listed the location of the operator, five listed the name of the organization in control, and 10 listed the groups being served. Thus, 63 (85%) of the
respondents did not list information about controls and costs. Only three (4%) were able to provide cost figures.

**Question 5:** Do models exist where school districts are using computer telecommunication for administrative and/or instructional purposes?

Fifteen respondents provided the following information about existing models in their state:

1. **EDUNET (Electronic-Mail),** which is part of the Big Sky Telegraph project at Helena, Montana. It is listed as being for teachers to use for instructional purposes.

2. **IRIS (CAUCUS, Advance Conferencing),** which is part of the Minnesota Department of Education's (St. Paul) On-line project, which was being used for instructional purposes by those interested in piloting projects.

3. **BULLETIN BOARDS**
   - a. School District, Rolla, North Dakota
   - b. Lake Region Special Education Co-op, Devils Lake, North Dakota
   - c. Software Unlimited, Sioux Falls, South Dakota
   - d. School District, Surrey, North Dakota
   - e. Southwest Area Vocational Education Project, Dickinson, ND
   - f. U. S. West, Bismarck, North Dakota
   - g. Valley & Lakes Education District, Fergus Falls, Minnesota
   - h. Mid-River Telephone Company, Circle, Montana

4. **FINANCIAL AND DATA REPORTING**
   - a. Pilot project developing at Department of Public Instruction, Bismarck, North Dakota.

**Summary of Answers given in Open-Response Questions**

Funding educational telecommunications is a major concern for school administrators even though they feel strongly that this medium could help provide
staff development opportunities and higher-level courses or new courses that enhance the curriculum. About one out of every five expressed the need for administrative or instructional uses of computer conferencing.

The respondents envision the telecommunication media as a way to broaden and expand curriculum. This included hopes that it will offer more courses and advanced coursework for both students and adults. They view computer conferencing as a tool for sharing, collecting, or accessing data. Some view computer conferencing as a way to save time and reduce expenses involved in traveling and attending meetings.
CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This chapter provides the summary, conclusions, implications, and recommendations based upon the research effort. The summary of the study includes a restatement of the problem, the research objectives, and the methodology of the study. The conclusions are based upon the data describing the findings. Implications are derived from the list of barriers and problems regarding the implementation of computer conferencing. Implications are also derived from the school administrators' utilization and knowledge about computer conferencing. A list of recommendations concludes this chapter.

Summary of the Study

The problem of this study was based on the premise that rural schools and communities in isolated areas traditionally have had neither accessible nor equitable information services, as have their counterparts in urban and metropolitan areas. This no longer has to be the case, because technology has made it possible to alleviate this type of isolation. Telecommunications, particularly the computer-mediated communication media, provides economical computer conferencing and networking options through telephone services.

The problem is finding out if educational leaders of isolated, rural schools know about these technological services, whether they can or cannot afford these services, and if any models exist which can demonstrate the installation, training, and use of such services.

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The research objectives of this study were to answer the following questions:

**Question 1:** What computer telecommunication technologies are being used for administrative and instructional purposes in rural school districts?

**Question 2:** If rural schools are not using these technologies, what are the problems and what are the barriers?

**Question 3:** Do the school administrators understand the differences between E-Mail, bulletin boards, conferencing with forums, and conferencing with networking systems?

**Question 4:** Do school administrators understand who controls these kinds of computer telecommunication programs and the costs involved to utilize them?

**Question 5:** Do models exist where school districts are using computer telecommunication for administrative and/or instructional purposes?

a. If so, what are the components and characteristics?

b. If so, where are they being used?

c. If they are not used in rural school districts, are they applicable?

A review of literature revealed there were many articles about the use and practicality of computer conferencing. However, the empirical research focused on communication factors rather than education. Reports on educational uses pertained to staff development. Thus, no research was found regarding the use of this medium by school leaders for administrative, instructional, and coordinating activities between clusters of schools or other such cooperatives. Therefore, the literary review centered on general aspects about the utility, uses, and problems and barriers for using this new telecommunication technology.

