Educators' adoption of the Internet

by

Patricia Anne Sereg

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE

Major: Education (Curriculum and Instructional Technology)
Major Professor: Michael R. Simonson

Iowa State University
Ames, Iowa
1996

Graduate College
Iowa State University

This is to certify that the Matster's thesis of

Patricia Anne Sereg

has met the thesis requirements of Iowa State University

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I. INTRODUCTION

In 1996, the Iowa Legislature approved a school technology bill that assists schools in improving the availability of instructional technology. The Iowa Schools Technology Bill offers a means for innovative technologically-based changes to take place within many Iowa schools. "This bill signals a new era for Iowa schools, we are going to have schools for the twenty-first century with this legislative move. Educators say the breakthrough in the bill is in earmarking state aid for improving classroom technology. Lawmakers say a future legislature may decide to make such a fund a permanent feature of school financing" (Fogarty, 1996, p. 5). The Iowa state government has provided a capacity for its public schools to implement the Internet. The state of Iowa has decided to use its surplus monies for improving instructional technology in Iowa public schools. If Iowa schools are like other public schools across the nation, they will most likely use a large percentage of technology funds for connecting to the Internet.

The Internet is a technological innovation. The definition of technological innovation has two components (Rogers, 1995). The first component is the hardware aspect. This consists of the tool that embodies the technology; it includes the physical objects such as the server, electrical connections and the networked computers. The second component is the software aspect. This consists of the coded commands and instructions that allow use of the hardware to extend human capacity.

Many Iowa public schools have access to the Internet. Some schools have plans to connect to the Internet in the future. As monies become available, more Iowa public schools will connect to the Internet. As Iowa public schools continue to connect, educators will continue to be challenged to learn how to use the Internet. Some Iowa public educators have accepted the Internet very willingly and others have been more resistant to this new technology. Research studies indicate that personality traits, perceptions of the innovation, and organizational characteristics are important factors in the rate of adoption of an innovation (Rogers, 1994; Wangen, 1982; Jocoby, 1971; Goldsmith & Nuegent, 1984; Kirton, 1976).

Hall and George (1980) have conducted many investigations on the implementation strategies for innovations. They believed specific interventions and delivery of interventions

have direct influence on the rate of adoption. Interventions or implementation strategies must be designed to accommodate for individual differences.

Rogers (1995) stated that innovation adoption may cause some degree of uncertainty. Uncertainties are directly related to the outcomes of the innovation and the low levels of information about the innovation (Rogers, 1995). Hall and George (1980) pointed out that educators need specific interventions to reduce levels of uncertainty. These interventions may be in the form of descriptive brochures and media presentations. Hall and George indicated that provisions may be made for the individual to visit another site where the innovation is being used to experience a "hands-on time." They also indicated that workshops and group presentations may reduce the information concern or uncertainty.

In many research studies, the influence of government incentives on innovation adoption has been investigated (Rogers, 1995). Some research studies indicated governmental financial support of innovations has little influence on the rate of adoption (Rogers, 1995). Fullan and Pomfret (1977) pointed out that federal policies (initiatives and incentives) have had little impact on the implementation of innovations; the important influences are the implementation strategies and characteristics of the implementing organization. Thus, possibly the Iowa Schools Technology Bill will have an impact on the rate of adoption of the Internet by Iowa public school educators.

Overview of Chapter I

In this chapter an explanation of the Iowa Schools Technology Bill is provided. Legislative intent and specific regulations of the bill are summarized. The explanation of the bill includes a discussion of the possible uses of the funds dispersed into Iowa public schools. The information provided outlines the stipulations of the Iowa Schools Technology Bill.

In this chapter, the background of the Internet in public schools in the United States is discussed. Findings from a national survey indicate a rapid increase in the number of schools connecting to the Internet (United States of Education, 1996). Data also

indicate some barriers of access to the Internet. These results are compared to similar events in Iowa schools.

The purpose of this study is explained in detail in this chapter. This investigation examined Iowa public school educators as they progressed through the adoption of the Internet. The process of adoption was studied as well as specific personality traits, organizational characteristics, perceived attributes of the Internet, and implementation strategies. Research questions provided direction to data collection, and are included. The theoretical framework for this investigation was the Diffusion of Innovations Theory. A summary of Rogers' (1995) Diffusion of Innovations Theory is provided.

Background

Iowa Schools Technology Bill

In April of 1996, the School Technology Bill was signed by Iowa Governor Terry Branstad. This bill will provide Iowa public schools with $150 million in state funding to improve classroom technology. The funds will be dispersed to Iowa school districts over a five-year period. The main provision of the bill is that each school district in Iowa will receive a minimum of $15,000 annually. The money will be prorated by enrollment. The average will be $58.43 per pupil statewide. Each area education agency will receive a portion of $450,000 which will be divided among the agencies on the basis of the agency's percentage of the total full-time equivalent elementary and secondary teachers employed in the school districts in Iowa. The funds will be paid to each school district and area education agency in October of each fiscal year in which the appropriation is made (Buenz, 1996).

A second provision of the bill states that each school district receiving funds must devise a technology plan. "School districts shall provide to the Department of Education adequate assurance that they have developed or are developing a technology plan and that funds received will be used in accordance with the required technology plan. The board of directors of a school district shall adopt a technology plan that supports school improvement technology

efforts including an evaluation component. The plan shall be developed by licensed professional staff of the district, including both teachers and administrators" (Buenz, 1996, p. 1).

A school district may use the funds for "the acquisition, lease, lease-purchase, installation, and maintenance of instructional technology equipment (including hardware and software), materials and supplies related to instructional technology and staff development and training related to instructional technology and shall establish priorities for the use of the funds. These funds received by a school district shall not be expended to add a full-time equivalent position or other-wise increase staffing" (Buenz, 1996, p. 1).

The legislative intent section of the bill states, "The general assembly finds that it is in the public interest to develop and equitably fund instructional technology within the public schools of this state to ensure that school students, teachers and administrators are equipped and prepared to excel in the twenty-first century" (SF 2063, 1996). It is the hopes of Iowa lawmakers to assist schools, students, and teachers in preparation for the future through financial support for technological innovations.

National Center for Education Statistics Survey

A recent national survey was conducted by the National Center for Education Statistics (U.S. Department of Education, 1996). The purpose of the 1995 survey was to compile current data to compare with baseline data obtained in 1994 on the status of advanced telecommunications in public elementary and secondary schools. The original survey was conducted in response to President Clinton's goal of the National Information Infrastructure. This goal was to connect all of the nation's classrooms, libraries, hospitals, and law enforcement agencies to the information superhighway.

The survey was mailed to 1,000 public school principals throughout the United States. Six schools were removed from the sampling due to school closings, thus leaving 994 eligible schools in the sample. The sample was selected by stratification of instructional level (elementary, secondary, combined) and by geographical region. The return rate was 92%.

The results indicated that half of U.S. public schools currently had access to the Internet. This percentage increased from 35% just one year earlier. The percentage of public schools located in the central geographical region connected to the Internet was 52%, which was an increase of 18% from 1994. The survey indicated that among the central region, 48% of the public schools did not have access to the Internet, but 69% planned to obtain access in the future. The central geographical region includes Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. From these data, one can infer that many Iowa public schools are connected or probably have future plans to connect to the information infrastructure (U. S. Department of Education, 1996).

Another significant result indicated that the major barriers to the acquisition of the Internet were lack of technical support and advice, lack of trained staff, and lack of instructional software. Administrative support or initiative was viewed as a moderate barrier to Internet access.

Diffusion of Innovations

Because the Internet is considered to be an innovation, the theory that provided a conceptual framework for this investigation was Rogers' Diffusion of Innovations Theory. The diffusion of innovations is a special type of communication process. The communication process occurs when an organization or social structure adopts an innovation (a new idea, practice, or object). During the process there is a degree of uncertainty about the effects of the innovation. The elements that are involved in this special communication process are complex. Each element of the diffusion plays an intricate role in the rate of the adoption of the innovation (Rogers, 1995).

Statement of the Problem

The Iowa state government is providing financial support to Iowa public schools for instructional technology improvements. The legislative intent of the funding is to improve instructional technology in Iowa schools so that students, teachers and administrators are equipped for the twenty-first century. Research is needed to provide knowledge and a greater understanding of the success of technological innovations (National Science Foundation, 1980).

Because the use of the Internet, is new in public schools; there is little systematic understanding of the issues which shape their implementation, adoption, and use in the educational environment. The literature that does exist on the networks, such as the Internet, describes specific educational applications, and projects (Harris, 1994; Newman, 1989; Riel, 1986) instead of exploring the factors that relate to successful or unsuccessful network implementation, adoption, and use. Thus, the purpose of this investigation was to identify and discuss issues which played an important role in shaping patterns of use, adoption, and implementation of wide area networking and local area networking in an Iowa public school district.

A great deal of research has been conducted that points out the many mechanisms involved in an innovation adoption. This research indicated that the rate of adoption is influenced by personality traits, organizational characteristics, the innovation itself, and implementation strategies. It is the interaction of these mechanics: implementation strategies (Hall, 1977), personality traits (Rogers, 1995), behaviors (Hurt, Joseph & Cook, 1977), organizational characteristics (Abernathy & Utterback, 1978; Rogers, 1995), perceived innovation attributes (Rogers, 1995), and cognitive characteristics (National Center for Educational Statistics, 1991) that influence the rate of adoption. In this case an added mechanism is the government funding, the Iowa Schools Technology Bill which may or may not be a catalyst for educators as they face the implementation of technological innovations such as the Internet.

Purpose of Study

The purpose of this investigation was to identify and discuss issues which were likely to play an important role in shaping patterns of use, adoption, and implementation of wide area networking and local area networking in Iowa public schools. This investigation examined specific personality characteristics of persons involved in the adoption of an innovation (the wide area network, the Internet) and the rate of adoption. This study identified educators' significant perceptions of the Internet, local area networking, and wide area networking which influenced their rate of adoption. This study identified Iowa public educators' perceptions of administrative support and innovativeness. The following research questions provided a guide for this investigation.

Research Questions

1. What are the personality characteristics, perceived organizational characteristics, and implementation strategies that are indicators of Internet adoption for public educators from one Iowa school district?

2. In general, what are the current comfort levels and the current levels of usage of public educators in one Iowa school district with the Internet?

3. What are the perceived attributes of the Internet that influence the rate of adoption for public educators in one Iowa school district?

Definitions of Terms

In this study certain terms will be consistently used. For the purpose of a thorough technical understanding, terms used will refer to the following definitions:

Internet - In this study, this term is used interchangeably with the Information Infrastructure. This term refers to the computer networking system that consists of millions of

computers and networks which are connected through a variety of existing local area networks and wide area networks that are related to the World Wide Web (WWW) making it possible to access any computer located anywhere in the system.

Local area networking (LAN) - refers to the linkage of computers and/or peripherals (e.g. printer) confined to a limited area that may consist of a room, building, or school district that allows users to communicate and share information.

Wide area networking (WAN) - refers to a data communications linkage designed to connect computers over distances greater than the distance transmitted by local area networks (e.g. buildings, city to city, across the country, or internationally), that allows users to communicate and share information.

computer networking - refers to the connecting of computers for the purpose of sharing information or communicating in local area networking or wide area networking.

First Class - refers to a specific software package that allows a computer to communicate in a local area networking system.

Netscape - refers to the specific software package that allows a user to access a server computer on the Internet.

World Wide Web (WWW) - refers to the Internet, a system that allows access to information sites all over the world using a standard, common interface called hypertext to organize and search information. It simplifies the process of finding a site, connections, locating the appropriate documents, and downloading the information through the use of a browser (e.g. Netscape).

innovation - refers to any perceived new idea, project or object within a social system.

implementation strategy - refers to the teacher training or staff development utilizing information exchange pertaining to the innovation.

Summary

In this chapter, an overview of the Iowa Schools Technology Bill was provided. The legislative intent and specific regulations of the bill were summarized. The explanation of the bill covered the design and applications of the funds dispersed in Iowa public schools. The information provided outlined the incentives and stipulations of the Iowa Schools Technology Bill.

This chapter discussed the background of the Internet in public schools in the United States. Findings from a national survey indicated a rapid increase in the number of schools connecting to the Internet. Some barriers to access to the Internet were also given. It was deduced that Iowa public schools have connected or will connect to the Internet.

The purpose of this study was explained. As noted, this investigation examined Iowa public school educators as they progressed through the adoption of the Internet. Research questions indicated the direction of data collection of the important variables involved in the rate of adoption.

The theoretical framework for this investigation was the Theory of Diffusion of Innovations. A brief summary of Rogers' Diffusion of Innovations Theory was provided. Limitations of diffusion studies were explained. Other limitations of generalizability were addressed. Definitions were provided for terms related to this investigation.

A literature review is provided in the next chapter. The rate of adoption is explored as well as research on the effects of specific personality traits, organizational characteristics, perceived attributes of the innovation, implementation strategies, and Internet use. The literature explains in detail Rogers' Diffusion of Innovations Theory. The history and services of the Internet are discussed.

CHAPTER II. LITERATURE REVIEW

Introduction

In this chapter a brief history of the Internet is provided. A description of the services and functions of the Internet is given, as will information about origins and developments of the Internet.

The literature review explains Rogers' Diffusion of Innovations Theory. A detailed description of this theory provides an understanding the complexity of diffusion of innovations.

Past research on diffusions of interactive technologies and computer networks is reviewed. The literature review provides an explanation of the rate of adoption of an innovation. The literature includes information about the rate of adoption as it relates to the mechanisms involved in the adoption process of an innovation. These mechanisms were the key variables in this investigation. The variables are: personality traits, organizational characteristics, perceived attributes of the innovation, and implementation strategies. Research indicated cognitive characteristics such as intellectual ability also influenced the rate of adoption (National Center for Educational Statistics, 1991).

The information in this chapter is organized in the following manner: (a) history of the Internet; (b) services of the Internet; (c) Diffusion of Innovations Theory; (d) research on use of the Internet in education; (e) research on interactive technologies and the Internet; (f) research on personality traits and use of innovation; (g) research on organizational characteristics and the rate of adoption; (h) research on attributes of the innovation and the rate of adoption; (i) research on implementation strategies and the rate of adoption; and (j) a summary.

History of the Internet

The Internet is a worldwide telecommunications system that connects computers and networks. It connects millions of users. It is a worldwide network of networks. This

networking was created for the purpose of sharing resources and information. Thus, it is titled the Information Infrastructure (United States Department of Education, 1996). The Internet provides access to information and communication services for people through the use of computers, telephone lines, modems, and T1 cables. It connects millions of people in over 200 countries (Krol, 1992; Rogers, 1995).

The origins of the Internet date to the 1960s. The United States Department of Defense Advanced Research Projects Agency began a computer network system designed to support military research. The objective of the research project was to build an unbreakable line of communication. The U. S. Department of Defense designed the network in such a way as to withstand partial outages and continue to function (Krol, 1992). For instance, if an area of the network was destroyed, then there would still be a means of communicating by another network route. It was named ARPAnet. ARPAnet established a resource-sharing system that connected computers to remote computational services for academic, industrial, and government research (Comer, 1983; Gurbaxani, 1990; Krol, 1992; Rogers, 1995).

BITnet and NSFnet evolved from the concept of ARPAnet. "Because it's time" network (BITnet) began in 1981 when two universities decided to connect their computer centers via leased phone lines. The City University of New York and Yale University had been using local area networking within their campuses. The local area networking promoted communication and collaboration of an academic nature. As a result of the local area networking success, the two universities decided to experiment with "wide area networking" and both universities' computer centers were connected at the beginning of 1981. Computerized messages could be sent back and forth and information could be shared between the two universities. The wide area networking proved successful and by the end of 1981 four more universities joined the computer network (Rogers, 1995).

The National Science Foundation (NSF), a separate government agency, decided to make information and resources available to more universities. To promote research, this government agency built five mainframe supercomputers. The NSF needed a connecting structure - a network. The NSF tried to use ARPAnet's communication networking, but access was denied. As a result, the NSF constructed their own networking that connected the

five supercomputers; therefore, in 1983, a new network was created called the National Science Foundation Networking (NSFnet; Krol, 1992). BITnet and NSFnet continued to expand. In fact, between 1984 and 1985 BITnet doubled in size every six months (Rogers, 1995).

Soon other organizations began building their own computer networking systems. Eventually in the early 1990s, BITnet, ARPAnet and NSFnet connected with the other various networks to form the Internet. This is the network of networks. There is over 20,000 different networks connected by the Internet (Rogers, 1995). Thousands of computers are linked by telephone lines through thousands of networks. According to research conducted by Rogers (1995), the Internet connects over 15,000,000 computers. The Internet users consist of people in 200 different nations. They transmitted over 800 million messages during the year 1994.

The demand continues to increase and many other organizations are connecting to the Internet. Most four-year universities in the United States are networked and now many elementary and secondary public schools are connected (United States Department of Education, 1996). With the rapid expansion and continued growth of the Internet there are many issues to be examined. It is the rapid expansion of the Internet that provides an environment for this investigation.

Services of the Internet

The Internet encompasses many services. They are e-mail, Telnet, file transfer protocol, the World Wide Web, and electronic bulletin boards. Each of these services has a separate function.

E-mail is electronic mail. This is sending messages by computer via the computer network to another computer. Electronic mail may be sent by local area networking and wide area networking. This is one of the most widely used services on the Internet (Hill & Misic, 1996; Shaefermeyer & Sewell, 1988; Mathies & Nelson, 1995). This function gives the user the ability to communicate with anyone who is on the Internet or any of the networks connected

to the Internet (Descy, 1993). The messages can contain a few words or long documents (Krol, 1992). Some examples of uses are teachers contacting other teachers (Descy, 1993), students communicating with other students in different locations (Harris, 1995), and discussion groups (Harris, 1995; Robinson, 1996). Some educators have used e-mail as an instructional strategy to increase group discussion (Lowry et al. 1994).

E-mail can also be used to communicate with large groups of people. This is a listserve. These are sometimes called forums or discussion groups. The forums or listserves are collections of e-mail users sharing common interests. A user subscribes to the forum. Once added to the forum the user may receive all messages posted to that particular listserve. The user may send messages to all other subscribers as well (Krol, 1992; Hill & Misic, 1996). Some examples of use of listserves or discussion groups are debates on presidential elections, announcements of employment opportunities, and communication with colleagues (Krol, 1992).

Remote logon, Telnet, allows the user to connect to other computers and to have access to the services provided by the remote computer. It is as if the user is physically at the location of the remote site. The services provided by the remote computer varies by location. Some examples of services are library catalogs, community bulletin boards, and campus information services (Krol, 1992; Hill & Misic, 1996). Reports, photographs and databases on specific topics may be accessed.

File transfer protocol (FTP) allows users to move data files from computer to computer. Documents, journals, computer games, software, graphics and many other resources may be transferred (Krol, 1992).

The World Wide Web (WWW) allows users to access information. The WWW consists of home pages and links. The home pages are created by the owners of the information. Home pages display information on universities, commercial products, students' projects (Harris, 1995), personal and family life, and advertisements (Krol, 1992). The home pages may only be viewed by the Internet user at a computer and can only be changed by the creator.

Electronic bulletin boards are notifications of news and meetings. Colleges, universities and communities post upcoming events on electronic bulletin boards.

Many ethical issues pertaining to the use of the Internet are a concern for educators, governments, military, and the public sector. Ethical issues such as privacy and equal access are among the concerns in the research literature (Johnson, 1991). Security is also an ongoing issue. Security is necessary to prevent documents from being plagiarized or from being erased. According to Rogers (1995), the Internet is a self-policing network. He noted that if someone "misbehaves" on the Internet then they will receive negative feedback until they change their behavior.

The Internet is a multitude of information and services. The resources that the Information Infrastructure provides seem endless. Along with the services there are ethical concerns and issues to be examined. Educators have expressed many concerns and praises for connecting public schools to the Internet. It may be possible that these perceptions will affect the rate of adoption of the Internet within an Iowa public school system.