The design of this study is descriptive. The intent is to utilize data obtained in a survey of school administrators in order to ascertain the extent to which computer telecommunication technologies are being utilized in rural school districts within
selected counties located in four rural states. It is also an intent to assess the perspectives of school administrators and their schools' capacity to utilize these technologies for administrative and instructional uses. Consequently, a survey questionnaire was constructed as an appropriate means to collect data for this research.

The target population for this study consists of all counties in North Dakota and tiers of counties which border or are near the borders of the state of North Dakota. One school administrator was selected from each of these 101 counties to represent the population unit. In order to obtain the information needed for this study, the survey questionnaire was designed to collect data about demographic information and the level of the school administrators' understanding about computer conferencing and services. The instrument was also designed to inquire about their perspectives concerning barriers and regarding the utilization of computer conferencing technologies.

Adjustments were made to the instrument's questions at the suggestion of educators and administrators who participated in the expert analysis of the instrument and the subsequent field test. It was designed so that if instrument reliability was established, the findings would describe a reliable data base. Thus, the statistical analysis of this study was based on descriptive statistics concluding with Cronbach's alpha measures to ascertain this end.

Conclusions

The conclusions reflect the descriptions of the findings of this study. The following conclusions are summarized according to the order of the research questions:

1. Typically, an experienced rural school administrator does not use computers for communicating long distances and has no knowledge about advanced
computer conferencing capabilities. There is some familiarity with bulletin boards and electronic mail, but it is not being used for instructional or administrative purposes.

2. A typical rural school administrator agrees with over half of the problems or barriers current literature says impede the usage of computer conferencing technologies in schools. The following describes these typical concerns:

Equity concerns of these rural school administrators agree that subject-matter experts are not available in their rural communities. They feel computer conferencing will help with this as well as with the problem of not being able to interact with career role models. They also have a desire to use this medium for interaction and joint activities with peers in other locations. They suggest this technology will help with acquiring needed additional resources for information and instruction. Finally, they agree it would provide additional staff development courses, equity of educational opportunity, and equal access to increase quality of information services.

Infrastructure requirements for rural schools are adequate, but school administrators do feel it is somewhat of a barrier that many rural telephone companies lack a system with equalized capability and service. Two-thirds of the rural telephone companies provide digital switches and high-quality transmission lines for reliable data transmission. Fiber optics is installed in half of the rural areas included in this study.

Financial aspects would not be a barrier for school administrators if they knew computer conferencing was cost effective; however, they indicate that financial support is not available for computer conferencing equipment and to cover long-distance charges. Budget cuts and constraints have prevented previous usage. Consortia and Cooperatives provide ways for area rural schools to develop long-range strategic plans to use computer conferencing. The school administrators
indicated that a cluster of cooperating schools are ideal for developing an administrative network for state and local communications needs.

Regulations and policy problems affecting rural schools are issues not being dealt with by either national or individual state leadership groups who should be interested in changing policy in favor of education. There is a need for collaboration among administrators regarding such regulations for using technologies like computer conferencing. School administrators agree that Congress must review and shape policies to reflect the nation's educational needs in light of the possibilities created by new computer conferencing technologies. They also feel policy makers at all levels of government are not giving enough attention to expanding the amount and capability of computer conferencing technology in schools.

Users' interest statements found that rural school administrators have a desire to use computer conferencing for instructional and administrative purposes. Half of these respondents lacked computer-accessing skills needed for searching and retrieving information on-line with a computer. They believe it can be a part of their daily style and routine. They have the ability and keyboarding skills necessary to use this medium effectively, yet they admit, overwhelmingly, that school districts do not have clear goals for using technologies such as computer conferencing.

Socio-technical aspects pose many barriers for the rural school administrators to contend with as leaders in the transition toward utilization of telecommunication technologies. These administrators agree the knowledge explosion is too much for anyone to handle without assistance of long-distance telecommunication technology. They also admit educators are reluctant to learn because of computer anxiety. They agree teachers are reluctant to become technologists in addition to being educational professionals. They disagree that computer networking skills should be taught in vocational education courses and that computer conferencing is becoming one of the needs of the workplace.
To educators, "educational technology" implies devices, not the process approach to instructional development. Administrators realize they have to break down the barriers that make many educators feel compelled by powerful social and administrative pressure to teach in particular ways which limit their opportunity to utilize computers. They agreed it is necessary to lead in changing the perception that computers are "another" technology rather than a mode that extends an educator's capacity to help people.

Management and leadership problems appear nonexistent among the administrators surveyed. Although the majority felt they should utilize computer conferencing for state and local purposes, they overwhelmingly rejected the notion to develop such skills for nationwide communication needs. However, most everyone agreed that they should provide teachers with the opportunity to expand their thinking about use for instructional purposes.

Time consideration poses problems and creates barriers for implementing technologies in rural schools. A typical rural school administrator admits there is a lack of time for proper training of people to use computers. Turnaround time and timely feedback for exchanging information is a problem. These administrators contend they do not have time to explore and implement computer conferencing networks.

Support Resources involve barriers for rural schools because they lack sufficient support personnel to properly utilize computer conferencing. The administrators agreed that resources are not used properly to train people in how to use the computers. Personnel are just not available in rural areas to help explore educators' creative capabilities with computer conferencing.

Access Issues involve such concerns as having a dedicated telephone line in each of the school buildings and access to computer conferencing services. The school
administrators admit it is a barrier that rural areas have inequitable access to telephone services, and desire access to competitive long-distance carriers.

The typical rural school administrator accepts the concept of computer conferencing.

3. This research suggests the typical school administrator in these northern plains states has had very little instruction in computer conferencing. One out of every three rural school administrators had no training or education whatsoever in this area.

4. The majority of these school administrators have no understanding of who controls computer telecommunication programs or what it costs to utilize them. Very few can report on available systems in use, the program being used, the location of the system operator, the name of the organization in control, or the groups being served.

5. The statewide systems that are applicable for computer communications in the area surveyed are the following:

   a. EDUNET, an electronic-mail system located in Helena, Montana. It is listed as being for teachers to use for instructional purposes.

   b. IRIS, an advanced conferencing system located in St. Paul, Minnesota. It is listed as a pilot project for instructional purposes.

Implications

The findings from both the review of literature and this research are paralleled in most respects. Computer conferencing use is minimal in schools and nonexistent among school administrators, but interest is high for utilizing these new communication technologies in rural schools.

There is a keen interest among rural school administrators to develop these telecommunication links to enhance curriculum and support added instructional
opportunity for students. These school administrators tend to perceive this medium for instruction rather than administrative purposes. Yet the findings suggest there is much interest to develop projects which organize networks between administrators who are involved in consortia or cooperative activities.

The research shows that rural administrators are faced with a majority of the problems and barriers the literature suggests occurs throughout the nation.

The fact that funding is a concern and most school districts lack proper goals to use new communication technologies in education suggests diffusion of new projects will occur slowly during the next few years. However, indications that diffusion will occur are evident because administrators place a high priority on eliminating equity- and-access barriers in rural areas with telecommunications. Rural school administrators recognize the need to help expand their teachers' thinking toward change, adaptation, and implementation of telecommunication projects. These administrators admit they have much to learn. They lack time for proper implementation, but appear to be committed to start using these technologies. This could occur faster when or if they were trained to the extent that they could obtain the skills to make computer conferencing cost effective. The infrastructure for telecommunication appears to be in place for these rural areas to utilize these opportunities.

The findings suggest that if the school administrators would become involved in utilizing communication networks via computer conferencing, they might also become more involved in urging policy makers on the state and national levels to give education more attention regarding related regulations and policies.

The findings also show that leaders have much to do to help associates overcome the barriers involved with computer anxiety. This includes helping eliminate the reluctance of educators to be involved as technologists, and accepting technology as a process approach to instructional development. This also implies the
need for administrators to set the tone so educators do not limit their opportunity to use computers when it is more expedient and effective to enhance the delivery of education.