Diffusion of Innovations Theory

Diffusion is a special type of communication process. The context of the communication process is about an innovation (a new idea, practice or object). The communication process is a two-way exchange of information about the innovation, it occurs over time, and occurs within a social system.

> Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas. Communication is a process in which participants create and share information with one another in order to reach a mutual understanding. This definition implies that communication is a process of convergence or divergence as two or more individuals exchange

> information in order to move toward each other or apart in the meanings that they give to certain events. We think of communication as a two-way process of convergence, rather than as a one-way, linear act in which one individual seeks to transfer a message to another in order to achieve certain effects. (Rogers & Kincaid, 1981 as cited in Rogers, 1995, p. 6)

Diffusion of innovations encompasses four events in the communication process. They are the innovation, communication channels, time, and social system. "Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1995, p. 11). These events are identifiable in every diffusion research study and in every diffusion program (Rogers, 1995).

Innovation

The innovation is an idea, practice, product, or object that is perceived as new to the individual or organization of adoption. If the idea seems new to the individual or organization it is an innovation. For example, the origins of the Internet date back to the 1960s. The computer networking system was first used by the United States Department of Defense (ARPAnet) as a way for computers to be connected, ARPAnet connected to BITnet (1983) and quickly expanded into the Internet (1990). Today in many public schools, the Internet is being introduced. To most Iowa public schools, the Internet is an innovation because it is perceived as a new idea or practice.

Internet as a Special Form of Innovation

The Internet is a special form of innovation. The Internet is an interactive communication technology. This type of innovation has special attributes which are critical mass (Williams, Rice & Rogers, 1988), reciprocal interdependence (Markus, 1987), interactivity, and multidirectional information exchange (Williams, Rice & Rogers, 1988).

The critical mass refers to the number of adopters. This unique characteristic refers to the point at which enough individuals have adopted the innovation for it to be self-sustaining. "The interactive innovation is of little use unless other individuals of whom the adopter wishes to communicate with also adopt" (Rogers, 1995, p. 314). For the Internet to reach a rapid rate of adoption in Iowa public schools a critical mass of adopters must all ready be using the Internet for various purposes.

Reciprocal interdependence is the influence of earlier adopters on later adopters and the other way around. For instance, early adopters communicate with later adopters, then later adopters communicate with the earlier adopters. The early adopters benefit from later adopters and later adopters benefit from early adopters (Markus, 1987). For example, each time BITnet connected another university it was that much more efficient and powerful , because Yale University and City University of New York could communicate with more users. Each university benefited from additional adopters.

Another special attribute in the diffusion of the Internet is the interactivity of the innovation. Interactivity refers to the individual who has control of the timing of the message, content of the message and new message capability. For the Internet, control is exchanged from the sender to the receiver; the receiver takes the control and returns the message or he/she may put the message in storage for later use. The receiver sends a message to a new receiver, who may take control and send a message in return. Thus, the communication process is a cumulative effect (Williams, Rice & Rogers, 1988).

Communication Channels

A communication channel is the means by which messages get from one individual to another. Communication is a two-way process in which information is exchanged between two or more individuals. There are two categories of channels in which communication occurs (Simonson & Volker, 1984). The first are the technological channels. Technological channels extends the senses. This category consists of radio, television, computers, and words and pictures written down for use at a later time and place. Rogers (1995) refers to this channel as

the mass media channel. In this channel all messages "transmitted" involve a medium of radio, television, newspapers or magazines.

The second categories of communication channels are the sensory channels (Simonson & Volker, 1984). These channels involve the five senses. Facial expressions, voice influctuations, gestures and non-verbal messages fit into this category. Since this channel of communication takes place over a short distance, the senses are very limited. Rogers (1995) refers to this as interpersonal channels, where the interpersonal channel information is exchanged by face-to-face conversations.

Rogers (1995) points out that diffusion is a very social process. Communication and the channels in which the new idea is transmitted has a strong influence on the adoption of the innovation. According to Rogers (1995), most people do not adopt an innovation because of scientific research. They rely on communication channels to learn about the innovation. Most people depend on the "subjective evaluation of an innovation conveyed to them by a peer that is like themselves" (Rogers, 1995, p. 18).

Time

Time is the given period beginning with information about the innovation to the adoption or use of the innovation. The time dimension begins at the moment an individual learns about the innovation until he or she actually adopts the innovation or rejects the innovation. Time involves the relative lateness or earliness that an individual adopts the innovation as compared to the rest of the members of the social system. Time allows for the rate of adoption to be measured (Rogers, 1995). Time is necessary for an innovation to be adopted.

Social System

Social system is the organization in which the new idea is being implemented. The members of the organization are connected by a mutual goal. The organization can be divided

into units, individuals or informal groups. A social system provides the boundaries in which the innovation is taking place (Rogers, 1995). The members of the organization are connected by the mutual goals. An educational organization consists of subunits such as grade levels of teachers, the particular school building in which the teacher is located, and the curriculum units that educators teach.

Incentives

"Many change agencies award incentives or subsidies to clients to speed up the rate of adoption of innovations. The main function of an incentive for adopters is to increase the degree of relative advantage of the new idea. Incentives are direct or indirect payments of either in cash or in kind that are given to the individual or system" (Rogers, 1995, p. 219). These incentives can be paid to the individual or to the social system to which the individual belongs (Rogers, 1995). The incentives can be positive or negative. According to Rogers (1995), some examples of government incentives are tax rebates, increased funding, mandates, and stiff penalties

Rogers (1995) has reported many research studies on the effects of government incentives on the rate of adoption. In Rogers research on family planning studies it was concluded that government incentives do exert pressure on the individual to recognize the relative advantage of an innovation (Rogers, 1995).

Rate of Adoption

The rate of innovation adoption is the speed in which the innovation is adopted by the organization. It is measured by the length of time required for a certain percentage of members to adopt the innovation (Rogers, 1995). The rate of adoption involves an integration of specific mechanics. The mechanisms are personality traits of individuals involved, the organizational characteristics, the implementation strategies, and the perceptions of the innovation.

Specific personality traits of individuals directly correlate to the rate of adoption or non-adoption (Rogers, 1995). A specific personality trait that has a direct influence on the rate of adoption is a person's innovativeness. According to Rogers (1995), innovativeness is the desire to seek out information about a new idea. An innovative person is more likely to be among the first to adopt a new idea and are more willing to accept change. Innovative persons are more capable of dealing with uncertainties. Innovative persons have the ability to apply and understand complex technical knowledge. They are described as venturesome, risk takers, and daring. They are willing to accept an occasional setback when an idea proves unsuccessful. Innovative persons are the launchers of new ideas. They play an important role in the diffusion process within an organization.

In addition to personality traits, another contributing mechanism is the organization or social system in which the innovation is to be adopted. Size, flexibility, budget (Abernathy & Utterback, 1978), the innovativeness of the organization (Rogers, 1995; Hurt, 1977), and the administrative support of the innovation (Hall & Loucks, 1977) are characteristics that directly influence the rate of adoption.

Perceived characteristics of the innovation by the users of the innovation have a direct correlation to the rate of adoption. Rogers (1995) stated, "The perceived attributes of an innovation are one important explanation of the rate of adoption of an innovation" (Rogers, 1995, p. 206). The five contributing factors are "relative advantage, compatibility, complexity, trialability and observability" (Rogers, 1995, p. 250). The relative advantage refers to the degree to which the participants perceive the innovation as better than the idea it supersedes. Compatibility is the amount of value and need placed on the innovation by future adopters. Complexity refers to the ease of use and understanding of the innovation. Trialability refers to the amount of "trying out" time or experimentation allowed with the innovation. Finally, the participants need to be able to observe that the results of the innovation are viable; observability is defined by the visibility of results of the innovation to others.

The rate of adoption is not the same for all members of a social system. According to Rogers (1995) there are differing degrees of adoption. Some individuals may adopt an innovation earlier than others. Rogers identifies five adopter categories as the 1) innovators, 2)

early adopters, 3) early majority, 4) later majority, and 5) laggards. Innovators are usually the first to try new ideas. Early adopters are usually highly respected within the social system and may be relied upon for advice and information about an innovation. The early majority follow with a deliberate willingness in adopting innovations, but seldom lead. The late majority approach an innovation with skepticism and caution and adopt an innovation only after most others in their social system have adopted. Laggards are the last to adopt an innovation and tend to be suspicious of change agents and innovations (Rogers, 1995).

Research on the Use of the Internet

The Internet provides access to information. It has the potential to change the nature of learning and instruction (Kinzie et al. 1996). One example of use of Internet and its effects on learning was a study conducted by Kinzie et al. (1996) on the use of the interactive frog dissection site located on the WWW. Kinzie and her colleagues (1996) collected statistics on the number of times this web site was accessed. They also collected qualitative data on the effects of the experiences of on-line frog dissection. They found that this site had been visited 166,821 times within 17 months of use. The average number of visits per week was 2,285 times. Each month there was an average of 6,888 visits from different users. The qualitative information collected were comments from visitors at the web site. The comments collected were largely positive. The 430 comments received expressed that the site was outstanding and very beneficial to the user's understanding.

Kinzie and her colleagues (1996) analyzed the machine addresses of visitors to the frog dissection site. They found that 81% of the site users could be tracked to the United States. Of this 81%, 36.6% were from U.S. commercial addresses, 26.6% were from U.S. educational institutions, and 10.1% were from network addresses. Requests also came from Canada (4.5%), United Kingdom (3.5%), Germany (1.8%), Australia (1.3%), Sweden (1.2%), and the Netherlands (1.1%).

The authors concluded educational programs such as Net Frog have a positive effect on learning. They believed that the Internet was a powerful instructional tool which will

profoundly change learning and instruction (Kinzie et al. 1996).

Allen and Thompson (1995) conducted a study on the effect of networking on computer-assisted collaborative writing in a fifth grade classroom. The participants were fifth grade students who used computers to do word processing. The fifth grade students were randomly assigned to the control group or the experimental group. The experimental group completed their writing assignments and sent them to an authentic audience via e-mail. The acting authentic audience was 13 graduate students at a midwestern university. The control group completed their writing for the teacher to read and make comments on as usual. Both groups were given a pretest to assess attitudes and levels of writing skills. After the eight week investigation the students were given a post test. The scores on the post test indicated an increase in the experimental group's writing quality and word count as compared to the control group. Final scores on attitude toward writing did not show any difference between the experimental group who wrote for an authentic audience and the control group who wrote for the teacher.

Although there was no difference in attitudes toward writing, these results identified a need for an authentic audience in computer mediated writing to improve students' writing quality (Allen & Thompson, 1995). The results also indicated that the integration of telecommunications into the classroom curriculum can be accomplished. The use of computer networking does have positive effects and reinforces the importance of using technology in the classroom.

Research on the Adoption of Interactive Technologies and Internet

BITnet

As was stated above, BITnet was one of the original computer networks. The Internet emerged from BITnet (Krol, 1992). Because of similarities in characteristics and purposes of BITnet, prior research to the adoption of BITnet is beneficial in examining the adoption of the Internet. Factors pertaining to rate of adoption, relative advantage, and critical mass of

adopters may give insight into the adoption of the Internet.

In an earlier study which investigated the adoption of BITnet, Schaefermeyer & Sewell (1988) surveyed users via the BITnetwork. The responses received were from many different countries, the United States, Canada, West Germany, Sweden, Denmark, and a few other European nations. Replies from many different countries implied the global diffusion of this innovation. Schaefermeyer and Sewell found that users were in close proximity to their computer terminals they used. Most users (91.5% of the respondents) had private access to the computer terminal. This made the adoption of BITnet easy and accessible.

It was also found that the respondents viewed the use of computer networks as advantageous because of the speed of communication. Forty-two percent of the respondents said that some advantages to using the computer network were the speed, convenience, and time saved. The next largest advantage was the ability to reach large numbers and different types of people. There was fewer disadvantages noted. Among the disadvantages listed were the inability of users to contact colleagues either because of network downtime, lack of use by peers, or unknown e-mail addresses. Only 8.2% of the respondents said there were no disadvantages.

The 52.1% of the respondents in Schaefermeyer and Sewell's (1988) investigation indicated that they sent or received from one to ten messages per day. Eleven percent of the respondents sent or received 11 to 20 messages per day; and 8.9% sent or received 21-99 messages per day. Heavy use (ten or more messages per day) of computer networked messages accounted for 20% of the respondents amount of use (Shaefermeyer & Sewell, 1988).

The respondents noted that they used the network mostly for e-mail and to seek information. The authors of this study concluded that the respondents of the surveys appeared to be utilizing e-mail to replace other communication channels, for example, the telephone, letters and face-to-face communication. Rogers (1995) noted that an innovation is adopted when it replaces the previous way of doing something.

Internet

"The Internet has the potential to change our learning culture. The problem is that if it is used effectively and fully integrated into teaching and learning, telecommunication will dramatically alter the status quo of our educational system" (Frazier & Frazier, 1994, p. iii). Frazier and Frazier (1994) believed that the Internet had a multitude of educational applications. Once educators discover the potential of the Internet, they will find it easy to integrate it into the curriculum. Educators will understand that the Internet breaks down communication and geographical barriers, and it increases information sources. The challenge is to find the most strategic ways to integrate the Internet into teaching and learning (Frazier & Frazier, 1994).

Schrum (1995) investigated educators' adoption of the Internet. The subjects of Schrum's study were educators who were interested in learning about the Internet. Schrum found that these educators were willing to drive over an hour each way and after a day of teaching, to attend a one- hour seminar on the Internet. She noted that the seminar was provided at the end of the school year which was a busy time of year for teachers. The educators were at varying levels of technological abilities and taught a variety of subjects and grade levels.

In this qualitative study, Schrum (1995) collected data on educators' feelings, experiences, and behaviors pertaining to the Internet. Schrum asked educators to maintain a daily log throughout the seminar. The educators kept information on their experiences, successful and unsuccessful during the six month investigation.

In reviewing the reflection journals, Schrum found that the educators described themselves as innovators. They wanted to be on the cutting edge of the information explosion, feel personally competent, provide new skills to their students, and create new opportunities for career moves; thus, indicating that they were motivated in searching for new information and lowering their uncertainties. She also found that educators had plans to integrate the Internet in the fall when school began again.

After school began again in the fall, Schrum conducted follow-up interviews with the participants on their continued use of the Internet. During the interviews, Schrum found that

some educators were using the Internet, but most of the educators faced obstacles that prevented their use. The interviews provided documentation of the obstacles educators were confronted with as they attempted to incorporate the Internet into educational activities.

The obstacles most often cited were time, access, and budget. Educators stated that it was difficult to find time to explore on-line resources. Access to equipment to use the Internet was another obstacle. Money to connect and purchase the equipment posed a problem to many as well.

Schrum concluded that educators must be supported with time, access, resources, and administrative support if they are to become leaders in implementing telecommunications. Schrum suggested that colleges of education, in conjunction with school districts, be willing to make an investment in wide area networking, and recommended that follow-up support be provided to maintain the progress and momentum of technological innovations such as the Internet. Schrum stated that more refined and conformed curricular expectations will promote use of information technology. Finally, Schrum suggested that those educators willing to take risks and to challenge themselves be rewarded in some small measure (Schrum, 1995).

Honey and Henriquez (1993) surveyed K-12 educators who used the Internet in their teaching. They found that these educators felt that integrating the Internet into their teaching had made a real difference in how they teach. The respondents indicated that conducting telecommunication activities with students enabled them to spend more time with individual students, less time lecturing to the whole class, and it allowed students to carry out more independent work. Teachers indicated that they felt using telecommunications broadens students' perspectives on the world and provided access to information not generally found in the classroom. The results of the survey showed that teachers viewed using computer networks and technology as a way to enhance student learning and a way to increase professional development (Honey and Henriquez, 1993).

Research on Personality Traits and Use of the Internet

Many studies indicated that educators who had innovative tendencies are motivated to learn, have higher technological skills and are more experienced in education tend to adopt the Internet. The following literature indicated many consistencies in personality traits of educators' and their continued use of the Internet.

In an investigation conducted by Perkins, Baugh and Petrosko (1993), teacher type was a strong predictor of the adoption of technology in schools. The purpose of this study was to assess the types of teachers who wanted to learn how to integrate technology. A course for educators was offered to an entire school system. The course content focused on how to incorporate computers and technology into writing activities with their students. All 240 participants were volunteers or were recruited by their peers to attend. During the course the teachers were asked to complete a Myers-Briggs Type Indicator (MBTI). The results of the MBTI indicated that the teachers enrolled in the class were profiled as independent innovators in thought and action who were stimulated by problems. The participating teacher types were different from the general population of teacher types which generally seemed to be more accommodating and less innovative (Perkins, Baugh & Petrosko, 1993).

A follow-up study conducted one year later to assess the adoption levels of the technology by participants, Perkins, Baugh & Petrosko (1993), found that 64% of the teachers that participated in the course continued to use the Internet. These teachers were rated as high or medium in their level of adoption. High level adoption was defined as daily use in the classroom or for personal use; medium adoption was defined as weekly use. Approximately one-third of the teacher participants had not involved their students and had not developed an independent use of technology. Thirteen percent of the original teachers had chosen to drop out of the study. The results of this study pointed out that innovative thinkers and problem solvers were more likely to continue usage of the Internet and that they were more likely to educate themselves on technology.

A qualitative study conducted by Gallo and Horton (1994) demonstrated the effects of direct and unrestricted access to the Internet for high school teachers. Information was

collected through interviews with the volunteers and through e-mail messages from the volunteers. The researchers conducted three interviews with each volunteer. The volunteers kept a daily log on Internet use and experiences. The volunteers corresponded with the researchers daily by using their local area networking to send e-mail.

Results of data analysis indicated that teachers continued usage because they had access to the Internet at home. Continued use was also attributed to teachers' excitement and intrigue with the Internet. Teachers continued to use the Internet because it reduced feelings of isolation. Gallo and Horton found that teachers felt that "The Internet was a source of empowerment" (Gallo & Horton, 1994, p. 33). Gallo and Horton (1994) concluded that teachers had continued their use of the Internet because they were enticed with the vast amounts of information available.

In this study, teachers' behaviors changed. Teachers had started the experiment with a minimum amount of time exploring the Internet as required by the researchers. At the end of the investigation teachers spent more than twice the amount of required time. Gallo and Horton (1994) indicated that teachers began the experiment by searching the Internet for one hour and by the end of the experiment teachers were spending two hours in the morning and two hours in the evening and still felt they were not finished (Gallo & Horton, 1994).

Honey and Henriquez (1993) found that the majority of the users in telecommunications described themselves as highly motivated. They viewed themselves as very knowledgeable in telecommunications technology. Their desire to use telecommunications was driven by personal interest and motivation, rather than by school or district initiatives.

These researchers also indicated teachers with higher education and more experience are likely to be the users of telecommunications technology. Honey and Henriquez (1993) found that the teachers who were integrating telecommunications into their instruction had more experience and more education than the national average teacher. The majority of the respondents had taught for more than ten years and had done graduate work at or beyond a master's degree (60% of the total respondents). Forty percent had taught for less than ten years.

Honey and Henriquez (1993) found that many of the teachers who were using the Internet successfully were adept in using the computer. In fact, 43% of the educators surveyed had been using the computer for more than nine years and had access to a computer at home. Honey and Henriquez concluded that it takes five to seven years for educators to become comfortable in using the computer. This study suggested that teachers need to be comfortable with the computer and to be adept in using technology prior to adopting the Internet.

One study suggested that "computer anxiety" may be a result of low computer experience. High computer anxiety may cause resistance to using the computer, therefore resisting Internet usage. Dyck and Smither (1994) found that there was a negative correlation between computer experience and computer anxiety meaning that high computer experience lowered computer anxiety. Subjects with low computer anxiety were more likely to have a more positive attitude toward the computer. Therefore, the more positive attitude toward the computer the more likely the subject will use the computer (Dyck & Smither, 1994).