Finally, this study found that school administrators wholeheartedly agree that the knowledge explosion is too much for any one person to handle without assistance from telecommunication technology. Therefore, even though minimal utilization of computer conferencing was detected, the existence of the IRIS project in Minnesota and the EDUNET service in Montana reveals the seeds are sown for long-range development for instructional and administrative purposes. The upsurge of consortia and cooperatives created to support these rural activities suggests that much involvement should occur in all aspects of telecommunications. This movement is exactly what the literature predicted will happen while projecting an increasing need for rural school administrators to collaborate and coordinate through computer conferencing. The administrators responding to this study concur.

Recommendations

Recommendations for current practice and future research are offered in this section. There is evident need, as derived from literature, theory, and this research, that a better understanding is needed concerning the utilization and implementation of computer conferencing in rural schools. There is a need for educational leadership in the technology transition to ensure teachers and administrators are properly trained to use telecommunications. (Perelman, 1987; Wolman, 1988). The leadership trend to properly ensure this need has shifted to consortia or state leadership through the benefit of long-range strategic planning (Van Horn, 1986; Olson and Morrison, 1987; Cawelti, 1989; Nachtigal, 1990).

Computer conferencing is a service and a tool for communicating electronically with people over long distances. It consists of users who collaborate and coordinate in
an information network. Networking as an active support group is a function of consortia and cooperatives.

As a result of this research effort, the following recommendations are provided in order for faculty and administrators to enhance their computer conferencing skills and services:

1. The respective administrative and leadership associations in each rural state should create task forces to coordinate a statewide needs assessment, investigate business and industry support, sanction a pilot project, and actively disseminate the results to their respective membership.

2. The state educational agencies and regional planning entities of the rural states should coordinate the inventory of experts who would be available to communicate their expertise via computer conferencing. These state agencies should be responsible for continuing this responsibility.

3. The state vocational educational agency should be requested by school administrators to participate in the coordination of career counseling via computer conferencing. This would provide rural areas access to career role models and increase participation with existing data bases developed for this purpose.

4. The clusters of independent school districts in rural, remote areas of the nation, like the population studied in this research, should be targeted to establish a pilot project. The effort should be combined with resources and facilities available at colleges, universities, state agencies, and extension services serving the educational needs of these rural areas.

5. These agencies and institutions serving the rural school clusters should focus on providing staff development needs along with developing objectives to meet the goals for equity of educational opportunity and equal access to increase the quality of information services.

6. Coordination and statewide promotion of a rural computer conferencing network should start with a comprehensive and advanced network program like PARTICIPATE or CAUCUS. This would expedite the utilization of advanced networking capabilities.

7. Rural telephone cooperatives should be made part of regional planning efforts in order to provide assistance, support,
expertise, and adequately respond to the marketplace needs created by increased utilization of their services.

8. The state advisory councils, the state educational associations, the state councils of school administrators or related associations should involve their staffs in computer conferencing networks. They can provide leadership for educators who wish to be more involved with the politics involving regulations and policy about telecommunications.

9. State educational agencies, in conjunction with concerned associations or consortia leadership, should launch a positive campaign which addresses the socio-technical aspects that block proper utilization of educational technology.

10. The federally funded Leadership in Educational Administration Development (LEAD) programs could provide workshops to develop technology transition leadership skills needed by school administrators, vocational directors, special education directors, and other administrators serving local rural schools.

11. Those interested in the proper development and utilization of technologies, like computer conferencing, should create examples to demonstrate such slogans as, "Take the time to learn how to save time by communicating with computers."

12. The state university systems should lead in staff development and offer university credit courses that properly train and teach educators how to utilize computer conferencing.

13. The educational administrators and leaders of local agencies, state agencies, and universities or colleges should establish a network system which utilizes computer conferencing for mentorship opportunities to help beginning administrators.