Research on Organizational Characteristics and the Rate of Adoption

According to Rogers (1995) organizational characteristics influence the rate of adoption of an innovation. Rogers found that studies of characteristics of innovative organizations indicate similar characteristics to innovative individuals.

One specific factor is the size of an organization. Size is related to the number of staff members belonging to the organization and to the amount of the organization's budget. In a larger organization there may be more members with higher technical experiences and knowledge. Rogers (1995) also noted that larger organizations tend to have less restrictions on allotted monies, meaning that they are more flexible in allocating funds for innovations.

Another variable indicated by Rogers (1995) is innovative leaders within the organization. Rogers called these leaders "innovative champions." They are the individuals who "throws his/her weight into the innovation to overcome the indifference or resistance that a new idea often provokes in an organization" (Rogers, 1995, p. 398). The innovation

champion can serve as the organizational sponsor for the new idea. The innovative champion may hold a high position in the organization such as an administrator in a school district. The innovative champion tends to be a high risk taker and charismatic in influencing others to adopt an innovation.

In addition to the innovative champion, an organization must see the importance or need for the innovation (Rogers, 1995). Rogers identified the stage of recognizing a need and importance for the innovation as "agenda-setting." Agenda-setting is prioritizing the innovation as an important goal to the functions of the organization. The organization views the innovation as an opportunity to improve the organization or to accomplish common goals.

Research on Attributes of the Innovation and the Rate of Adoption

"The receivers' perceptions of the attributes of an innovation, not the attributes as classified by experts or change agents, affect its rate of adoption" (Rogers, 1995, p. 209). As stated in the above quote the perceptions of the attributes of an innovation are the most important predictors of the rate of adoption. Rogers (1995) has categorized the five main perceived attributes of an innovation. They are the relative advantage, compatibility, complexity, trialability, and observability.

Honey and Henriquez (1993) pointed out that the teachers viewed the computer network as useful to their professional development and for classroom purposes. The study also indicated that teachers felt integrating computer networking enabled them give more time individually to students rather than spend time lecturing.

In an analysis of computer networking investigations, Fulcer and Schofield (1995) found that ease and user friendliness were contributing factors to Internet use. According to Fulcer and Schofield, many studies found that ease of use was vital to adopting of the Internet and other computer networking systems. Reliability of hardware and software components seemed to be important factors related to ease of use. Obviously, computer networking systems that were difficult to use and unreliable made it impossible to implement classroom activities (Fulcer & Schofield, 1995).

Research on Implementation Strategies and the Rate of Adoption

The education and training application requirements for use of the Internet are stated in a position paper published by the National Coordinating Committee on Technology in Education and Training (NCC-TET). It is noted that training is an important requirement for the National Information Infrastructure (NII), (NCC-TET, 1994). Teacher training, professional development and technical assistance for educators should be an integral part of the development of the NII. The teacher training should be for equipment and software operation, and it should be for teaching strategies that incorporate the use of a variety of technologies. Funding should be provided for both the training and the development of training materials. Federal funding should provide grants to promote research on the impacts of the NII. Grants should be provided to assist in evaluating and implementing application of the NII, and for evaluating the impact on learning and teaching of the NII. The information should be available for all educators over the network. Support should be ongoing. Businesses, government and communities need to collaborate to promote adherence to these standards to improve educational goals and educational reform (NCC-TET, 1994).

"The effective use of technologies in the classroom will occur much more rapidly if those responsible for training teachers are careful to convey that the purpose of technology is not the use of the technology as an end in itself. Rather, the teacher's goal, just as it always was with older technologies like slides, or books or even chalk, is to use the technology as a tool to teach the content" (Foa, Schwab & Johnson, 1996, p. 40). This literature suggested that training for teachers emphasizes the perspective of technology as a tool that enhances instruction. These researchers suggested teachers training to use technology should convey the message that technology is a tool; similar to the notion of slides and chalkboards used as tools to deliver instruction.

Foa, Schwab and Johnson (1996) pointed out that children learn in different ways and so do teachers. To make teacher training effective the trainers need to take into account the differences in teacher learning styles and needs. Social and emotional aspects need to be

considered as well. Time to socialize and bond with others during training sessions is important.

Consideration needs to be made to lower the frustrations of technology training. Foa, Schwab and Johnson (1996) indicated that teachers are people who like to have things flow smoothly; they are a "time-deprived group and they do not have patience for things that do not work" (Foa, Schwab & Johnson, 1996, p. 40).

These researchers recommended that training teachers in technology should fit the teachers' learning needs. They also recommended that training time should be frustration-free and should allow for social and emotional bonding. Technology should be viewed as a tool to enhance instruction. Thus, teachers would be more willing to use technology in the classroom (Foa, Schwab & Johnson, 1996).

Extensive research conducted by Hall, Hord & Griffin (1980) indicated that teachers need specific interventions to lower level of concerns. Hall et al. (1980) believed that adoption of an innovation was a process that individuals undergo. The process can be facilitated by identifying stages of concerns and applying specific prescriptions for that particular stage. A longitudinal case study of nine schools was conducted. The schools were at differing stages that required differing interventions. The prescribed interventions were applied to lower the levels of concerns. Some examples of prescriptions were workshops, written information, administrative support and mentoring. After the interventions were administered the stages of concerns were lowered and innovation use was more routinized (Hall, Hord & Griffin, 1980).

A study conducted by Freitag and Sullivan (1995) found that when instruction time matched learners preferences and strategies, a higher amount of learning was accomplished. Subjects were given a ten-item Likert-type rating scale prior to instruction time. The subjects were to indicate their preferences for the type of instruction (a more comprehensive instruction or a more basic instruction) and the amount of time they preferred to spend in instruction. After completion of the rating scale the subjects were assigned to an instructional strategy matching or mismatching their preferences. A pretest was administered to each group to assess knowledge and to collect baseline data. After the treatments a post-test was administered

to each group. The results of the scores indicated that the subjects with the matched instruction learned more and had more positive attitudes (Freitag & Sullivan 1995).

Summary

In this chapter, a brief history of the Internet was provided, including background information about the origins and developments of the Internet. A description of the services and functions of the Internet defined the benefits and issues relating to adoption of the Internet.

Rogers' theory revealed the basic structure of diffusion of an innovation. The components of the Diffusions of Innovations Theory indicated these four events as critical to the adoption: the innovation, the communication channels, the time, and the social system.

Research on diffusion of interactive technologies and other computer networks gave information about the rate of adoption of an innovation. The literature included information about the rate of adoption and the mechanisms involved in the adoption process of an innovation, which were: personality traits, organizational characteristics, perceived attributes of the innovation, implementation strategies, and incentives.

The literature consistently indicated a relationship between variables such as personality traits, perceived attributes of the innovation, innovativeness of the educators involved, organizational characteristics and appropriate implementation strategies as predicting factors in adoption of the Internet. Studies were also conclusive on the positive value of the Internet in education.

CHAPTER III. METHODOLOGY

This study had three objectives. The first was to examine the usage and comfort levels of educators in using various computer technologies. The second objective was to examine the perceptions of the Internet by Iowa public school educators. The third was to examine perceptions of administration, and the implementation strategies, and personality traits of educators, in an Iowa public school district in which the adoption of the Internet took place. According to Rogers (1995), the rate of adoption of an innovation is influenced by many factors.

This chapter includes an explanation of the methodology chosen for this research situation. The research situation is outlined in detail. The information in this chapter includes a description of participants, design of instrument. and validity of instrument. Procedures for administering the instrument are noted and treatment of data is discussed.

Collection of Data

Quantitative data was collected during this investigation. Quantitative data were collected using the K-12 Local Area Network and Wide Area Network Survey (NAS). (See Appendix A.) A survey was chosen as the major data gathering instrument. The primary purpose of the survey was to gather information on characteristics of a specific population (Fraenkel & Wallen, 1993).

According to Henersen, Morris and Fitz-Gibbon (1978) there are many advantages in using surveys to collect data. Surveys can be distributed to a large number of people simultaneously. They allow time for subjects to reflect on answers to questions privately. Surveys provide the respondents with anonymity. Surveys are uniform; each participant has exactly the same measurement instrument.

The survey collected information on current use and perceptions of the Internet. In this survey, data on innovativeness and other personality characteristics of educators in the Iowa public school district was collected. Data included learner preferences pertaining to type of implementation strategies for increasing knowledge and applications of the Internet.

Research Situation

As indicated in the literature review, the Internet has many complex features. Diffusion of an innovation is a complex process. Thus, the combination of these complexities provided a natural environment for an investigation of the diffusion process. The Iowa public school district in which the investigation took place established connection to local area networking in October, 1995. Local area networking was piloted in one elementary school because it had the largest student and teacher population. This elementary school also had the most physical space available to house the servers necessary to begin the local area networking system. As construction of the LAN proceeded, other elementary schools, the middle school and finally, the high school were connected. In March, 1996, every school building had access to local area networking. This included networking and communication within buildings and within the district. After establishing local area networking, the next step was to connect to wide area networks. Access to the Internet occurred in the second week of May, 1996.

Administration of Instrument

After connection to the Internet was established, the survey was administered. On June 3, 1996, a cover letter explaining the purpose of the research study and the survey was distributed to the 240 educators employed by the selected Iowa public school district. The instrument was placed in the educators' school mailboxes. A message was posted in the local area networking news to remind educators to complete the survey before June 5, 1996.

The sample population consisted of persons who directly worked with students. This included principals, counselors, media specialists, talented and gifted education teachers, special education teachers and regular education teachers. All educators were employed either full or part-time with the selected Iowa public school district.

The overall sample included 240 public school educators in an Iowa public school district. Each educator received a cover letter and a survey in his/her school mailbox. The surveys were to be returned to the secretary in each school building. Reminder messages were sent via e-mail on the local area network. The researcher gathered the surveys from each

school building. The total number returned was 110 surveys. A reminder card was mailed to the nonrespondents two weeks later, but this did not produce additional responses. Of the returned surveys, two were not completed, and eight were returned blank. Therefore, 100 surveys were completed and used for analysis. This represented a 42% return rate (100/240).

Participants

The participants in the survey were educators of various grade levels (K-12) and subjects. All educators were employed full or part-time within the Iowa public school district. The survey had 100 respondents with 22 males and 78 females responding to the survey. Their ages ranged from 23 to 62 years old.

The lowest degree held was a B.S. and the highest degree held was a Ph.D. Forty-three percent held bachelor's degrees, nine percent held a bachelor's degree plus fifteen graduate credit hours. Twelve percent held a B.S. plus thirty graduate hours. Twenty-six percent of the respondents held master's degrees. One percent held a master's plus fifteen credit hours. Four percent of the respondents held a master's plus thirty graduate hours. One percent of the respondents held doctorate's degrees and 2% held specialist's degrees. Two educators did not indicate their degree.

The maximum number of professional organizations that educators belonged to was seven ($\underline{n} = 1$) and the lowest was zero ($\underline{n} = 42$). Twenty-eight percent of the educators belonged to at least three professional organizations.

The years of employment in the district varied as well. The range was from one year of employment to 32 years of employment. The mode was eight years employed by the district. The mean was 11.5 years employed by the public school district.

Design of Instrument

The K-12 Local Area Networking and Wide Area Networking Assessment Survey (NAS) was organized in five sections. (See Appendix A.) Each section was designed to

obtain specific data.

Section one of the NAS collected demographic information. Section two obtained data on general use and comfort levels of various technologies. Section three obtained data on educators' perceptions of the Internet, administrative support, and self perceptions of technological inclinations. Section four obtained information on educators' innovativeness. Finally, section five collected data on other concerns and questions that educators had pertaining to the Internet.

In section one, demographic characteristics were obtained; giving their name was an option for the respondents. The surveys were coded with an arbitrary number to track their return. Demographics included school building in which the educator was working, professional organizations in which the educators belonged, highest degree of education, the educator's current age, gender, and the length of time employed at the Iowa public school district.

In section two educators were asked to rank their comfort levels and usage levels of the various technologies. Educators ranked their comfort on a scale of 1 through 5. Five indicating the highest amount of comfort. This section was also designed to measure the usage levels of the various technologies. Educators ranked their amounts of usage on a scale of 1 through 5, five indicating the highest amount of use.

In section three of K-12 Local Area Networking and Wide Area Networking Assessment Survey (NAS) questions and statements were constructed by examining the literature pertaining to innovation adoption. In the relevant literature many studies indicated similar innovation attributes (Rogers, 1995; McCredie, 1984; Gallo & Horton, 1994; Honey & Henriquez, 1993). These attributes were complexity, relative advantage, trialability, observability, and compatibility. Several statements were devised to measure each construct. (See Appendix A.)

The scores from the groups of statements were compiled and categorized to measure ease and enjoyment of use for the construct complexity.

Relative advantage was measured by the perceptions of enabling the educators to communicate easier with others, the importance of the Internet to the classroom and to their

district, the perceptions of future need of the Internet. Trialability was measured by the perceptions of accessibility of the Internet, administrative support for use, and training available for educators. Observability was measured by the perceptions of the Internet as a resource for the classroom. Compatibility was obtained by the perceptions that the Internet would enhance learning, by providing resources and advantages for the classroom. In section three the educators were asked to respond to the degree in which they disagreed or agreed with the statements.

In section four of the NAS the items were designed to measure innovative tendencies in educators. These items were derived from the Innovativeness Scale (Hurt, Thomas & Cook, 1977). According to Hurt, et al. innovativeness can be measured more systematically by the use of self-report techniques. Second, this scale permitted a measure of innovativeness which was not innovation-specific. Third, the Innovativeness Scale permitted the use of self-report techniques which enabled researchers to predict innovation adoption.

Items from the Innovativeness Scale (IS) by Hurt, et al. (1977) were adopted to the NAS. The IS was based on the characteristics of the five innovativeness categories (Rogers, 1995) in chapter two of this thesis. The categories are innovator, early adapter, early majority, late majority and laggard.

In section four, educators were asked to respond in accordance to their self perceptions of willingness to change or their innovativeness. To make the IS section consistent with the other sections of the survey, a five point Likert-type scale was used. Then the scores were converted by proportion to parallel the seven point Innovativeness Scale (Hurt, et al. 1977). For example, the mean score for the innovativeness portion of NAS was 73.4 (SD = 8.2). The total score possible was 100. The mean score (73.4) was multiplied by 140 and then divided by 100 to obtain a score of 102.76. The Innovativeness Scale (Hurt, et al. 1977) mean score was 102.

In section five open ended questions were asked to obtain more information on specific uses of the Internet and concerns pertaining to the Internet. This provided the respondents an opportunity to give data on problems and ethical issues in regards to the Internet.

The NAS rating scale was based on a Likert-type response rating scale. Statements

were given on the survey and the educators were asked to respond to each statement in the following manner:

SA = strongly agree
A = agree
U = undecided
D = disagree
SD = strongly disagree

Selected Iowa public educators were asked to respond to the statements in terms of how they felt about their involvement with the Internet, local area networking and wide area networking services. Responses were scored so that higher scores indicated a higher degree of the construct. Responses to certain items were reversed scored so that scoring was consistent with the directionality of the wording of each statement.

NAS and Research Questions

Specific items on page 2 of the NAS collected information on personality characteristics. Items 4, 15,16, and 17 on pages 6 and 7 requested information about self perceptions of technological inclinations. Items 32 through 52 on pages 9, 10 and 11 obtained an innovativeness score for the each respondent. Perceived organizational characteristics was measured by item 19 on page 8 of the NAS. Data collected on implementation strategies was collected by item 9 on page 3 and items 18 and 19 on page 5 of the NAS. This data was collected to answer the following research question:

What are the significant personality characteristics, perceived organizational characteristics, and implementation strategies that are indicators of Internet adoption for public educators from one Iowa school district?

Items 10 and 11 on page 3 was designed to measure respondents' time spent in staff development, items 12 through 17 were designed to measure current comfort levels and current usage levels of the various technologies. (See Appendix A.) The various technologies were computer, local area networking software (First Class), and wide area networking software (Netscape). This portion of the survey was constructed to answer the following research question:

In general, what are the current comfort levels and the current levels of usage of public educators in one Iowa school district with the Internet?

Items 1, 3, 10, 18, and 28 on pages 6 through 9 were designed to measure ease and enjoyment of using the Internet. The Internet helps me to communicate with others easier was measured by item 22 on page 8. Importance of the Internet to the classroom was measured by items 9, 12, 14, 27, 30, and 31 on pages 7 through 9. Future advantages, resources, and possibilities of the Internet was measured by items 6, 7, 24, and 25 on pages 6 through 9. The desire to learn about the Internet was measured by items 8 and 26 on pages 7 and 8. These items were specifically designed to collect data on the following research question:

What are the perceived attributes of the Internet that influence the rate of adoption for public educators in one Iowa school district?

Treatment of Data

Data collected from the K-12 Local Area Networking and Wide Area Networking Assessment Survey (NAS) were analyzed using the descriptive statistics.

For some attributes and personality traits, multiple items were listed on the survey. These items were derived from the relative literature pertaining to the five attributes of an innovation (Rogers, 1995; Gallo and Horton, 1994; Fulcer and Schofield, 1995; Honey and Henriquez, 1993) and the personality traits of adopters (Hurt, et al. 1977, Rogers, 1995).

The survey included multiple items to measure each construct. An average score was obtained for each attribute measured.

The 20-item Innovativeness Scale, section four, was scored as a raw score. Each question was scored on a range from one to five, with five indicating more willingness to change.

A total of 110 surveys were returned. Eight of the surveys were returned blank. Two surveys were partially completed and were discarded due to insufficient data. One hundred of these surveys were completed and were used to for data collection. Of the one hundred surveys used certain demographic items were missing such as years of employment and grade level taught.

Validity

The survey instrument was developed in accordance with Henersen's guidelines on questionnaires (Henersen et al. 1987). After development of the survey, an expert examined the instrument for validity. The expert recommended some modifications such as rewording the statements for readability. The modifications were completed and the survey was again examined for validity of measure. The survey was approved for validity of measure by the subject matter expert. An internal reliability was not factored for the K-12 Local Area Assessment and Wide Area Assessment Survey because the data was to be used specifically within the local public school district.

Section four of the NAS contained the 20 items from the Innovativeness Scale (Hurt, Thomas & Cook, 1977). The Innovativeness Scale measured the willingness of an individual to change. The higher score on the IS indicated a tendency to be more innovative or more willing to accept new ideas. The scores used by Hurt et al. ranged from 22 to 139. The mean of the combined sample was 102 (SD = 14). Goldsmith (1986) compared the IS to Kirton Adoption-Innovation Inventory (Kirton, 1976), Jackson Personality Inventory (Jackson, 1976), and Open Processing Form (Leavitt and Walton, 1983). Goldsmith (1986)

reported the IS reliability coefficient to be .88. Hurt et al. (1977) found the internal reliability to be .89. The literature indicated that this was a standardized measure and was valid (Hurt, et al. 1977).

Summary

This study had three objectives. The first was to examine the usage and comfort levels of educators in using various technologies. The second objective was to examine the perceptions by Iowa public school educators about the Internet. The third was to examine perceptions of the administration's support, implementation strategies, and personality traits of educators, in an Iowa public school district in which the adoption of the Internet took place. This chapter included an explanation of methodology chosen in this research situation. The research situation was described. Respondents were described. Information was provided in regards to the design of the survey instrument Research questions were correlated with survey questions and data gathering. Validity and reliability of instruments was explained. Procedures for administering the instrument were noted. Treatment of data was discussed.

CHAPTER IV. RESULTS

The K-12 Local Area Networking and Wide Area Networking Assessment Survey (NAS) was used to collect data about Iowa public educators in a selected suburban school district. The responses to the survey contained information pertaining to educators' personality traits, current usage and comfort levels with various technologies, perceptions of the Internet, learner preferences, perceptions of organizational innovativeness and perceptions of administrative support. These data are presented in this chapter.

Statistical analyses were performed on the data to: (a) provide a description of the characteristics of educators, (b) describe educators' innovative tendencies, (c) present a summary of general use and comfort levels of using the Internet, (d) present a summary of their perceptions of the Internet, (e) present a summary of the perceived innovativeness of the administration, (f) present a summary of the perceptions of administrative support, (g) present a summary of the perceived importance of the Internet to the Iowa public school district, and (h) present a summary of learner preferences for staff development on the Internet.

Description of the Sample

The results reported in this chapter were obtained from the NAS returned by the Iowa public educators who were surveyed during the 1995-1996 school year. The subjects were Iowa public educators who were in some stage of adopting the Internet. All of the educators were employed full or part-time within the suburban public school district.

Answers to Research Questions

Characteristics of Educators

Section one of the NAS asked for information about the characteristics of the Iowa public school educators who completed the NAS. Respondents were asked their gender, age, years employed by the Iowa public school district, grade level currently teaching, school

building in which each respondent taught, highest degree held, and membership in professional organizations. Frequencies were calculated for each demographic. Results disclosed are found in Table 1.

Additionally, the NAS provided data to describe personality traits, technological ability, innovativeness, and self-perceived abilities using technology. This data relates to the research question:

What are the personality characteristics, perceived organizational characteristics and implementation strategies that are indicators of Internet adoption?

Females were the largest group of respondents. Seventy-eight percent were female and 22% were male. (See Table 1.)

Twenty percent of the educators were 20 to 29 years of age. Twenty-three percent were in the 30 to 39 years old age group. The mode age was 40 to 49 years old, 33% of the total number of respondents were in this age range. Eighteen percent of the respondents were in the 50 to 59 age range. The remaining 2% fell into the 60 to 69 years of age category. (See Table 1.) The mean age was 40 years with a standard deviation of 10.3 years.

Most of these educators had been employed by the district between five to ten years. It was found that 32% of the respondents had over five years of tenure in this Iowa public school district. The next largest category was zero to five years; 25% of the respondents 44 were employed by the district for five years or less. Eight percent had 10 to 15 years of employment. Four percent of the respondents had been employed by the district for 15 to 20 years. Finally, 14% of these educators had been employed by the district for over 20 years. (See Table 1.) Mean years of employment was 11.5 and the standard deviation was 9.1.

Most of the respondents were teaching at the primary level (K-3). The frequency analysis revealed 24% of the respondents taught in grades K-3. Twenty percent of the respondents were categorized as fourth or fifth grade teachers. Nineteen percent of the respondents worked with sixth through eighth grade students. Twenty-one percent of the respondents worked with high school-age students. Sixteen percent of the educators worked

Table 1. Educators' Demographic Information

		N	Percent
Gender:			
	Male	22	22
	Female	78	78
Age:			
	20-29 years old	20	20
	30-39 years old	23	23
	40-49 years old	33	33
	50-59 years old	18	18
	60-69 years old	2	2
		Mean age: 40 years	SD: 10.3
Years Employed By the District:			
	0- 5 years	25	26
	5-10 years	32	33.3
	10-15 years	8	8
	15-20 years	4	4
	20-25 years	14	14.6
		Mean: 11.5	SD: 9.1
Grade Level Respondents Currently Teaching:			
	Primary (K-3)	24	24
	Upper Elementary (4-5)	20	20
	Middle School (6-8)	19	19
	High School (9-12)	21	21
	Other (Includes Media Specialists, Principals, Talented and Gifted Educators, Counselors and Special Education Teachers)	16	16
Number of Respondents From Each School Building:			
	Elementary School Building Grades K-5 (A)	14	14
	Elementary School Building Grades K-5 (B)	19	19
	Elementary School Building Grades K-5 (C)	7	7
	Elementary School Building Grades K-5 (D)	10	10
	Elementary School Building Grades K-5 (E)	6	6
	Middle School Building Grades 6-8 (F)	18	18
	High School Building Grades 9-12 (G)	23	23
	Respondents in more than one building	3	3

Table 1. Continued	N	Percent
Degree:		
Bachelor's Degree	43	43
Bachelor's Degree + 15 graduate hours	9	9
Bachelor's Degree + 30 graduate hours	12	12
Master's Degree	26	26
Master's Degree + 15 graduate hours	1	1
Master's Degree + 30 graduate hours	4	4
Specialist	2	2
Doctorate's Degree	1	1
The Number of Professional Organization in which Educators Have Memberships:		
No memberships	42	42
One membership	10	10
Two memberships	4	4
Three memberships	28	28
Four memberships	9	9
Five memberships	6	6
Six memberships	0	0
Seven memberships	1	1
Total Number: 100		
Self Perceptions of Technological Inclinations:		
Technology is my area of expertise.		
Strongly Agree	2	2
Agree	36	36
Undecided	46	46
Disagree	16	16
Strongly Disagree	0	0
Total Number: 100	Mean: 3.6	SD: .7
Innovativeness Scale Scores:		
Total Number: 99	Mean: 102.8	SD: 11.4

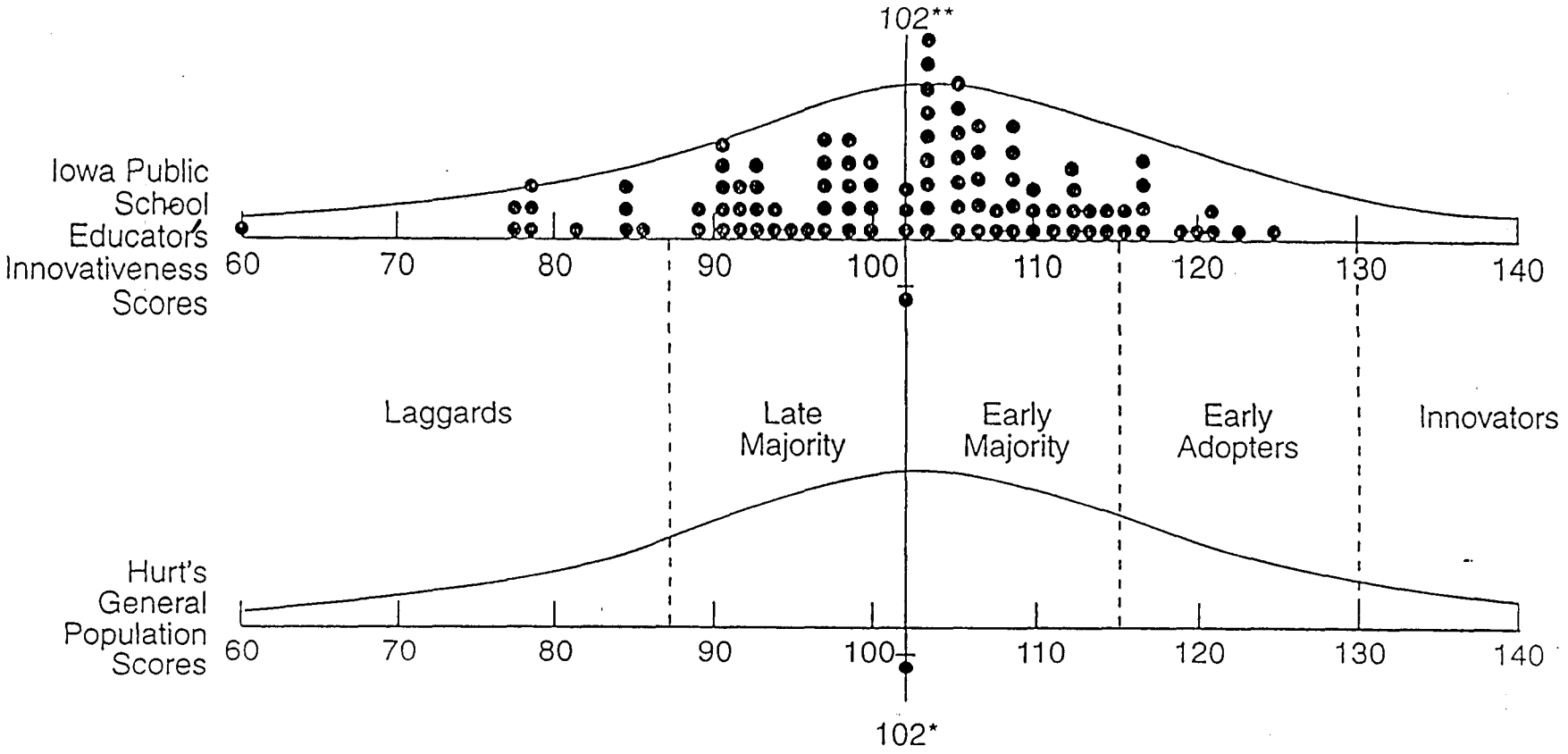
with all grades including counselors, media specialists, talented and gifted teachers and special education teachers. (See Table 1.)

The specific elementary schools where respondents are identified on Table 1. Elementary school building (A) had 24 educators and fourteen surveys were returned (58%). Teachers from elementary building (B) returned 19 out of 29 surveys (66%). Educators from elementary building (C) returned 7 out of 23 surveys (30%). Educators from building (D) returned 10 out of 20 surveys (50%). Educators from elementary building (E) returned 6 out of 17 (35%). Educators from the middle school building returned 18 out of 58 surveys (31%). The high school teachers returned 23 out of 69 surveys (33%). Three respondents worked in more than one building.

Forty-three percent of the respondents held bachelor's degrees as their highest degree completed. Respondents with master's degrees fell into the next largest category with 26% of the total respondents. Eight percent of the respondents held a degree beyond a master's level. (See Table 1.)

Most of the respondents belonged to a professional organization. It was found that 58% of the respondents belonged to one or more professional organizations. Twenty-eight percent of these educators held memberships in at least 3 professional organizations. Forty-two percent of the respondents did not indicate a membership to a professional 45 organization. (See Table 1.)

In section four of NAS, items 32 to 52 were adopted from the Innovativeness Scale by Hurt, Thomas and Cook (1977). Results from this portion of the survey indicated the educators' willingness to change. According to Hurt et al. (1977) in a normal distribution of population, the statistical mean is 102. Results from the NAS indicated a mean of 102.8 with a standard deviation of 11.4. (See Table 1.) The raw scores ranged from 60.2 to 125.5 points. When comparing the scores of the educators to the general population scores found in Hurt's Innovativeness Scale, it was apparent that this sample of educators was similar to the general population scores. (See Figure 1.) It was found that the raw scores between 102 and 115 included 48% of the respondents. Thirty-four.percent of the respondents scored between 85 and 102, thus indicating that these respondents fit into the late majority adopter category



* Mean Score Hurt's Population $\bar{X}$ = 102 SD = 14

** Mean Score for Iowa Public School Educators $\bar{X}$ = 102.8 SD = 11.4

*** Innovativeness Scale Scores: Higher scores = More Innovativeness

Figure 1. Comparison of Iowa Public School Educators' Innovativeness Scores to the Population Scores

(Rogers, 1995). Six percent scored between 60 and 85 points, indicating that these respondents fit into the laggard adopter category. Twelve percent of the respondents were categorized as early adopters. Zero percent of these respondents fit into the innovator category.

Items 4, 15, 16, and 17 in section three of NAS requested educators to indicate their self-perceptions of technological inclinations. The respondents indicated information on: their ability to use the computer without difficulty, how they felt about technology in their teaching, their enjoyment of using the computer, and their technological ability. The four items were totaled and then divided by four to obtain an average score. Two percent of the educators strongly agreed that they were technologically inclined. Thirty-six percent indicated that they felt somewhat technologically inclined. Most of the educators indicated that they were undecided and were unsure of their ability with technology (46%). Sixteen percent of the educators viewed themselves as lacking in technology ability. No educators felt they absolutely did not have any technological ability. (See Table 1.) Most educators were undecided about their technical ability ($\underline{M} = 3.6$, $\underline{SD} = .73$).

Perceived Organizational Characteristics

Item 19 on the NAS stated: "This Iowa public school district is an innovative organization." It was found that 63% of the educators who responded agreed that the Iowa public school district was innovative. Twenty-five percent strongly agreed that this district was innovative, and 12% were undecided. The majority of these educators ($\underline{M} = 4.1$, $\underline{SD} = .6$) tended to feel that the public school district was innovative. (See Table 2.)

Training Preferences on the Internet

The results from items 10 and 11 in section one of NAS indicated that most educators had spent approximately 6.2 hours in Internet training. (See Table 3.) Most of these educators had attended required workshops provided by the district (78%). Thirty-nine percent of the respondents attended the voluntary workshop provided by the district, 28% attended

Table 2. Educators' Perceived Organizational Characteristics

I believe that my Iowa public school district is innovative:(19)[b]		
Strongly Agree	25	25
Agree	63	63
Undecided	12	12
Disagree	0	0
Strongly Disagree	0	0
Total Number: 100	Mean: 4.1[a]	SD: .6

Note: [a]scores based on a five point scale
higher scores = tending to agree with the statement
[b]Item from section three of K-12 Local
Area Networking and Wide Area Networking
Assessment Survey (NAS)

Table 3. Training on Using the Internet

Type of Training Each Educator[a] Attended in 1995-1996:	Number	Percent
Voluntary Workshops Provided by the District	39	39
Required Workshops Provided by the District	78	78
Internet Workshops Provided by Area Education Agency	28	28
Workshops Provide by Other Sources	14	14
No Training on The Internet	10	10
Number of Hours Spent in Internet Workshops:[a]	Mean	SD
	6.2	8.1

[a]Number of Respondents = 100

workshops provided by the area education agency, 14% attended workshops provided by other sources and 10% of the respondents had not attended any type of workshop on the Internet.

Learner Preferences

Items 9, 18, and 19 in section two of NAS requested information on the type of training sessions educators would most prefer. Educators were to choose their top two choices on items 18 and 19. (See Table 4.) The results indicated that most educators preferred

independent exploration with some assistance for training on LAN n = 37. The next type of training chosen most was hands-on lab practice with structured on-line activities (n = 31).

For training on WANs, most educators chose independent exploration with some assistance (n = 36). The next type of training chosen most was hands-on lab practice with structured on-line activities (n = 32).

When asked what type of learning style educators felt they learned best, most educators indicated actually doing a new skill with practicing and hands-on learning. (See Table 5.) The second most chosen style was working independently on a new skill. The learning style chosen least by the educators was learning by rhymes and chants.

Table 4. Staff Development Preferred.[a]	Number[b]
Type of Training Preferred on Local Area Networking	
Total independent exploration	11
Independent exploration with some assistance	37
One to one coaching	18
Large group demonstration with independent practice	29
Large group demonstration with assisted practice	22
Hands on lab practice with an intensive schedule	13
Hands on lab Practice with slower paced schedule	21
Hands on lab practice with structured online activities	31
I do not need anymore staff development on LAN	2
Type of Training Preferred on Wide Area Networking	Number[b]
Total independent exploration	13
Independent exploration with some assistance	36
One to one coaching	21
Large group demonstration with independent practice	20
Large group demonstration with assisted practice	28
Hands on lab practice with an intensive schedule	14
Hands on lab Practice with slower paced schedule	31
Hands on lab practice with structured online activities	32
I do not need anymore staff development on WAN	2

[a] total number of respondents who most preferred this type of training

[b] total number of respondents: 100

Table 5. Educators' Learning Styles

Individuals Ranked the Following Items on a scale of 1-7.[a]	Number Answering	Mean[b]	SD
I learn best by:			
actually doing a new skill, practicing and hands on learning	98	1.74	1.24
working independently on a new skill until I have mastered it	98	3.34	1.75
writing things down or following a manual	97	3.51	1.98
teaching others and talking to people about a new idea	97	3.72	1.82
drawing a visual picture or looking at a visual illustration	98	3.98	1.96
exploring in a what if manner	97	4.44	1.95
rhymes, chants, or little jingles that help me memorize things	97	5.22	1.87

[a]Scale: 1=most like the educator
7= least like the educator

[b]lower mean = tends to style of learning

General Comfort and Usage Levels of the Internet

In NAS section two, items 12 through 17 requested information pertaining to educators' comfort levels and usage levels with computers, local area networking, and wide area networking services provided by the Iowa public school district. It relates to the research question as stated in chapter one of this thesis.

In general, what are the current comfort levels and the current levels of usage of public educators in an Iowa school district with the Internet?

Comfort Levels of Use of Various Technologies

Items 12 through 14 in the NAS requested the participants to estimate how comfortable they felt using the various computer and networking technologies. (See Table 6.) Items 12 through 14 in section two of NAS intended to measure the comfort levels of educators when they used the computer, LAN and WAN.

The results of educators' comfort levels with using the computer indicated that 46% of the educators were highly comfortable with the computer. Fourteen percent of the educators indicated they were extremely comfortable. Thirty-eight percent of the educators felt somewhat comfortable with using the computer. Two percent indicated they were not comfortable at all with the computer. (See Table 6.) In general, the educators felt moderately comfortable with using the computer ($\underline{M} = 3.7$, $\underline{SD}$ .7).

Item 13 requested the respondents to rate their comfort level in using the local area networking services. Many of the educators (39%) indicated that they felt highly comfortable with the LAN. Thirty-eight percent indicated moderate comfort levels. Ten percent of the educators responding felt extremely comfortable with LAN. Six percent of the respondents indicated that they felt no comfort and 6% indicated little comfort ($\underline{M} = 3.4$, $\underline{SD} = 1$). (See Table 6.)

Table 6. Educators' Comfort Level With the Various Technologies:[a]

Item	Number	Percent
Comfort Level with Using the Computer:		
Extremely Comfortable (I feel I know well beyond what others know)	14	14
Highly Comfortable (others ask me to help them)	46	46
Moderately Comfortable (I occasionally ask for help)	38	38
Little Comfort (It is frustrating, but I try)	2	2
No Comfort (It is too frustrating for me to attempt)	0	0
Total number: 100	Mean: 3.7	SD: .7
Comfort Level with Using the Local Area Networking:		
Extremely Comfortable (I feel know well beyond what others know)	10	10
Highly Comfortable (others ask me to help them)	39	39
Moderately Comfortable (I occasionally ask for help)	38	38
Little Comfort (It is frustrating, but I try)	6	6
No Comfort (It is too frustrating for me to attempt)	6	6
Total Number: 99	Mean: 3.4	SD: 1
Comfort Level with Using the Wide Area Networking:		
Extremely Comfortable (I feel know well beyond what others know)	4	4
Highly Comfortable (others ask me to help them)	10	10
Moderately Comfortable (I occasionally ask for help)	34	34
Little Comfort (It is frustrating, but I try)	29	29
No Comfort (It is too frustrating for me to attempt)	22	22
Total Number: 99	Mean: 2.4	SD: 1.1

[a] Note: Values for each level:
Extremely Comfortable = 5
Highly Comfortable = 4
Moderately Comfortable = 3
Little Comfort = 2
No Comfort = 1

The wide area networking comfort levels scored more toward the moderate and little comfort levels (M = 2.4, SD = 1.1). Approximately 34% of the respondents felt that they were moderately comfortable and 29% felt they had little comfort in their usage of the WAN. No comfort was indicated by 22% of the respondents. Four percent indicated they were extremely comfortable and 10% felt they were highly comfortable. (See Table 6.)

Items 14 through 17 in section two requested respondents to indicate their level of usage for the various technologies. (See Table 7.) The various technologies were computer, local area networking, and wide area networking.

The majority of educators reported using the computer many times a day, (59%). Twenty-six percent indicated high use and 14% indicated little use. It was found that most educators (M = 4.43, SD = .77) use the computer many times or at least one time per day. (See Table 7.)

Results about usage of the LAN were similar to computer use (M = 4.03, SD = 1.19). The percentages indicated that the majority of the respondents were using the LAN many times or at least one time per day. Forty-six percent used the LAN services many times per day, (extremely high use). Thirty-one percent used the LAN at least one time per day. Eleven percent indicated moderate LAN usage and 5% indicated little amount of use. The remaining 7% of the educators did not use LAN at all.

Data on wide area networking usage indicated that 30% of the educators were not using this technology. Twenty-six percent of the educators used this technology less than once a week (little use). Likewise, 27% indicated moderate usage of WAN (about once a week). Fourteen percent of the educators used this technology once a day (high use) and 3% used WAN many times per day (extremely high use) (M = 2.4, SD = 1.1). (See Table 7.)