14. The various agencies, institutions, consortia, and cooperating entities involved in education should support the same statewide telecommunication technologies to ensure compatibility and provide uniform services.

15. The vocational education curriculum development groups should provide guidance and teacher training to help secondary and postsecondary vocational teachers implement computer conferencing techniques in accordance with the usages found in business, industry, labor, military, and government.

16. The local school districts need to develop long-range goals and establish specific objectives for the proper educational and administrative uses of telecommunications.
The following recommendations are made to encourage future research on computer conferencing and related telecommunication technologies:

17. Correlation research should be conducted to compare the northern-tier states of this study with other rural regions of the United States, such as the midwestern states.

18. Further research should be conducted to determine the extent to which psychological or attitudinal variables bring about personal intimidation, anxiety, and fear which impedes adults from wanting to learn computer conferencing.

19. Further research should be conducted on the purposes and outcomes of computer conferencing networks in terms of solving problems relating to efficient and effective administrative performance.
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138


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APPENDIX A

The 101 Counties in North Dakota, Northeastern Montana, Northwestern Minnesota, and Northern South Dakota
### The 101 Counties in North Dakota, Northeastern Montana, Northwestern Minnesota and Northern South Dakota

<table>
<thead>
<tr>
<th>North Dakota counties</th>
<th>North Dakota Continued</th>
<th>Northeastern Minnesota counties</th>
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APPENDIX B

The Panel of Experts
PANEL OF EXPERTS

Reviewed Instrument:

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APPENDIX C

The Questionnaire
BARRIERS & ISSUES REGARDING COMPUTER CONFERENCING FOR SCHOOL ADMINISTRATORS

Brief Definition: Any long-distance exchange of computer text (i.e., discussion form) for the purpose of exchanging ideas or information is defined as computer conferencing.

The purpose of this first section of the survey is to identify your perceptions about using computer conferencing in your school system.

There are no right or wrong answers, so do not hesitate to respond frankly to each statement. Many different points of view are covered to determine the amount of agreement. This will help in identifying barriers and issues regarding the implementation of computer conferencing in rural schools.

Mark your responses by circling your choice in the columns to the right. Please respond once per question.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
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USER INTEREST (An inquiry into presumed reasons computers are not used for conferencing.)

1. I believe our school district has a desire to use computer conferencing for administrative and instructional purposes.

2. My daily administrative style and routine includes (or could include) using computers for distance communicating.

3. I am confident of my ability to use computer conferencing effectively.

4. My school district has clear goals for using technologies such as computer conferencing.

5. I possess the necessary computer-accessing skills for searching and retrieving electronic data.

6. I lack keyboarding skills necessary to use computer conferencing.
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<tr>
<th>Item Number</th>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<tr>
<td>7.</td>
<td>Lack of time is a problem in properly training people how to use computers.</td>
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<td>8.</td>
<td>Lack of time is a problem in properly implementing computer conferencing.</td>
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<td>9.</td>
<td>Overall, our school can keep up with the pace of technological change.</td>
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<td>10.</td>
<td>Turnaround time to provide timely feedback for certain messages is an issue</td>
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<td>that can be resolved with computer conferencing.</td>
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<td>11.</td>
<td>The majority of administrators in our rural district have time to</td>
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<td></td>
<td>explore computer conferencing.</td>
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<td>12.</td>
<td>Voting and polling options on advanced computer conferencing programs will</td>
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<td>save administrative time.</td>
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**FINANCIAL ASPECTS** (Determining whether certain financial aspects are issues or barriers.)