Table 7. Educators' Usage Level of the Various Technologies:[a]

Item		Number	Percent
Educators' use of the computer:			
Extremely high (many times per day)		59	59
High use (once a day)		26	26
Moderate use (about once a week)		14	14
Little use (very seldom less than once a week)		1	1
No use (I do not use this technology at all)		0	0
Total Number: 100	Mean: 4.4		SD: .8
Educators' use of the Local Area Networking:			
Extremely high (many times per day)		45	45
High use (once a day)		32	32
Moderate use (about once a week)		11	11
Little use (very seldom less than once a week)		5	5
No use (I do not use this technology at all)		7	7
Total Number: 100	Mean: 4		SD: 1.2
Educators' use of the Wide Area Networking:			
Extremely high (many times per day)		3	3
High use (once a day)		14	14
Moderate use (about once a week)		27	27
Little use (very seldom less than once a week)		26	26
No use (I do not use this technology at all)		30	30
Total Number: 100	Mean: 2.4		SD: 1.1

[a] Note: Values for each level of use:
Extremely high = 5
High use = 4
Moderate use = 3
Little use = 2
No use = 1

Educators Want to Learn About the Internet

The survey measured the desire of educators to learn about the Internet as a predictor to the adoption rate. Items 8 and 26 related to the interest of learning more about the Internet. The statements were: "I want to learn more about the possibilities of using Netscape (WAN) in my classroom," and "I want to learn more about the possibilities of First Class (LAN) in my classroom." The respondents were to rate each statement as to whether they strongly agreed, agreed, undecided, disagreed or strongly disagreed. The items were rated on a scale one through five. Five indicated that the respondent strongly agreed with the statements. The two statements were totaled and then divided by two to obtain an average score of their willingness to learn about the Internet. (See Table 8.)

It was found that the majority of the Iowa public educators strongly agreed with the statements. Approximately 68% indicated that they agreed with the statements. Seventeen percent strongly agreed, 12% were undecided, 1% disagreed, and 1% strongly disagreed. These results indicated that the majority of the educators agreed that they wanted to learn about the possibilities of the Internet ($\underline{M}$= 4.2, $\underline{SD}$ = .6).

Attributes of the Internet

Section three of the NAS, items 1, 3, 6, 7, 9, 10, 12, 14, 18, 27, 28, 30, and 31 measured the educators' perceptions of attributes of the Internet.

The scores from the groups of statements were compiled and categorized to measure ease and enjoyment of use for the construct complexity. Relative advantage was measured by the perceptions of enabling the educators to communicate easier with others, the importance of the Internet to the classroom and to their district, the perceptions of future need of the Internet. Trialability was measured by the perceptions of accessibility of the Internet, administrative support for use, and training available for educators. Observability was measured by the perceptions of the Internet as a resource for the classroom. Compatibility was obtained by the

perceptions that the Internet would enhance learning, by providing resources and advantages for the classroom. Data collected in this portion of NAS intended to gather information to answer the following research question:

What are the perceived attributes of the Internet that influence the rate of adoption for public educators in an Iowa school district?

Educators tended to agree that the Internet was easy to use ($\underline{M}$ = 3.8, $\underline{SD}$ = .6). Seven percent of the educators indicated that they strongly agreed that the Internet was easy to use. Forty percent agreed that the Internet was easy to use. Forty-six percent were undecided, 7% disagreed and 0% strongly disagreed. (See Table 8.)

Educators tended to enjoy using the Internet ($\underline{M}$ = 3.8, $\underline{SD}$ = .9). Forty percent of the educators (40%) indicated that they were undecided as to whether they enjoyed using the Internet. Twenty-four percent strongly enjoyed using the Internet, 32% enjoyed using the Internet, 1% were in the categories of disagree and strongly disagree with the enjoyment of using the Internet. (See Table 8.)

Most educators tended to be undecided about the Internet as important to their classrooms ($\underline{M}$ = 3.6, $\underline{SD}$ = .6). A frequency count revealed that 45% were undecided, 36% agreed, 0% strongly agreed, 19% disagreed, and 6% strongly disagreed with the statement, "The Internet is important to the classroom." (See Table 8.)

Most educators felt that the Internet would provide many resources for the classroom ($\underline{M}$ = 4.1, $\underline{SD}$ = .6). Ten percent of the educators responding strongly agreed that the Internet had many possibilities in the future. Sixty percent of the educators agreed that the Internet has many possibilities in the future. Twenty-seven percent of the educators felt undecided about the future need of the Internet. One percent disagreed with the future possibilities and 1% strongly disagreed. (See Table 8.)

Educators felt that the Internet helped them to communicate easier with others ($\underline{M}$ = 4.3, $\underline{SD}$ = .7). Forty-four percent of the educators agreed that the Internet helped them to communicate easier with others. Forty-three percent indicated that they strongly agreed that the

Table 8. Educators' Perceptions of the Internet:[a]

Items:	Number	Percent
The Internet is Easy to use: (1,10,18,28)[b]		
Strongly Agree	7	7
Agree	40	40
Undecided	46	46
Disagree	7	7
Strongly Disagree	0	0
Total Number: 100	Mean: 3.8	SD: .6
I enjoy using the Internet:(3)[b]		
Strongly Agree	24	24
Agree	32	32
Undecided	40	40
Disagree	1	1
Strongly Disagree	1	1
Total Number: 97	Mean: 3.8	SD: .9
The Internet is Important to the Classroom:(9,12,14,27,30.31)[b]		
Strongly Agree	0	0
Agree	36	36
Undecided	45	45
Disagree	19	19
Strongly Disagree	0	0
Total Number: 100	Mean: 3.6	SD: .6
The Internet has many possibilities in the future:(6,7,24,25)[b]		
Strongly Agree	10	10
Agree	60	60
Undecided	27	27
Disagree	1	1
Strongly Disagree	1	1
Total Number: 100	Mean: 4.1	SD: .6

Note: [a]higher scores = tending to agree with the statement
[b]Items combined from section three of K-12 Local Area Networking and Wide Area Networking Assessment Survey (NAS)

Table 8. Continued

Items:	Number	Percent
I want to learn more about the possibilities of the Internet in my classroom:(8,26)[b]		
Strongly Agree	17	17
Agree	68	68
Undecided	12	12
Disagree	1	1
Strongly Disagree	1	1
Total Number: 99	Mean: 4.2	SD: .6
The Internet enables me to communicate with others easier:(22)[b]		
Strongly Agree	43	43
Agree	44	44
Undecided	10	10
Disagree	2	2
Strongly Disagree	0	0
Total Number: 99	Mean: 4.3	SD: .7
The Administration supports the use of the Internet:(11,21,29)[b]		
Strongly Agree	8	8
Agree	52	52
Undecided	32	32
Disagree	8	8
Strongly Disagree	0	0
Total Number: 100	Mean: 3.9	SD: .6
The Internet is Important to the Iowa public school district:(2,5,23)[b]		
Strongly Agree	24	24
Agree	48	48
Undecided	23	23
Disagree	3	3
Strongly Disagree	1	1
Total Number: 100	Mean: 4.1	SD: .7

Internet helped them to communicate easier with others. Ten percent were undecided, 2% disagreed and 0% strongly disagreed. (See Table 8.)

Perceptions of Administrative Support

Items 11, 21 and 29 on NAS requested information on how the respondents felt about administrative support. Most educators felt that the administration was going to support them by providing training about the Internet ($M = 3.9$, $SD = .6$). Eight percent of the educators strongly agreed that the Iowa public school district's administration would support the use of the Internet through staff development. Fifty-two percent of the educators agreed with the statements, 32% were undecided, and 8% disagreed with the statements. (See Table 8.)

Perceived Importance of the Internet to Organization

Items 2, 5 and 23 asked the educators to rate the degree in which they felt that the Internet was important to their Iowa public school district. Forty-eight percent of the educators agreed that the Internet was important to the Iowa public school district. Twenty-four percent strongly agreed with the statements. Twenty-three percent were undecided, 3% disagreed, and 1% strongly disagreed. The mean was 4.1 with a standard deviation of .7, thus indicating that the majority of the educators ($M = 4.1$, $SD = .7$) felt the Internet was important to the Iowa public school district. (See Table 8.)

Correlations of Variables

A Pearson Correlation showed statistically significant relationships ($p < .01$) among several selected variables. Variables with more than 25% shared commonality will be discussed. (See Table 9.) The following statistics demonstrated that the more educators perceived themselves as technologically inclined and innovative the more likely they are to have positive perceptions of the Internet and the more likely they will want to learn about the

Table 9. Pearson Correlation Relationship for Variables and The Internet

	1[a]	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age														
2. Gender	.09													
3. Years of Employment	.74*	-.19												
4. Innovativeness Scale	2.03E-3	.05	-.08											
5. Technologically Inclined.	-.32*	.01	-.26*	.48*										
6. Internet is easy to use.	.30*	.09	-.36*	.42*	.58*									
7. I enjoy using the Internet.	.33*	.01	-.41*	.43*	.55*	.61*								
8. The Internet is Important.	-.14	.18	-.10	.39*	.36*	.55*	.51*							
9. The Internet has many possibilities in the future.	-.09	.08	-.09	.36*	.24	.42*	.45*	.68*						
10. I want to learn more about the Internet.	-.25*	.09	-.21	.30*	.45*	.45*	.37*	.60*	.59*					
11. The Internet helps me to communicate with others easier.	-.24	.17	-.23	.24	.45*	.57*	.50*	.63*	.53*	.63*				

[a]column numbers correspond to the variables listed in the first column

*significant at the .01 level

Table 9. Continued

	1[a]	2	3	4	5	6	7	8	9	10	11	12	13	14
12. The Administrative supports the Internet.	.05	.23	.05	.26*	.21	.34*	.09	.50*	.32*	.42*	.36*			
13. The Iowa public school district is Innovative.	-.01	.03	.01	.22	.20	.20	.23	.38*	.48*	.48*	.37*	.32*		
14. The Internet is Important to the district.	-.10	.14	.11	.36*	.44*	.48*	.50*	.77*	.73*	.62*	.35*	.35*	.42*	
15. Total hours spent in training on the Internet.	4.03E-3	-.02	.01	.13	.19	.15	.16	.08	.08	.02	.04	.14	-.11	.02
16. Comfort level with using the computer.	-.42*	-.08	-.35	.30*	.71*	.42*	.44*	.16	.12	.23	.27*	.03	-.01	.26*
17. Comfort level with using Local Area Networking.	-.37*	.05	-.35*	.18	.51*	.54*	.43*	.40*	.29*	.27*	.47*	.08	.03	.38*
18. Comfort level with using Wide Area Networking.	-.38*	-.06	-.36*	.31*	.57*	.60*	.60*	.23	.12	.24	.27*	.05	-.04	.21
19. Usage level with the computer.	-.24	.04	-.23	.40*	.59*	.49*	.41*	.32*	.23	.39*	.54*	.20	.19	.43*
20. Usage level with the LAN.	-.26*	.16	-.24	.23	.41*	.53*	.38*	.45*	.34*	.31*	.58*	.15	.03	.45*
21. Usage level with WAN.	-.26*	-.05	-.23	.34*	.53*	.63*	.60*	.35*	.29*	.31*	.42*	.15	.03	.39*

Table 9. Continued

	15	16	17	18	19	20	21
15. Total hours spent in training on the Internet.							
16. Comfort level with using the computer.	.24						
17. Comfort level with using Local Area Networking	.31*	.63*					
18. Comfort level with using Wide Area Networking.	.39*	.58*	.60*				
19. Usage level with the computer.	.20	.51*	.44*	.43*			
20. Usage level with the LAN.	.35*	.44*	.53*	.70*	.46*		
21. Usage level with WAN.	.35*	.44*	.53*	.70*	.46*	.49*	

Internet.

1) An expected correlation of years of employment and age occurred (r = .74). The perceptions of "ease of use of the Internet" (r = . 58), "enjoyment of use" (r =.55), "comfort level with the computer" (r = .71), "comfort level with LAN" (r = .51), "comfort level with WAN" (r = .57), "computer usage" (r = . 59), "usage of WAN" (r = .53), correlated with the variable that categorized respondents as technologically inclined.

2) Important correlations existed among the perception of "ease of use of the Internet" with "enjoyment of use" (r = .61), "importance to the classroom" (r = .55), the perception that the "Internet enables me to communicate with others easier" (r = .57), "comfort level with using LAN" (r = .54), "comfort level with using WAN" (r = .60), "usage with LAN" (r = .53), and "usage of WAN" (r = .63).

3) The perception of "enjoyment of use of the Internet" correlated with "importance to the classroom" (r = .51), "enables me to communicate with others easier" (r = .50), "Internet importance to district" (r = .50), "comfort level with WAN" (r = .60), and "usage level of WANs" (r = .60).

4) Significant correlations were found for the variable of "the perception that the Internet is important to the classroom" with "the future possibilities of the Internet" (r = .68), "the desire to learn more about the Internet" (r = .60), "the Internet helps me to communicate easier" (r = .63), "administrative support" (r = .50), and "the Internet is important to the district" (r = .77).

5) Significant correlations were found for the variable "the perception of the Internet has many possibilities in the future" with "I want to learn more about the Internet "(r = .59), "the Internet enables me to communicate with others easier" (r = .53), and "the Internet is important to the district" (r =73).

6) Correlations were found for the variable of "I want to learn more about the Internet" with "the Internet helps me to communicate with others easier" (r = .63), and "the Internet is important to the district" (r = .62).

7) Correlations were found for the variable of "The Internet helps me to communicate easier with others," and "usage levels of the computer" (r = .54) and "usage

levels of LAN" (r = .58).

8) Correlations were found for the variable of "comfort levels of the computer" and "comfort levels with using LAN" (r = .63), "comfort levels with using WAN" (r = .58), and "usage of the computer" (r = .51).

9) Correlations were found for the variable of "comfort levels with using LAN" and "comfort levels with using WAN" (r = .60), and "usage levels with LAN" and "usage levels with WAN" (r = .53).

10) Correlations were found for the "comfort level with using WAN" with "usage level of LAN," and "usage level of WAN" (r = .70, r = .70).

11) Relationships with innovativeness scores and many variables were found. Innovativeness scores directly correlated with perceptions of technologically inclined (r = .48). Many of these relationships were significant at the .01 level ($p < .01$), but commonality was less than 25%.

Comparison of Building Innovativeness

A comparison of innovativeness scores was calculated for differences in scores on the Innovativeness Scales. It was found that educators' innovativeness scores were significantly different among schools within the Iowa public school district. Educators in school building (A) scored significantly lower ($p > .01$) on the innovativeness scale (M = 99.7, SD = 9.6) than educators in buildings: B (M = 106.2, SD = 9), C (M = 106, SD =11.3), Middle School (M = 101 SD = 9), High School,(M = 102.5, SD = 11.3) and those that rotate among schools (M = 113, SD =9.3). Educators in school buildings (D) and (E) scored lower than all other buildings within their district (M = 96.3, SD = 13.3; M = 96, SD = 20.2). (See Table 10.)

T-tests Results

T-test analysis were calculated for selected variables and gender. (See Table 11.) The data denoted that females scored higher on the Innovativeness Scale, but the difference was not

Table 10. Innovativeness Scale Results For Educators in Different School Buildings

School Building:	Number of Educators In Building:	Surveys Returned:	Mean	SD
(A) Elementary Grades 1-5	19	17	99.7	10.0
(B) Elementary Grades K-5	29	19	106.2	9.0
(C) Elementary Grades 1-5	23	7	106.0	11.3
(D) Elementary Grades 1-5	20	11	96.3	13.3
(E) Elementary Grades 1-5	17	6	96.0	20.1
(F) Middle School Grades 6-8	58	18	101.0	9.1
(G) High School Grades 9-12	69	23	103.0	11.3
(H) Educators Who Rotate Schools	5	3	113.0	9.3

statistically significant. Five of the t-tests demonstrated significant differences between males and females ($p < .01$). The t-tests that revealed a significant were:

1) t-test for gender with the number of years employed by the district indicated males ($M = 14.6$ $SD = 10.2$) had more experience than females ($M = 10.7$, $SD = 8.6$; $t = 1.77$, $p<.01$). (See Table 11.)

2) t-test for gender with the perception of "The Internet is important to the classroom," indicated that females ($M = 3.6$, $SD = .6$) viewed the Internet as more important in the classroom than males ($M = 3.3$, $SD = .7$; $t = -1.99$, $p<.01$] . (See Table 11.)

3) The third significant t-test was gender and the perception of "The Internet enables me to communicate with others easier," ($t = -2.09$, $p<.01$). Females ($M = 4.4$, $SD = .6$) viewed the Internet as enabling them to communicate easier with others more than males ($M = 4$, $SD = 1$). (See Table 11.)

4) The fourth t-test that revealed a significant difference was gender and "The perception that the administration supports the use of the Internet," ($t = -2.19$, $p<.01$). The females ($M = 4$, $SD = .6$) perceived the administration to be more supportive than the males ($M = 3.7$, $SD = .7$). (See Table 11.)

5) Finally, the t-test of gender and the usage levels of LAN (see Table 11) demonstrated a significant difference, ($t = -2.02$, $p<.01$). Females ($M = 4.2$, $SD = 1.1$) used the LAN more than the males ($M = 3.6$, $SD = 1.4$).

The results of the t-tests indicated that females were more positive toward the Internet than males. Females had higher usage levels and higher comfort levels than males. Females also felt that the Internet enabled them to communicate easier with others. Females viewed that administration to be supportive of the Internet. Although there were differences in the data collected from t-tests analysis, it should be noted that these differences may be due to the fact that more respondents were female.

Table 11 t-tests

t-test	N	Mean	SD	t value	p
Gender and Years of Employment in the Iowa Public School District:					
Male	21	14.6	10.2		
				1.77	.04*
Female	78	10.7	8.6		
Gender and the Perception of "The Internet is important to the classroom:"					
Male	22	3.3[a]	.7		
				-1.99	.025*
Female	78	3.6[a]	.6		
Gender and the Perception of "The Internet enables me to communicate with others easier:"					
Male	22	4.0[a]	1		
				-2.09	.02*
Females	77	4.4[a]	.6		
Gender and the Perception of "The administration supports the use of the Internet:"					
Male	22	3.7[a]	.7		
				-2.19	.016*
Female	78	4.0[a]	.6		
Gender and the Usage Level with LAN:					
Male	22	3.6[a]	1.4		
				-2.02	.023*
Female	78	4.2[a]	1.1		

[a] score based on a 5 point scale
*Significance level p<.01

Summary

The K-12 Local Area Networking and Wide Area Networking Assessment Survey (NAS) was distributed to 240 educators employed by the Iowa public school district adopting the Internet. There were 110 surveys returned. Of the 110 surveys returned only 100 were used. The data from the NAS was analyzed by using frequency counts, percentages, raw scores, standard deviation, mean, correlations, and t-tests.

The survey results revealed educators' characteristics in relation to demographics, innovativeness, and self-perceptions of being technologically inclined. Educators in this sample seemed to be about 40 years old (mean age = 40). The majority of respondents were female (78 females and 22 males). Most educators had been employed by the district for over ten years. All grade levels were somewhat equally represented in this sample. Some individual buildings had more respondents than others. The majority of educators had only bachelor's degrees, only 34% had master's degrees or above. In this sample of educators it was found that educators' innovativeness was very similar to the general population. Educators felt undecided about their technical inclinations.

In general, it was found that most educators wanted to learn about the possibilities of the Internet in their classroom. Educators felt that the Internet was important to their Iowa public school district and to their classrooms. They agreed that Internet could provide many future resources for their classrooms. Educators perceived their district to be an innovative district. Educators believed that the administration supported the use of the Internet and was going to provide about staff development on the use of LAN and WAN.

In this sample, educators indicated that they learned best by hands-on practice. They preferred exploration time with some assistance to learn about the LAN and WAN. Some educators preferred structured on-line activities for staff development.