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<tr>
<th>Item Number</th>
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<td>Financial support is available to acquire computer conferencing equipment</td>
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<td></td>
<td>(a communication program for a microcomputer that has a modem connected</td>
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<td>to a dedicated telephone line.)</td>
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<td>14.</td>
<td>Financial support is available to cover the costs of long-distance</td>
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<td>Funds would be made available if it was accepted that computer conferencing</td>
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<td>enhanced certain communication tasks and reduced current long-distance</td>
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<td>telephone costs.</td>
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<td>16.</td>
<td>Budget cuts and related constraints have prevented any usage of computer</td>
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<td>...digital switches to accommodate full usage of services like computer conferencing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>21.</td>
<td>...an information infrastructure that contains a telecommunications system with equalized capability and service for computer conferencing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>22.</td>
<td>...fiber optics necessary to use all available network signals.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**INFRASTRUCTURE REQUIREMENTS** (All the facilities needed to use computers for communicating.)

Our rural school district's telephone company is **lacking** in the following areas:

23. Spectrum allocation* regulation issues are **not** being dealt with by either national or individual state leadership groups who should be interested in changing policy in favor of education.
   (*Allowable quantity and quality of data or bandwidth being transmitted over the telephone line.)

24. There is a **need** for collaboration among administrators regarding regulations for using technologies like computer conferencing.

25. Congress **must** review and shape policies to reflect the nation's educational needs in light of the possibilities created by new computer conferencing technologies.

26. Policy makers at all levels of government are **not** giving enough attention to expanding the amount and capability of computer conferencing technology in schools.
<table>
<thead>
<tr>
<th>Item Number</th>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
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</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Our school district buildings should have dedicated telephone lines to access computer conferencing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>28</td>
<td>Our school district office does not have a need for technologies like facsimile (fax) machines.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>29</td>
<td>Schools in our rural area have inequitable access to telephone service (i.e., some do and some do not have digital switches, telenet nodes, etc.).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>30</td>
<td>Our rural area needs access to competitive long-distance carriers (i.e., Sprint, CMI, etc.).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>31</td>
<td>Administrators in our districts have access to computer conferencing services.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**ACCESS ISSUES** (The challenge involved in acquiring available services for everyone.)

27. Our school district buildings should have dedicated telephone lines to access computer conferencing.

28. Our school district office does not have a need for technologies like facsimile (fax) machines.

29. Schools in our rural area have inequitable access to telephone service (i.e., some do and some do not have digital switches, telenet nodes, etc.).

30. Our rural area needs access to competitive long-distance carriers (i.e., Sprint, CMI, etc.).

31. Administrators in our districts have access to computer conferencing services.

**EQUITY CONCERNS** (The challenge involved in assuring everyone obtains services that are available.)

Computer conferencing should provide equal access in rural, isolated schools in regard to:

32. ...subject-matter experts not available in the local communities.

33. ...career role models not available in the local communities.

34. ...interaction and joint activities with peers in other schools and locations.

35. ...an additional resource for acquiring needed information and instruction in areas of interest.

36. ...additional staff development courses.

37. ...equity of educational opportunity.

38. ...increased quality of educational services.
### SOCIO-TECHNICAL PERSPECTIVES

(People do not want to be subservient to machines and systems.)

<table>
<thead>
<tr>
<th>Item Number</th>
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<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>Computer conferencing networking skills used in business and industry <em>should</em> be taught in vocational education courses.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>40</td>
<td>I believe computer conferencing skills are becoming one of the needs of the workplace.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>41</td>
<td>I believe the majority of educators in our school district <em>resist</em> off-campus electronic communication and distance education learning.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>42</td>
<td>I feel educators often are reluctant to learn to use computer conferencing because of computer anxiety.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>43</td>
<td>The majority of educators in our school district have a <em>fear</em> of using computers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>44</td>
<td>I believe teachers are reluctant to become technologists in addition to being educational professionals.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>45</td>
<td>To most local educators, <em>educational technology</em> still implies devices—hardware and associated software—not the process approach of instructional development.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>46</td>
<td>Many local educators feel <em>compelled</em> by powerful social and administrative pressures to teach in particular ways, so they limit their opportunity to utilize computer technologies.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>47</td>
<td>In our school district, computers are perceived as <em>another</em> technology rather than as a mode that extends an educator's capacity to help people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>48</td>
<td>The knowledge explosion is too much for anyone to handle without assistance of long-distance telecommunication technology.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Item Number</td>
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</tr>
<tr>
<td>49</td>
<td>Our school district leadership is <em>not</em> motivated by its peers to join a computer conferencing network.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>50</td>
<td>Turnover of school administrators is a <strong>barrier</strong> to the implementation of computer conferencing technologies in our region of the state.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>51</td>
<td>Turnover of key teachers is a <strong>barrier</strong> to the implementation of computer conferencing technologies in our region of the state.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>52</td>
<td>Administrators in our region of the state must provide the opportunity for teachers to expand their thinking about the use of computer conferencing for instructional purposes.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>53</td>
<td>Educational leaders in our region of the state <strong>should</strong> develop skills for computer conferencing nationwide.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**CONSORTIA AND COOPERATIVES** (Clusters of schools and/or institutions uniting for a common purpose.)