Correlations revealed relationships among many variables. Most of these correlations were somewhat expected. For example, a positive correlation was found between innovativeness and technological inclination, computer use, Internet use, administrative support and perceptions of the Internet. (See Table 9.)

The differences among educators' innovativeness scores indicated that educators were significantly different in their innovativeness. Differences existed between educators in the elementary buildings and upper level buildings.

t-tests (see Table 11) demonstrated significant differences for females. Although males tended to have more experience than females, it was found that females were significantly more positive toward the Internet than males. The results indicated that females ($\underline{M} = 3.6$, $\underline{SD} = .6$) viewed the Internet as more important in the classroom than males ($\underline{M} = 3.3$, $\underline{SD} = .7$). Females ($\underline{M} = 4.4$, $\underline{SD} = .6$) viewed the Internet as enabling them to communicate easier with others more than males ($\underline{M} = 4$, $\underline{SD} = 1$). The females ($\underline{M} = 4$, $\underline{SD} = .6$) perceived the administration to be more supportive than the males ($\underline{M} = 3.7$, $\underline{SD} = .7$). Finally, females ($\underline{M} = 4.2$, $\underline{SD} = 1.1$) used the LAN more than the males ($\underline{M} = 3.6$, $\underline{SD} = 1.4$).

Data collected from the open-ended questions (Appendix C) revealed a need for more training on the use of the Internet. Seventy-five percent of the educators responding to the survey had ten hours or less of training on the Internet. Most of the training that the educators attended was required by the district (78%).

The open-ended questions also revealed concerns about the slowness of the downloading and the lack of proper equipment necessary for classroom use. Many respondents indicated they were frustrated with the crashing of their computers when using Netscape. Some ethical issues such as misuse and pornography concerned educators as well.

CHAPTER V. CONCLUSIONS

Many public schools are connected to the Internet. With the approval of the Iowa Schools Technology Bill it is expected that the number of schools connected to the Internet will increase. Thus, educators will be faced with the challenge to learn how to use the Internet.

The Internet may change the way learning takes place (Kinzie et al., 1996). The Internet has a multitude of educational applications (Frazier & Frazier, 1994). Once educators discover the potential of the Internet, they will find it easy to integrate its use into their curriculum. Educators will understand that the Internet removes communication and geographical barriers, thus, increasing information sources.

Adoption of an innovation such as the Internet is a very complex event. There are many factors involved with the adoption process of an innovation. One important factor which influences the adoption of an innovation is an individual's willingness to change or the individual's innovativeness. A second variable which influenced the adoption process is the perception of the innovation, or the perceived attributes of the innovation. A third mechanism is the implementation strategy in which educators learn about the innovation. Another contributing mechanism is the organization or social system in which the innovation is to be adopted. As noted in chapter two, size, flexibility, budget (Abernathy & Utterback, 1978), the innovativeness of the organization, (Rogers, 1995; Hurt, 1977) and the administrative support of the innovation (Hall & Loucks, 1977) are characteristics that directly influence the rate of adoption. Finally, the adoption rate is influenced by the organization itself and the organization's innovation champion (Rogers, 1995; Hall et al., 1980; Honey & Henriquez, 1983; Perkins-Rude et al., 1993).

The purpose of this study was to examine the issues which surrounded the adoption of the Internet in one Iowa public school district. The investigation set forth to find out if Iowa public educators in one school district were adopting the Internet. The study identified and discussed issues which played an important role in shaping patterns of use and implementation strategies of wide area networking and local area networking in an Iowa public school. This investigation examined specific characteristics of persons involved in the adoption of the Internet. Additionally, this study identified educators' perceptions of the Internet which might

have influenced their rate of adoption.

Chapter five summarizes information found in previous chapters. Data collected from the survey instrument and answers to the research questions are discussed. Suggestions for future research are given and final conclusions are made. The following research questions provided a guide for collection of data.

Research Questions

1. What are the significant personality characteristics, perceived organizational characteristics, and implementation strategies that are predictors of Internet adoption for public educators from one Iowa school district?

2. In general, what are the current comfort levels and the current levels of usage of public educators in one Iowa school district with the Internet?

3. What are the perceived attributes of the Internet that influence the rate of adoption for public educators in one Iowa school district?

Discussion of the Results

In the literature review it was noted that personality characteristics such as innovativeness (Rogers, 1995; Perkins, et al. 1993; Honey & Henriquez, 1993), technological inclinations (Rogers, 1995; Honey & Henriquez, 1993) and highly motivated (Honey & Henriquez, 1993) have a strong influence on the rate of adoption. Perceptions of the organization as innovative, agenda-setting, and the innovative champion also influence the rate of adoption (Rogers, 1995). Foa, Schwab and Johnson (1996) pointed that educators learn in different ways much like children learn in different ways. Training needs to be tailored to meet the needs of teachers (Hall, et al. 1980) and it should be done in such a way that technology is viewed as a tool used for instruction (Foa, Schwab & Johnson, 1996). Instruction time should also match learners preferences (Freitag & Sullivan, 1995).

These educators tended to be undecided about their technical abilities. (See Table 1.)

Fifty-two percent of these educators had earned graduated credit beyond a Bachelor's degree. The innovativeness scores indicated that this sample of educators ($\underline{M}$ = 102.8, $\underline{SD}$ = 11.4) was similar to the population sample ($\underline{M}$ = 102, $\underline{SD}$ = 14) collected by Hurt et al. (1977). (See Figure 1.)

Educators from different school buildings scored significantly different on the Innovativeness Scale (IS). (See Table 10.) It seemed that the educators who were located in buildings with higher teacher populations tended to score higher on the IS.

Most educators felt that they would learn about the Internet best if there were more staff development with hands-on lab time with assisted practice. (See Table 4.) In general, educators indicated that they would feel more comfortable with LAN and WAN if there were more hands-on lab practice with structured on-line activities, assistance and free exploration time.

Educators perceived the organization to be innovative ($\underline{M}$ = 4.1, $\underline{SD}$ = .6). (See Table 2.)

In the literature review it was noted that many times educators have technophobia. Dyck and Smither (1994) found that there was a negative correlation between computer experience and computer anxiety meaning that high computer experience lowered computer anxiety. Subjects with low computer anxiety were more likely to have a more positive attitude toward the computer. Therefore, the more positive attitude toward the computer, the more likely the subject will use the computer (Dyck & Smither, 1994). These researchers indicated that individuals with high computer anxiety avoid using the computer because of this anxiety or low comfort level with the technology. Because it is necessary to use the computer to access the Internet it was important to know the levels of comfort with various technologies.

The data collected from NAS indicated that the majority of educators were using the computer many times a day, 59% indicated extremely high use of the computer. Twenty-six percent indicated high use and 14% indicated little use. This data reveals that educators are extremely high users of computers. Therefore a critical mass (Rogers, 1995) has adopted the computer ($\underline{M}$ = 4.43, $\underline{SD}$ = .7). As described in the literature, computer usage is a prerequisite to use of LANs and WANs (including the Internet).

Results of the question about usage of LANs indicated that the majority of the respondents were using the LAN many times or at least one time per day. Forty-six percent used the LAN services many times per day, (extremely high use). Thirty-one percent used the LAN at least one time per day. Eleven percent indicated moderate LAN usage and 5% indicated little amount of use. The remaining 7% of the educators did not use LAN at all. An analysis of this data revealed that most educators have high use of this technology ($\underline{M}$ = 4.0, $\underline{SD}$ = 1.2).

Data on wide area networking usage indicated that 30% of the educators were not using this technology. Twenty-six percent of the educators had used this technology less than once a week (little use). Twenty-seven percent indicated moderate usage of WAN (about once a week). Fourteen percent of the educators used this technology once a day (high use) and 3% used WAN many times per day (extremely high use). (See Table 7.) Educators were using this technology very seldom ($\underline{M}$ = 2.4, $\underline{SD}$ = 1.1). The reason for the lower amount of use on WAN may be explained by the answers to the open-ended questions on NAS (Appendix C). The comments indicated that many people were not knowledgeable about the Internet. Furthermore, respondents indicated that training was needed on the Internet and that the school in which the educator was located was just connected. Some comments stated that the barrier to use was not enough equipment to integrate WAN into the classroom.

A frequency count of answers to questions about educators' comfort levels with using the computer indicated that 46% of the educators were highly comfortable with the computer. Fourteen percent of the educators indicated they were comfortable. Thirty-eight percent of the educators felt little comfort with using the computer. Two percent indicated they were not comfortable at all with the computer. (See Table 6.) An analysis of the mean and standard deviation indicated that educators felt moderately comfortable with using the computer ($\underline{M}$ = 3.7, $\underline{SD}$ = .7).

Results from questions about educators' comfort levels when using LAN indicated that 39% of the respondents felt highly comfortable with the LAN. Moderate comfort was felt by 38% of the respondents. Ten percent of the educators responding felt extremely comfortable with LAN, 6% of the respondents indicated that they felt no comfort and 6% indicated little

comfort. (See Table 6.) Educators, in general, seemed to feel moderately comfortable using this technology (M = 3.4, SD = 1).

The wide area networking comfort levels scores were in the moderate range. Approximately 34% of the respondents felt that they were moderately comfortable and 29% felt they had little comfort in their usage of the WAN. No comfort was indicated by 22% of the respondents. Four percent indicated extremely comfortable and 10% felt they were highly comfortable. (See Table 6.) Results on the comfort level of using the WAN services indicated most educators felt little comfort with this technology (M = 2.4, SD = 1), but they continued to try.

Results of the data on comfort levels with using the various technologies pointed out that many educators in felt moderately comfortable using the computer, LAN, and little comfort using the WAN. Although educators seemed to feel moderately comfortable with the innovations they seemed to continue to use the innovations. Data indicated have high usage levels of the computer and local area networking; thus, implying that there is a critical mass (Rogers, 1995) of adopters using the computer and LAN within this Iowa public school district. (See Table 7.) Educators seemed to be struggling with WAN, but they continued to try. Information collected from the open ended concerns and comments indicated that educators needed more time and training with WAN, which includes the Internet.

According to the literature, the perceived attributes of the innovation by the users of the innovation influence the rate of adoption. Rogers (1995) stated, "The perceived attributes of an innovation are one important explanation of the rate of adoption of an innovation" (Rogers, 1995, p. 206). The five contributing factors are "relative advantage, compatibility, complexity, trialability and observability" (Rogers, 1995, p. 250). The relative advantage refers to the degree to which the participants perceive the innovation as better than the idea it supersedes. Compatibility is the amount of value and need placed on the innovation by future adopters. Complexity refers to the ease of use and understanding of the innovation. Trialability refers to the amount of "trying out" time or experimentation allowed with the innovation. Finally, observability is defined as the visibility of results of the innovation to others. (See Table 8.)

These educators seemed to perceive the Internet as having relative advantage for them.

Many educators perceived the Internet to be important to the Iowa public school district (M = 4.1, SD = .7). Educators felt that the Internet enabled them to communicate with others easier (M = 4.3, SD = .7). Educators felt that the Internet would provide the classroom with many resources and had many future possibilities (M = 4.1, SD = .6).

Educators also perceived the Internet to be low complexity. The majority of educators agreed that the Internet was easy to use (M = 3.8, SD = .6) and that they enjoyed using the Internet (M = 3.8, SD = .9).

These educators also believed that the Internet was compatible to their values. They tended to agree that the Internet had many possibilities for the future (M = 4.1, SD = .6) and they wanted to learn more about the uses of the Internet in their classrooms (M = 4.2, SD = .6).

Educators felt that they would have access to staff development and more training in the future (M = 3.9, SD = .6). Educators felt that the administration supported the use of the Internet and that the Internet was accessible. Some educators indicated difficulty with slowness and crashing of the computer. (See Appendix C.) Comments also indicated that educators were struggling with the amount of time the Internet consumed for doing research.

In the literature review it was noted that many educators who had instruction about Internet use were motivated by the desire to learn about the Internet (Schrum, 1995; Honey & Henriquez, 1993). It was concluded that if educators had a desire to learn, then this would increase the rate of adoption of this innovation. In this study it was apparent that most educators wanted to learn about the Internet (M = 4.2, SD = .6).

t-tests indicated that females tended to be more positive toward the Internet. The results indicated that females (M = 3.6, SD = .6) viewed the Internet as more important in the classroom than males (M = 3.3, SD = .7). Females (M = 4.4, SD = .6) viewed the Internet as enabling them to communicate easier with others more than males (M = 4, SD = 1). The females (M = 4, SD = .6) perceived the administration to be more supportive than the males (M = 3.7, SD = .7). Finally, females (M = 4.2, SD = 1.1) used the LAN more than the males (M = 3.6, SD = 1.4).

Reactions to Results

Because of increased state funding for technological innovations, this study attempted to find out if educators would adopt the Internet if their schools were connected to it. In providing the answer to this question, three research questions were formulated. This study examined the usage and comfort levels of various technologies. It examined personality traits of educators which influences the rate of adoption of an innovation. Finally, it investigated the perceptions and attributes of the Internet which also played a significant role in the rate of adoption of an innovation.

1 What are the significant personality characteristics, perceived organizational characteristics, and implementation strategies that are indicators of Internet adoption for public educators from one Iowa school district?

Data collected to answer this question indicated that educators who perceived themselves to be technologically inclined and innovative reported high use of the LAN ($\underline{r}$ = .41, $\underline{p} < .01$) and WAN ($\underline{r}$ = .34, $\underline{r}$ = . 53, $\underline{p} < .01$). It was found that there were positive correlations between self-perceptions of technological inclinations and innovativeness with the usage levels and comfort levels of the Internet. (See Table 9.)

Perceptions of the innovativeness of the local school district administration did not correlate strongly with the amount of usage with the Internet ($\underline{r}$ = .03). Even if the educators viewed the school district as innovative they did not have consistent higher use of the Internet. Prior research conducted by Honey and Henriquez (1993) indicated that many educators were not influenced by administrative innovativeness, but that educators who used telecommunications in their classrooms were highly motivated to learn this technology. In this study, educators who wanted to learn about the Internet tended to use the Internet ($\underline{r}$ = .31) services which were provided by the Iowa public school district.

Training and administrative support were not significant correlations to usage levels ($\underline{r}$ = .15) and comfort levels ($\underline{r}$ = .15) of the Internet . The perception of the Internet as important to the public school district was correlated to the usage and comfort levels for

educators with the Internet. Educators who perceived the Internet as important tended to have higher comfort levels and higher usage levels of LAN ($r = .45$) and WAN ($r = .39$).

If public school districts use funds from the Iowa Schools Technology Bill to connect their computers to the Internet, then they will need to rely on the educators who are employed by the school district to implement its use. The administration and training will need to be supportive of those individuals who want to learn about the Internet and who perceive it as important for the classroom and the district. Training will need to be provided to increase comfort levels and usage levels of the Internet which in turn will improve the perceptions of ease and enjoyment of using the Internet. Thus, training is necessary for educators to develop perceptions that the Internet is easy to use and to increase enjoyment of using the Internet.

Training strategies that appealed most to educators were on-line structured activities and free exploration of the LAN. Data indicated that 37% of the respondents preferred to have independent exploration with some assistance and 31% preferred to be trained with hands-on lab practice and structured on-line activities. Training strategies most preferred by educators for WAN were independent exploration with some assistance (36%) and hands-on lab practice with structured on-line activities (32%). These results indicated that training needs to provide educators with structured on-line activities. Instruction should also include free exploration time. A one-shot group demonstration would not be sufficient for educators to become familiar with the complexity of the Internet.

Innovativeness scores of these educators resembled the general population innovativeness scores (Hurt et al. 1977; see Figure 1 and Table 12.) During the adoption of the Internet educators in the early adopter and early majority categories should be encouraged in their efforts to adopt the Internet. Educators in the laggard and late majority categories need to have training designed specifically for their needs and personality traits.

2 *In general, what are the current comfort levels and the current levels of usage of public educators in an Iowa school district with the Internet?*

Table 12. Innovativeness Scale Results:

	N	Items	Range	Mean	SD	Highest	Reliability Possible Score
Innovativeness Scale (normative information)	431	20	22-139	102	14	140	.9
Iowa Public School Educators	100	20	60-125	102.8	11.4	140	

Data collected to measure usage and comfort levels indicated that educators were moderately comfortable with the computer (M = 3.7, SD = .7) and educators felt somewhat comfortable using this technology. (See Table 6.) They indicated that they occasionally asked for help. Data collected on the usage levels of this technology indicated that educators are using the computer many times per day (M = 4.4, SD = .8). Fifty-nine percent of the respondents indicated that they had extremely high use of the computer.

Computer usage and low computer anxiety are prerequisites to using the Internet (Honey & Henriquez, 1993; Dyck & Smither, 1994). There was a direct correlation with computer usage levels and LAN and WAN usage levels. (See Table 9.) It seemed that if educators had high use of the computer then they also had high use of LAN and WAN services. It also appeared that if educators felt comfortable with the computer then they tended to feel comfortable with LAN and WAN services as well.

Data collected on comfort levels and usage levels of LAN and WAN services indicated somewhat lower comfort and usage levels of these technologies by educators. Data collected indicated that educators were moderately comfortable using local area networking (M = 3.4, SD = 1) and somewhat comfortable with WAN (M = 2.4, SD = 1.1). They used LAN at least once per day which indicated high use (M = 4, SD = 1.2). Educators indicated that they were using WAN (M = 2.4, SD = 1.2) at least once per week. Many educators explained that their buildings were just connected and that there was not enough staff development or time to learn about the Internet for them to feel comfortable (Appendix C).

Training was directly correlated with comfort levels and usage levels of the LAN and WAN services. The more training educators received, the higher comfort levels and usage levels were for the educators with these technologies. Training for educators increased comfort levels for LAN (r = .31) and WAN (r = .39). The amount of training that educators had correlated with usage levels for LAN (r = . 35) and WAN (r = .35). (See Table 9.) The results of this data indicated that training was needed for educators on the Internet. Therefore, if a school district connects to the Internet it will be necessary to provide training to increase the adoption rate.

According to Rogers (1995) a critical mass of adopters of the Internet will result in reciprocal interdependence. The definition of reciprocal interdependence is the process of early adopters benefiting from later adopters and vice-versa. The benefits of an interactive innovation such as the Internet flow backward in time to previous adopters and forward to future adopters. The critical mass occurs at an early stage in an interactive innovation.

As the data indicated, 14% of the respondents were using WAN once a day and 45% of the respondents were using LAN many times per day. (See Table 2). This data showed that the majority of educators responding had adopted computer and local area networking. Usage and comfort levels with wide area networking indicated that WAN was considerably new to the educators and the organization. Rogers (1995) indicated that any adoption process occurs over time. Honey and Henriquez (1993) indicated that it takes approximately seven years for educators to fully adopt telecommunication technologies into their classroom instruction.

3. What are the perceived attributes of the Internet that influence the rate of adoption for public educators in an Iowa school district?

Data collected to answer this question indicated that educators viewed the Internet as helping them to communicate easier with others ($\underline{M}$ = 4.3, $\underline{SD}$ = .7). (See Table 4.) They perceived the Internet to be important to the Iowa public school district ($\underline{M}$ = 4.1, $\underline{SD}$ = .7). Educators believed that the Internet will provide access to many resources in the classroom and the Internet has many possibilities in the future ($\underline{M}$ = 4.1, $\underline{SD}$ = .6). It was found that educators wanted to learn about the Internet ($\underline{M}$ = 4.2, $\underline{SD}$ = .6). Data collected on educators' perceptions of the ease of use of the Internet indicated that most educators tended to view the Internet as easy to use ($\underline{M}$ = 3.8, $\underline{SD}$ = .6). Many educators tended to enjoy using the Internet ($\underline{M}$ = 3.8, $\underline{SD}$ = .9).

According to Rogers (1995), perceived attributes of the innovation are one explanation in the rate of adoption. The five attributes that influence the adoption rate are: relative advantage, complexity, compatibility, trialability, and observability.

In this Iowa public school district educators tended to feel that the Internet had relative advantage for them. They agreed that the Internet would help them to communicate with others easier. They tended to agree that the Internet was important to their school district. They agreed that the Internet would provide many resources for their classrooms.

Educators also tended to agree that the Internet was easy to use and tended to enjoy using it. Rogers (1995) indicated that complexity of the innovation refers to how difficult or easy the innovation appears to the adopters.

Trialability refers to the degree in which the innovation is accessible. Many educators agreed that their public school administration supported the use of the Internet and would provide more training on the use of the Internet, although data collected from the open ended comments indicated that not all educators were accessing the Internet. Some educators were frustrated because their computers would crash when they were using the Internet. Other educators indicated that they were frustrated because they had 28 students per class and only one available computer in their classroom. These results point out that the Internet is not accessible for all educators to try or experiment with and further expand their adoption of the Internet into their teaching.

Perceptions of ease, enjoyment, importance, future possibilities, motivation to learn about the Internet, and communication with others were directly related to the amount of usage of the technologies by the educators. (See Table 9.) There were positive significant correlations between the usage levels of LAN and WAN and each of these perceptions. The data indicated that 40% of the educators felt that the Internet was easy to use and 32% of the educators felt that they enjoyed using the Internet. Fourteen percent of these educators had high use of the Internet (at least one time per day). Educators with high usage levels and high comfort levels tended to agree that the Internet was important for their classroom ($\underline{r} = .35$). Likewise, these same educators tended to agree that the Internet was easy to use ($\underline{r} = .63$) and they enjoyed using the Internet ($\underline{r} = .60$).

Although training was not correlated with perceptions about the Internet, the amount of use and comfort levels were correlated with the variables of ease, importance, enjoyment, communication, motivation and future possibilities. It may be necessary to provide training to

increase usage and comfort levels so that educators will develop such perceptions of the Internet. Instruction for educators on the Internet should be focused on increasing usage and comfort levels for educators.

It was found that many educators wanted to learn about the Internet ($\underline{M} = 4.2$, $\underline{SD} = .6$). Research findings (Honey and Henriquez, 1993) indicated that most educators who were motivated to learn about telecommunications were using it in their classroom instruction. In this study many educators (68%) wanted to learn about the possibilities of using the Internet in their classrooms. These results indicated that most of the educators surveyed wanted to learn about the Internet, therefore, it is likely that these educators planned to integrate the Internet into classroom instruction.

Limitations of Study

The limitation to this investigation was the low sample of educators, and the low return rate. The distribution of the initial survey was during the end of the school year when many educators had prior commitments which may have contributed to the small return rate. The surveyed population was 240 educators in a suburban school district. The return rate was 42%. An effort to gather more surveys was implemented using a reminder card and a duplicate survey, but this did not produce any additional responses. This small sample and low return rate may limit generalizations.

Demographics also limit generalizations. The school district surveyed had very unique characteristics that may or may not be similar to the majority of Iowa public schools.

Diffusion of innovation studies have faced some criticisms in the past. Among these criticisms is the phenomenon of separating organizational behavior from the individuals involved in the organization (Granovetter, 1978 as cited in Rogers, 1995). The rate of adoption may actually be influenced by the organization rather than the individuals involved.

Rogers (1995) pointed out that diffusion of innovations research may involve some "pro-innovation" bias. This is the implication that the innovation should be adopted by all individuals in the organizations. "This bias leads researchers to ignore the study of ignorance

about the innovation, to underemphasize the rejection of the innovation, to overlook reinvention, and to fail to study antidiffusion programs designed to prevent the diffusion of bad innovations" (Rogers, 1995, p. 100). Therefore, what is known about an innovation is unnecessarily limited.

Suggestions for Future Research

This sample of educators was small. It may be more beneficial to conduct an investigation on a larger scale, for instance, to survey several school districts to obtain a larger sample of the innovativeness of educators and their willingness to adopt the Internet.

Secondly, Rogers (1995) stated that incentives influenced the rate of adoption. In this study incentives were not considered. For future investigations it may be beneficial to examine the influence of incentives on the adoption of the Internet. Research is needed to find answers to what can be done to help educators who are in the late majority and laggard categories of adoption.

Finally, additional research needs to be conducted on the actual use of the Internet in the classroom. The benefits and the changes that the Internet causes in education should be researched. The Internet will change the way learning occurs in the future. This change will provide many future research situations.

Summary

This study examined the usage and comfort levels of various technologies and examined factors which influence the rate of adoption of an innovation. This investigation examined personality traits of educators which influence the rate of adoption of an innovation. Three research questions were formulated to provide guidance for this investigation.

The K-12 Local Area Networking and Wide Area Networking Assessment Survey (NAS) was developed to provide insight into the perceptions that educators had toward the Internet. The NAS provided data on educators personality traits that influence the rate of

adoption. The Innovativeness Scale was used to determine educators' innovativeness.

Results indicated that the educators were using their computers many times per day. They were also using LAN services many times per day. Educators were using wide area networking once per week. Some educators were using WAN many times per day. Information indicated that more training on WAN was needed for educators to increase their comfort and usage levels.

Positive perceptions of the Internet seemed to be directly related to the educators' technological inclinations and innovativeness. These characteristics also influenced usage and comfort levels of various technologies such as the computer, LAN, and WAN. Data indicated that the more training an educator had on the Internet the more usage and comfort the educator felt in using the Internet.

Results from the Innovativeness Scale indicated that these educators were similar to the general population. Some school buildings seemed to have more innovative teachers within the setting. The larger the teacher population in the school building the more innovative the teachers tended to be.

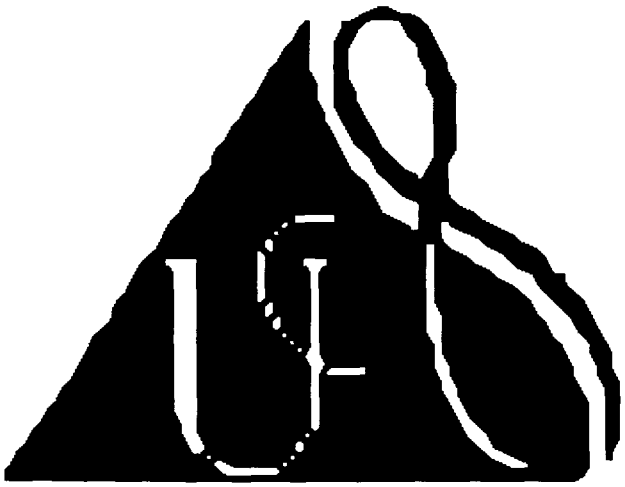
Females tended to have more positive perceptions of the Internet than males. Although there were no significant differences in innovativeness scores, females viewed the LAN as helping them to communicate easier with others, more important to their classrooms and more important to their school district. Females tended to want to learn about the Internet more so than males.

Educators in this Iowa public school district viewed the Internet as having relative advantage for them. They indicated that more training and more time to learn about the Internet was needed. They also indicated that they were somewhat frustrated with software and hardware problems. Some educators were concerned with ethical issues pertaining to the Internet.

Future investigations need to be conducted to provide more knowledge on the benefits and changes that the Internet will cause. The Internet is redefining education. It will provide a new arena for instructional opportunities in education.

APPENDIX A.
K-12 LOCAL AREA NETWORKING AND WIDE AREA NETWORKING ASSESSMENT SURVEY

K-12
Local Area Networking
and Wide Area Networking Assessment
Survey



Patricia A. Sereg
Urbandale Community Schools
Iowa State University

Local Area Network and Wide Area Network
Assessment Survey

This survey is designed to evaluate the use of local area networking (First Class) and wide area networking (WWW, Netscape) by you during the 1995-1996 school year. The survey is divided into the following categories: demographics, general use and general opinion. Thank you in advance for taking the time to complete this survey. It should be noted that the school with the most surveys returned will receive bagels from Bruegers on the last day of school.

After completion, please use the attached envelope and leave it with your building secretary or return it through inner school mail to: Patty Sereg, Olmsted School. Please return your survey by June 4 so that I can deliver the bagels to the winners on the last day of school.

All surveys and information will be kept in the strictest confidentiality. An arbitrary code has been assigned to your survey. This number will assist me in measuring changes and keeping track of data. The surveys will be destroyed after data has been entered. Completion should take 10 to 15 minutes.

Please tell me about yourself:

Fill in the blanks:

1. Name (Optional)_____

This survey has been coded with an arbitrary number: ___ ___ ___ ___ this is to assist in keeping track of data.

Would you be willing to participate in a biweekly log of your use of computer networks for the next six weeks, there will be a one-time compensation for your time of $25.00. If so please contact me by June 5, 1996.

2. School _____

3. Grade Level and Subject _____

4. Please list the Professional Organizations you currently belong to:

_____

_____

5. What is your highest degree held? _____

6. What is your current age?_____ years

7. What is your gender? _____Male _____ Female

8. How long have you been employed with UCSD?

_____ years

General Use Of Telecommunications:

9. Please rank the following items on a 1-7 scale. 1 as being most like you and 7 as being least like you. Use each number only once. I learn best by:

_____writing things down or following a manual
_____exploring in a what if manner
_____drawing a visual picture or looking at a visual illustration
_____actually doing a new skill, practicing and hands on learning
_____rhymes, chants or little jingles that help me memorize things
_____teaching others and talking to people about the new idea
_____working independently on a new skill until I have mastered it

10. What type of staff development on using the internet have you attended? Please check all that apply.

_____voluntary workshops provided by district technology team
_____required staff development workshops required by district
_____Heartland AEA staff development
_____other (please specify) _____
_____none at all

11. Please estimate approximately how many hours you have had in training on using the district's computer networking system. (Local area networking and wide area networking.)

_____ total hours

Please circle the number that relates to your current comfort level of how you feel when you use the various technologies. Please use the following scale:

1) Not at all comfortable (it is too frustrating for me to attempt)
2) Little comfort (it is frustrating, but I try)
3) Moderately comfortable (I occasionally ask for help)
4) Highly comfortable (others ask me to help them)
5) Extremely comfortable (I feel I know well beyond what others know)

	No	Little	Moder	High	ExtrHigh
12. Computer.....	1	2	3	4	5
13. LAN (First Class).....	1	2	3	4	5
14. WAN (WWW).....	1	2	3	4	5

Responses in this section tell me your current level of use for the various technologies. Please circle the number that corresponds with your current usage level. Please use the following scale:

1) No use (I do not use this technology at all)
2) Little use (very seldom less than once a week)
3) Moderate use (about once a week)
4) High use (once a day)
5) Extremely high use (many times a day)

	No	Little	Moder	High	ExtrHigh
15. Computer.....	1	2	3	4	5
16. LAN (First Class).....	1	2	3	4	5
17. WAN (WWW).....	1	2	3	4	5

18. I would feel more comfortable with the First Class if we had more time for: (Please check only your top two choices.)

_____total independent exploration learning
_____independent exploration with some assistance
_____one to one coaching
_____large-group demonstration with independent practice
_____large-group demonstration with assisted practice
_____hands on lab practice, intensive schedule
_____hands on lab practice with slower paced schedule
_____hands on lab practice with structured on-line activities
_____we really do not need to have the local area networking I am too busy with other things right now

19. I would feel more comfortable with the wide area networking if we had more time for: (Please check only your top two choices.)

_____total independent exploration learning
_____independent exploration with some assistance
_____one to one coaching
_____large-group demonstration with independent practice
_____large-group demonstration with assisted practice
_____hands on lab practice, intensive schedule
_____hands on lab practice with slower paced schedule
_____hands on lab practice with structured on-line activities
_____we really do not need to have the wide area networking I am too busy with other things right now.

General Opinion of The Local Area Networking (First Class) and Wide Area Networking (World Wide Web):

Using the categories below, please circle the answer that best describes the degree in which you agree or disagree with each statement.

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

1. Netscape is easy to use.

SA A U D SD

2. The computer networking system (LAN and WAN) is important to the achievement of Urbandale Community School District and its mission.

SA A U D SD

3. I enjoy using the internet.

SA A U D SD

4. Technology is an area of my expertise and people come to me with questions about computers, LAN, WWW and other technologies.

SA A U D SD

5. The wide area networking is important for UCSD faculty and staff.

SA A U D SD

6. The WWW has many possibilities in the future.

SA A U D SD

7. The World Wide Web will provide us with many resources for the classroom.

SA A U D SD

8. I want to learn more about the possibilities of using the world wide web in my classroom.

SA A U D SD

9. The wide area networking is an unnecessary luxury.

SA A U D SD

10. Netscape is difficult to use.

SA A U D SD

11. We will probably not have any more staff development training on how to use Netscape.

SA A U D SD

12. There are more important innovations to be concerned with for my classroom at this time than wide area networking.

SA A U D SD

13. In most situations I will try a new idea or solution to a problem.

SA A U D SD

14. There are better ways to do research for group investigation than the internet.

SA A U D SD

15. I have no difficulty using my computer.

SA A U D SD

16. I enjoy using the computer.

SA A U D SD

17. Technology has helped me improve my teaching.

SA A U D SD

18. The First Class (LAN) is easy to use.

SA A U D SD

19. The Urbandale Community School District is an innovative organization.

SA A U D SD

21. Our administration supports the use of the WAN (world wide web) and LAN (First Class).

SA A U D SD

22. The First Class(LAN) and Wide Area Networking enable me to communicate with others easier.

SA A U D SD

23. The First Class (LAN) is important for UCSD faculty and staff.

SA A U D SD

24. The First Class (LAN) has many possibilities in the future.

SA A U D SD

25. The First Class (LAN) will provide teachers with many resources for the classroom.

SA A U D SD

26. I want to learn more about the possibilities of First Class (LAN) in my classroom.

SA A U D SD

27. The First Class (LAN) is an unnecessary luxury.

SA A U D SD

28. The First Class (LAN) is difficult to use.

SA A U D SD

29. We will probably not have any more staff development training on the First Class(LAN).

SA A U D SD

30. There are more important innovations to be concerned with for my classroom at this time than First Class (LAN) .

SA A U D SD

31. The computer networking system (local area network and wide area network) will create many new problems for me.

SA A U D SD

32. I enjoy taking part in the leadership responsibilities of the groups I belong to.

SA A U D SD

33. I find it energizing to be original and creative in my thinking and behavior.

SA A U D SD

34. I take my time and use caution to learn about a new technique.

SA A U D SD

35. I find unanswered questions challenging.

SA A U D SD

36. I usually like to see how others have applied a new idea before I will try it.

SA A U D SD

37. My peers often come to me for advice.

SA A U D SD

38. I like to try new ways of doing things.

SA A U D SD

39. I make sure I do new things only because I have to.

SA A U D SD

40. In most situations I will try a new idea or solution to a problem.

SA A U D SD

41. I am suspicious of new ways of doing things.

SA A U D SD

42. I am aware that I am usually the last person to try a new idea.

SA A U D SD

43. I am an inventive type of person.

SA A U D SD

44. I prefer new ideas over the familiar.

SA A U D SD

45. I like to see how successful a new technique is before I will try it.

SA A U D SD

46. I consider myself to be creative and original in my thinking.

SA A U D SD

47. In most situations I am suspicious of new inventions and new ways of thinking.

SA A U D SD

48. I usually need to see others using the new approach before I will attempt it myself.

SA A U D SD

50. People really listen to what my opinion is.

SA A U D SD

51. I like devising a new solution to a problem.

SA A U D SD

52. I find it difficult to make decisions when the outcome is uncertain.

SA A U D SD

53. In what ways have you used the internet and First Class? Please give up to two examples.

_____
_____
_____

54. In what ways are you incorporating First Class into your instruction? Please give up to two examples.

_____
_____
_____

55. In what way have you incorporated internet into your classroom? Please give up to two examples.

_____
_____
_____

56. What concerns and questions pertaining to the computer networking do you have at this time?

_____
_____
_____

*****Thank you again for taking the time to complete this survey*****

APPENDIX B.
COVER LETTER TO SUBJECTS
WIDE AREA NETWORKING ASSESSMENT SURVEY

June 3, 1996

Dear Colleague:

As many of you may know I am working on my masters in Curriculum and Instruction at Iowa State University in Ames, Iowa. As part of my graduate work in Instructional Technology, I am conducting research under the direct supervision of Dr. Michael R. Simonson.

The purpose of my research is to examine perceptions and opinions of educators who use the internet. I am very interested in the effectiveness of the internet.

We are asking for your help. We have assigned an arbitrary number to the survey, this is for me to keep track of how many surveys were completed. Your answers will be kept in strict confidentiality. No names will be associated with any reports or results of data. Participation is voluntary. All surveys will be destroyed upon compilation of data. To help insure a timely response to this important matter I am providing a morning of bagels from Bruegers Bakery for the building with the most surveys completed and returned by June 4.

After completion you may leave your survey with your building secretary in the envelope attached to the survey or you may return by inner school mail to me at Olmsted Elementary.

Please return the survey on or before June 5, 1996. If you have questions about the survey, please feel free to contact me at Olmsted 253-2316.

We feel this research can make a significant contribution to future implementations of new technologies in education. The responses you express are highly valued and appreciated. We thank you very much for you support and time.

Patricia A. Sereg
Olmsted Elementary
Urbandale, Iowa

Michael R. Simonson
Iowa State University
Ames, Iowa

APPENDIX C.
RESULTS OF OPEN ENDED QUESTIONS

What concerns and question do you have pertaining to the computer networking at this time?

- What elese can we do with the LAN? Email is nice but there is so much more. We have many programs on our media center LAN. Our mac LAN could serve many more uses than running printers and local e-mail.
- Not enough time to use it.
- We need more RAM to keep up.
- We need more laser printers to print high quality graphics down loaded form WWW. for example, Mexico or world book and state research.
- Can I get Netscape through the school district at my home? (for use in the summer)
- Proper training-guided practice
- Just for younger teachers to realize and understand the difficulty it is for an older teacher to operate all this technlology.
- Will we receive adequate training?
- Will we have adequate time to practice?
- Will the district update computers, so information can be transferred more quickly?
- Will funding continue to be sufficeint to have appropriate tools and training?
- More intense training for building trainers so more intense training can occur for staff.
- I have a concern about adults abusing the system at such an early stage of participation.
- Student misuse of the net that would be attempted to be blamed on classroom teacher.
- More in-service on the internt.
- How to use it more effectively and me taking more time to learn more effectively WWW. Then I will be able3 to use in classroom after I am more knowledgeable.
- I need staff development on the use of the internet.
- I need more background and practice with Intternet. Time is a bug hurdle with it.
- The time it takes to find what you need.
- Ram speed?
- More information the better.
- Improper use by students. How to supervise all of the kids.

- First class is great too many messages to read, really time consuming.
- More training on internet.
- The wait time is excessive and very hard to justify when there are papers to check.
- Computer is very slow.
- In-service time to prepare.
- We need more one on one training. We're given a "crash course" on e-mail, etc. and are expected to know it. I had to learn from a co-worker.
- When will we have access to storage space on the server? It seems we have had almost no training.
- Privacy on First Class and WWW who has access to "spy".
- Back systems in case technology goes down.
- Furture training and availability.
- Time to use and learn the network
- Internet training is needed
- I would like to know more about it.
- I am looking forward to the training and working with it.
- Will web sites be used to replace real, active, hands-on learning?
- Will we have time to explore what's out there?
- I want to be able to e-mail people who work outside of the district, state, country, etc. How? When?
- We need more training and troubleshooting.
- Not enough space on my hard drive.
- I need access to a printer!
- I just need time to get on the computer! I share 1 computer with 3 adults and all the students I work with.
- Why does netscape crash my computer? Why does downloading Internet files mess up my computer?
- I would like to know about full class procedures in using networking as well as more about personal use. How are students to have access with 1 computer and 20 students?