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td>Consortia and cooperatives should provide ways to develop long-range strategic plans so rural schools can better use computer-communication technologies.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>55</td>
<td>A cluster of cooperating school districts <strong>would be</strong> ideal for developing an administrative computer conferencing network.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>56</td>
<td>I believe existing consortia and cooperatives need computer conferencing for administrative, coordination, and instructional development activities.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>57</td>
<td>There is <strong>no</strong> need to have computer conferencing between my school district, state educational agencies, and other educational institutions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>58</td>
<td>Our existing local organizations and associations sufficiently handle communications and coordination needs without the aid of a computer conferencing medium.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Item Number</td>
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</tr>
<tr>
<td></td>
<td>SUPPORT RESOURCES (Consultants, experts, and mentors who are around when needed.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59.</td>
<td>Our local rural schools lack sufficient support personnel to properly utilize computer conferencing.</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60.</td>
<td>Resources are not used properly to train people in how to use the computers.</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.</td>
<td>Personnel are available in rural areas to help explore educators' creative capabilities with computer conferencing.</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62.</td>
<td>Computer conferencing is a way to access experts, consultants, mentors, and other support resources.</td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OPEN-ENDED QUESTIONS:

63. If your school district were deciding to improve communications because of pending telecommunication opportunities, what is the area of greatest need or concern?

64. What problems might telecommunications solve for you and your school district?
BACKGROUND INFORMATION ON KNOWLEDGE OF COMPUTER CONFERENCING

INSTRUCTIONS: The purpose of this section of the survey is to obtain general background information about your computer conferencing knowledge. Please respond to this part by writing in the information requested or checking the category which best applies to you.

65. Approximate hours of formal training/instruction related to computer conferencing:
   (a) ___ none (0 hours)
   (b) ___ very little (sessions totalling from 1 to 9 hours)
   (c) ___ moderate (sessions totalling from 10 to 20 hours)
   (d) ___ extensive (a course or sessions totalling more than 21 hours)

66. How would you rate your overall understanding of computer conferencing?
   (a) ___ no understanding
   (b) ___ not clear, I find it confusing
   (c) ___ fair, but need more help
   (d) ___ excellent, I know what I'm doing with computer conferencing

Check the following types of computer-communication host programs which you have had experience using for computer conferencing:

67. ___ electronic mail
68. ___ bulletin board
69. ___ computer conferencing - forums
70. ___ computer conferencing - advanced networks
   ___ none of the above

71. ___ Yes Do either you or your school district use computers for long-distance communicating (computer conferencing)?
   ___ No

IF YOU ANSWERED NO TO QUESTION 71, GO TO QUESTION 84,
(Questions 72-83 won't apply)
Please place a check by the type(s) of computer-communication host program being used.

72. ___ computer conferencing - advanced networks  
73. ___ electronic mail

74. ___ computer conferencing - forums  
75. ___ bulletin board

76. What is the name of the computer-communication host program being used? Please check all that apply.

___ PARTICIPATE   ___ EDUNET   ___ FORUM
___ CAUCUS       ___ BITNET   ___ don't know
___ COSY         ___ Other _____________________________

77. Where is the host controller or operator located?

___ CIS (CompuServe Information Service)  
___ Big Sky Telegraph (Montana)
___ IRIS (Minnesota Ed. Computer Consortium)  
___ Learning Link (NcRel)
___ Other _____________________________

78. Name the organization or cooperative in control of systems operation.

________________________________________

79. What group is primarily being served by this computer conferencing system? Please check all that apply.

___ administrators  
___ teachers
___ business  
___ public
___ other _____________________________

What is the approximate monthly cost of operating this computer conferencing system?

80. $_________ host controller or operator's subscription fee

81. $_________ additional type of billing; please briefly describe these charges below

________________________________________

82. $_________ a membership fee, if applicable

________________________________________

83. $_________ other recurring costs; please briefly describe these costs below

________________________________________
84. Do you know of any computer conferencing models or systems being developed for school administrators or other educational leaders to facilitate electronic communication among school districts or clusters of school districts?

(a.) No.

(b.) Yes. (If yes, please give name and address of individual or organization if it is readily available.)

Name ______________________________
Address ______________________________

Answer this section only if the information is readily available.

Name ______________________________
Address ______________________________

Name ______________________________
Address ______________________________

PART 3

DEMOGRAPHIC INFORMATION: Your individual responses will be kept confidential. In order to comply with research requirements and follow up on nonrespondents, each questionnaire is identified by a survey number*

85. My highest level of degree attained:

(a.) _____ bachelor’s degree
(b.) _____ bachelor’s degree plus graduate
(c.) _____ master’s degree
(d.) _____ specialist’s degree
(e.) _____ doctor’s degree

86. My administrative experience:

(a.) _____ 5 years or less
(b.) _____ 6 to 10 years
(c.) _____ 11 to 15 years
(d.) _____ 16 to 20 years
(e.) _____ more than 20 years

*Please check here if you wish to have a summary of this survey.
APPENDIX D

Data Collection Correspondence
Dear «SAL»:

I am conducting research about the use of microcomputers for long-distance communications in rural school districts. I would like to ask you to help by completing the enclosed survey.

The focus of the study is to determine the degree to which computer telecommunication technologies are used for administration and instructional purposes in rural school districts. The study is designed to provide knowledge and insight into how school administrators might use computer conferencing. It also attempts to assess the barriers impeding the use of this communication alternative.

One school district was selected from each of the counties located in North Dakota, eastern Montana, northern South Dakota, and northwestern Minnesota. Your school district was chosen to represent «COUNTY» County.

Please complete the enclosed questionnaire and return it to me in the self-addressed, stamped envelope. Although some of the questions focus on areas you might not be familiar with, please respond to reflect your perceptions. Your responses will remain confidential.

Hopefully, this research will be a good start in building a knowledge base which will help future telecommunication endeavors in our northern plains states. You may have a copy of the summary of results by so indicating on the last page of the survey. Your help in this research effort would be greatly appreciated.

Sincerely,

Ronald M. Stammen
Doctoral Candidate
The Ohio State University

P.S. Starting this fall, I will join the educational administration staff at North Dakota State University (Tri-College). However, I also will continue to be associated with Divide County School District at Crosby, North Dakota, where I have been superintendent for the past 16 years. I will be involved with several statewide telecommunication projects while serving in both capacities.
Late Reminder
Dear SAL:

About two to three weeks ago a questionnaire seeking information about the use of computer conferencing in rural school districts was mailed to you. Your name was selected to represent your county.

If you have completed the questionnaire and returned it to me, please accept my sincere thanks. If you have not completed it, please do so today.

Since the questionnaire was designed to represent your area, it is important to the success of the survey. It is a timely topic and only I will see the individual responses.

If by some chance you did not receive the questionnaire, or it got misplaced, please call me today at 1-800-848-4815 or call collect tonight at 614-263-9596, and I will mail another one to you immediately.

I look forward to hearing from you, and I hope you have a good summer vacation.

Sincerely,

Ronald M. Stammen
Graduate Research Associate
The Ohio State University