- How can I get on the net with such limited time?
- Security of e-mail. Internet training.
- It will only get better - my concerns are not having the hardware or software to use it.
- Why did we not get a booklet or more information other than 15 minutes one day!
- I need to have more practice and instruction on the WWW. I have gotten a lot of advertising and not much information even though I have spent quite a bit of timelooking.
- More need for guidance in WWW.
- I am concerned about confidentiality. I understand some administrators have the power to over-ride a user's password. Is this an invasion of privacy?
- Future funding? Technology changes in the future.
- Problems with freezing up of computer.
- Just interested in more training next year (1996-1997).
- I am not very well versed, but I think with practice and a little guidance I will be OK.
- My biggest concern is having enough "play" time so teachers can familiarize themselves to what's out there and how to use it to benefit kids.
- How can I use it more effectively at my level? How will I monitor where a child goes on the WWW?
- I am worried about the students getting inappropriate information.
- We need more inservice.
- Forcing the use of the Internet when not appropriate or bst metho jest to justify its use or cost.
- Internet is so time consuming and sites change sot faxst. On minute it is there and then it's gone. It is so unpredictable and there seems to be so much garbage.
- Staff training on use of WWW. Will there be any? How much? Extra duties because of First Class. Easier for administrators to tell you to do something without seeing you to tell you about it.
- I need more training in the WWW. I don't even know how to get on it.
- I would like further staff development.
- When do the students use it? Don't the students still need to use and develop communication and cooperation in groups?
- Will we have any lengthy workshops before school starts?

- We were just hooked up last week! Time for training and practice.
- Would like to access Internet for Information easier.
- How can 30 students use 1 computer for seeking infor on the net?
- I need more instructions as far as addresses on the internet.
- Need more time to become familiar with WWW.
- I need more help on how to access the internet.
- Concerns: Lack of printed material on First Class - manuals, handbooks, etc. What plans are in place to get students (independent users) Internet access? When will this plan be shared?
- Will we have access from home to school? Privacy of my e-mail?

In what ways have you used the Internet? In what ways are you incorporating local area networking and wide area networking into your classroom instruction?

- Our LAN should do more than FIRST Class - I want to explore those possiblities such as using the LAN to serve CD-Roms.
- First Class - mass mailings to the technology staff development in each building
- Internet - work on district home page.
- Looked up Mexico for a class.
- Looked up childrens' literature.
- The encyclopdias are used to look up things in room by students.
- School mail
- I use First Class for interschool communication. I use Internet to do current research on Mexico for a group investigation.
- I am strictly using First Class as teacher communication at this time.
- E-mail
- I wuse the internet at home to speak to other teachers and to research information. I haven't had much time to do that here at school because we were just hooked up two days ago.
- My students have sent e-mail once.
- I haven't had time to yet since we were just hooked up.

- I use the lan for faculty communications such as meeting messages, curriculum information transfer.
- email
- I haven't used internet yet.
- I have used First Class to communicate with administration and staff.
- I communicate with staff
- I communciat with other staff on First Class. I check stocks and airline fares on the WWW.
- it's only been up for about 2 days, so I just showed my class some spossibilites.
- To communicate with teachers in my building, district, state to send and receive information with others. Students are communicating wiht others. Students are sending written peices tolocal newsletter.
- Teaching kids ot use e-mail to send messages to office and keds in other rooms.
- Sending messages for communication purposes. Exploration for wasrs information.
- First class- bulingin and district memos
- teacm communcation.
- sending students' memos to office
- Firstclass-communicate with teachers in my building and other buildings
- Communcate with other teachersin my building and with others in district.
- Communcatie with staffmembers between buildings. Find out about building and district information and opportunities.
- Using mostly for commounication with teachers. Communicated with on student.
- I am comfortable with lan.
- Communication of same grade lelvel teaher for curricular purposes. Networking among committee members for a district initiative.
- Question-answer to building office.
- Sharing curricular ideas from building to building.
- Gaining information on spedific subjects.
- Writing to sources to gain access for further investigation.
- To communicate with peers. Locate information. The internet is a great wayu to utilize various sources.

- We are not yet connected to internt at least my terminal isn't.
- Research for group investigation. Math activities.
- To find activities and articles for student's reserach. To find materials for classroom acitivities. Finding activities for students finding articles, information, pictures for students' reserarch.
- Communication with other buildings.
- setting up and saving attachments to file.
- Research and email.
- Research for class work and ideas.
- Intra and Inter school messages. Research. Class research and Individual research.
- Hven't used internet. Firstclass to communicate between buildings.
- Sending messages to staff here and in other buildings.
- Findout student progress in other areas and update on meetings.
- Talked about Dr. Math.
- Communicating with peers.
- Communication with other buildings News info for the whole school.
- Program updates and data collection.
- We are not hooked up so I have not used it . I have not had the training.
- I have not used it. Some students have used intenet for my projects, but not in my classroom.
- We have only had Internet access twol weeks. I have not even attemptedit. I look forward to working with it in the fall. I am sure it will be addictive.
- I use it for communication! I hope we will be able to communicate with other schools soon.
- Conference with others in special education. To communicate with people who are hrd to contact for example, AEA staff.
- Helps me monitore IEP goals when students have integrated classes. Hant used the internet at this tiem not commected until recently.
- To check sports infromation to check on active games.
- Communication.

- First Class- providing student information to counselors and teachers.

- Responding to inquiries. I have not had any training on the internet.

- I use local area networking two to three times a day for messages. I am just learing to use the Internet.

- E-mail and surfing the net.
- Rainforest explorations.

- WWW-looked at Luke Havesu wetlands project. Sent messages to my daughter. First Class-local area networking-shared duty schedule with Kindergarten teachers.
- Sent messages to a child's mother. Used information from the principal.. Previewed a child's trip to California. Check out Area Education Agency resources.

- E-mail within my building. E-mail outside of my building. I am not using it with my students at this time. We just got on-line.

- Giving and receiving information. Communication with others. The other counselors and I are better able to communicate so our content of curriculum is more consisitent. Planning is easier.

- Experiemental and sending messages.

- I sent a survey to all district employees on First Class(LAN) with an attached form to be returned to me. Computer similation games-ICONS class. AOL presentation on geneology.

- Research for a disease study in class- we contacted the CDC in Atlanta. E-mail to discuss particular problems/solutions with other teachers.

- We have not been up long enough to allow my students to work on it.

- Checking on students' progress with other classroom teachers. I now have more up to date progress infromation so I can work more efficiently with problems the student is having. Setting up meetings with others.

- E-mail, Research for a travel project. We have only had WWW for one week, not enough time to incorporate it this year.

- Contact other teachers for advice. Contact guidance office for student reports. I have not used it in my class directly, but I have used it to prepare for class activities. Researched newspaper links and yearbook links.

- One on one business with other teachers and district administration.

- E-mail messages, sending papers to committee members for proofing.

- Staff communications. Volcanic and EQ data collection.

- Elimination of paper. Increased communication/ memorandums. Immediate notice and immediate communication. I will join bulletin boards of administrators.

- Reviewing references resources and sources of inforamtion. Communication to other staff on grades, student progress, or schedules. References to information. Teaching serach techniques. Discussions of technology with students.

- Mainly communicating with other staff members. Internet: class planned a vacation and used Internet to find out about various cities.

- I have helped many students with their assignments in Supreme Court Classes and Geneology. I use the e-mail personally. I sent materials to an elelmentary for a student project. I have helped students to e-mail to Russia for 2 years. In the media center I have helped sutdents on a regular basis and have trained teachers.

- Communication, student information. Hyperstudio and Power Point.

- E-mail and message sending.

- sending messages to staff in other buildings and tour of the white house

- E-mail and netscape.

- I have used First Class (LAN) to communicate with staff members in my building and with teachers in other building in our district. I have used the Internet to locate information for my students. I have gotten ideas to use in academic subject areas from other grade level teachers. Students who have parents on our First Classs have e-mailed messages to each other. I've instructed these students on how to do this. I have given a class demonstration on information about Australia found on the internet. I have gained information that I've shared with my students.

- Sent grades to principal. Communicated with people inother buildings easily.

- Contact with teachers and administrators at other buildings. Speedy response is great!
- Explored a club promoting the music of Clara Schumann. I would have loved to share this with my music classes, but not enough time this school year.

- Sending and receiving messages, documents and infromation.

- Staff notes, sending files.

- Personal and professional messages. Looking up resources on the Internet.

- Haven't used Internet yet. Daily mail, sending messages, adding attachments. Not using it in instruction with Kindergarten kids just using to communicate with other staff members.

- Communicating with co-workers. Sending messages to teachers in other building. I would like to do a pen-pal thing with another school. Browsing for information, virtual field trips. Shared facts about other countries and took themn on a virtual fiel trip of Hawaii.

- Internet-exploration only. First Class (LAN) - senidn messages both building and district, sending and retrieving documents, chats, graphics in messages, other special types of messages in menu. The new language arts curriculum has travelled quite a bit over LAN. Also our group investigation team documents has been shared over the LAN.

- To communicate with others and to find out information. Only as a mean of showing them how we can communicate with others and respond.

- Communication within building. Sending attachments districtwide.

- I have used First Class for the Kindergarten meeting survey and to communicate with others.

- E-mail to other staff, chat line, news and mail from administration.

- I have sent messages to Jensen. I have sent in a repair order.

- Sending mail faster and quicker. I have used private chats. Two of my students sent thank yous to Marjean Wagner after she sent copies of newspapers from the High School for their research.

- I have used Internet on home computer to communicate with other teachers and friends and relatives. First Class - e-mail only.

- First Class - sending and receiveing messgates reading news. Internet - exploring and letting students use educational games. Communicating with teachers - I'm not sure how First Class could be used in instruction.

- Sending messages to others. Asking info of others to arrange meetings quickly.

- Just on-line, no time to use it.

- Internet - I ahve explored educational sites to see what resources are available to teachers, ie: pathways. First Class - communicating with colleagues across district. Communicating with another classroom on what they have done on a topic.

- Communication and fun. Lesson plans.

- Communication with others. Group study and individual assignments.

- Communiation with others.

- First Class - to reserve a room for a meeting and to communicate with others in the district instead of inner school mail.

- Communication wihtin and between buildings.

- I have sent messages to inform them of class activities. I have sent pictures to teachers and principal on First Class. I have allowed students to use First Class to send important messages to Administration Office.

- For my currencey unit, I get the exchange rate from the Internet so it is more extensive and recent.

- E-mail.

- Communication with others in the district on First Class. Have not used the Internet much because I couldn't get on. Haven't found materials to use in P.E. class yet, but I have looked for information. Lines were busy.

- Innerschool memos.

- In between building communiation, inside building communications.

- Messages to toehr building and within building.

- Communication among department. Bouncing off ideas.

- WWW - tried to find answer to computer problem at home. Used FAQ. First Class communitions with staff.

- Exploration and communication.

- Contact other teachers and administrators.

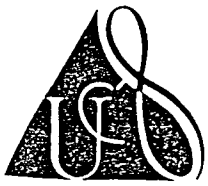
- Sent messages to another teacher. Used history to make sure they recieved it.

- Locate materials and resources fot students. Communicate with peers. Exchange e-mail with other countries. Locate bibliographies for staff.

- To correspond with the building and Administrative Office.

- To communicate with colleagues and students. Pen pals, shareware, lesson plans, free net.

APPENDIX D.
DOCUMENTATION OF APPROVAL OF STUDY FROM THE IOWA PUBLIC SCHOOL DISTRICT



URBANDALE COMMUNITY SCHOOL DISTRICT

June 3, 1996

Patty Sereg
Olmsted Elementary
Urbandale Community School District
Merle Hay Centre, Suite 500 West
6200 Aurora Avenue
Urbandale, Iowa 50322

Dear Patty:

The Urbandale Community School District looks forward to your surveying our district's teachers regarding technology. If I can be of any assistance, please contact me at 253-2300.

Again, best wishes with this project. Your results will be very helpful as we continue to make plans for our implementation of a quality technology program that achieves higher learning for our students.

Sincerely,

Lou Howell
Associate Superintendent

APPENDIX E.
HUMAN SUBJECTS APPROVAL

Last Name of Principal Investigator Seneg

ecklist for Attachments and Time Schedule

e following are attached (please check):

- [X] Letter or written statement to subjects indicating clearly:
  - a) purpose of the research
  - b) the use of any identifier codes (names, #'s), how they will be used, and when they will be removed (see Item 17)
  - c) an estimate of time needed for participation in the research and the place
  - d) if applicable, location of the research activity
  - e) how you will ensure confidentiality
  - f) in a longitudinal study, note when and how you will contact subjects later
  - g) participation is voluntary; nonparticipation will not affect evaluations of the subject
- [ ] Consent form (if applicable)
- [X] Letter of approval for research from cooperating organizations or institutions (if applicable)
- [X] Data-gathering instruments

6. Anticipated dates for contact with subjects:

First Contact	Last Contact
May 31, 1996	October 10, 1996
Month / Day / Year	Month / Day / Year

7. If applicable: anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased:

June 10, 1996
Month / Day / Year

8. Signature of Departmental Executive Officer | Date | Department or Administrative Unit

5-28-96 | Cur & Inst.

9. Decision of the University Human Subjects Review Committee:

X Project Approved ___ Project Not Approved ___ No Action Required

Patricia M. Keith | 6-10-96 | Signature of Committee Chairperson

Name of Committee Chairperson | Date

REFERENCES

Abernathy, W.J., & Uterback, J.M. (1978). Patterns of industrial innovation. Technology Review , 80 40-47.

Buenz, T. (1996, Spring). Technology bill signed by governor! The Interface, 1-3.

Comer, D. (1983). The computer science research network CSNET: a history and status report. Communications of the ACM, 26, 747-753.

Descy, D.E. (1993) All aboard the Internet. Tech Trends, 38 (1), 29-34.

Dyck, J.L., & Smither, J.A. (1994). Age differences in computer anxiety: the role of computer experience, gender and education. Journal of Educational Computing Research, 10(3), 239-248.

Foa, L., Schwab, R.L., & Johnson, M. (1996, May 1). Upgrading school technology: supporting the zealots and other pointers for entering a strange new land. Education Week.

Fogarty, T.A., (1996, April 3). School technology fund OK'd. The Des Moines Register, Metro, p. 5.

Fraenkel, J.R., & Wallen, N.E. (1993). How to design and evaluate research in education. New York: McGraw-Hill.

Frazier, G.G., & Frazier, D. (1994). Telecommunications and education: surfing and the art of change. Alexandria, VA: The National School Boards Association.

Freitag, E.T., & Sullivan, H.J. (1995). Matching learner preferences to amount of instruction: an alternative form of learner control. Educational Technology Research and Development, 43(2), 5-14.

Fulcer, R.E., & Schofield, J.W. (1995). Wide-Area Networking in K-12 education: issues shaping implementation and use. Computers in Education, 24(3), 221-220.

Fullan, M & Pomfret, A. (1977). Research on curriculum instruction and implementation. Review of Education Research. 47(2), 335-397.

Gallo, M.A. & Horton, P.B. (1994). Assessing the effect on high school teachers of direct and unrestricted access to the Internet: a case study of an east central Florida high school. Educational Technology Research and Development, 42(4), 17-39.

Goldsmith, R.E. & Nuegent, N. (1984). Innovativeness and cognitive complexity: a second look. Psychological Reports, 55, 439-445.

Granovetter, M. (1978). Threshold models of collective behavior. American Journal of Sociology. 83, 1420-1443.

Gurbaxani,V. (1990) Diffusion in computing networks: the case of bitnet. Communications of the ACM. 33(12), 65-75.

Hall, G.E.& George, A.A., (1980). Stages of concern about the innovation: the concept initial verification and some implications. (R&D report 3065). Austin, Texas: University of Texas, Research and Development Center for Teacher Education.

Hall, G.E., Hord, S.M., & Griffin, T.H. (1980). Implementation at the school building level: the development and analysis of nine mini-case studies. Research on Concerns-Based Adoption. (R&D report no. 3098). Austin, Texas: University of Texas, Research and Development Center for Teacher Education. Paper presented at the annual meeting of the American Educational Research Association, Boston, MA. .

Harris, J. (1995). Mining the Internet. The Computing Teacher, 22, 6 [Online].

Henersen, M.E., Morris, L.L., & Fitz-Gibbon, C.T. (1987). How to Measure Attitudes. Beverly Hills, CA: Sage Publications.

Hill, J.A. & Misic, M. M. (1996). Why you should establish a connection to the Internet. Tech Trends, 41, 2 pp.10-16.

Honey, M. & Henriquez, A. (1993). Telecommunications and K-12 educators: findings from a national survey. New York, New York: Center for Technology in Education. (ERIC Document Reproduction Service No. ED 359 923).

Hurt, H.T., Joseph, K. & Cook, C.D., (1977) Scales for the measurement of innovativeness, Human Communications Research, 4(1), 58-65.

Hurt, H.T. & Teigen, C.W. (1977). The development of a measurement of perceived organizational innovativeness. Communication Yearbook I, 377-385.

Iowa Schools Technology Bill, Senate File 2063, Seventy-sixth General Assembly. (1996).

Jacoby, J. (1971, May). Personality and innovation proneness. Journal of Marketing Research, Vol. VIII, 244-247.

Johnson, D. (1991). The future of electronic educational networks: some ethical issues. New York, New York: Center for Technology in Education. (ERIC Document Reproduction Service No. ED 332 689)

Kinzie, M.B., Larsen, V.A., Burch, J.B., & Baker, S.M. (1996). Frog dissection via the World Wide Web: implications for widespread delivery of instruction. Educational Technology Research and Development, 44(2), 59-69.

Kirton, M. (1976). Adaptors and innovators: a description and measure. Journal of Applied Psychology, 61(5), 622-629.

Krol, E. (1992). The Whole Internet User's Guide and Catalog. Sebastopol, California: O'Reilly and Associates.

Lowry, M., Koneman, P., Osman-Jouchoux, R., & Wilson, B. (1994). Electronic discussion groups: using e-mail as an instructional strategy. Tech Trends, 39(2), 22-24.

Markus, A.A. (1987). Toward a critical mass theory of interactive media: universal access, interdependence and diffusion. Communication Research, 14, 491-511.

Mathies, B.K. & Nelson, B.(1995). A network named desire. Tech Trends, 40(1), 20-23.

McCredie, J.W., (1984). BITNET's changing role in higher education. Educom, 19 (2), 2-11.

National Center for Educational Statistics, 1991. Digest of Educational Statistics. Washington D.C.: Department of Education, Office of Research and Improvement.

National Science Foundation, 1980. Second Annual Science and Technology Report. Washington, D.C.: Government Printing Agency:

National Coordinating Committee on Technology in Education and Training, (1994). The national information infrastructure: requirements for education and training. Tech Trends, 39(4), 32-34.

Newman, D., (1989). Formative experiments on technologies that change the organization of instruction. Paper presented at the meeting of the American Educational Research Association, San Francisco, CA.

Perkins-Rude, C., Baugh, I., & Petrouski, J.M., Jr. (1993) Teacher type and technology training. Computers In Schools, 9(2/3), 45-53.

Riel, M.M., (1986). The educational potential of computer networking, (Report no. 16). Paper presented at the meeting of the American Educational Research Association, San Francisco, CA.

Robinson, K.L. (1996). People talking to people: making the most of Internet discussion groups. Online, 20(1), 27-32.

Rogers, E.M. (1995). Diffusion of Innovations. (4th ed.) New York: Free Press.

Rogers, E.M. (1973). Communication Strategies for Family Planning. New York: Free Press.

Rogers, E. M. & Kincaid, D.L. (1981). Communications Networks: Toward a New Paradigm for Research. New York: Free Press

Schaefermeyer, M.J., & Sewell, E.H., Jr., (1988). Communication by electronic mail. American Behavioral Scientist 32 (2), 112-123.

Schrum, L. (1995). Educators and the internet: a case study of professional development. Computers in Education ,24(3), 221-228.

Simonson, M.R. & Volker, R. (1984). Media Planning and Production, Columbus, OH:Merrill.

U. S. Department of Education. (1996). Survey on Advanced Telecommunications in U.S. Public Elementary and Secondary Schools 1995, (NCES 96-854). Washington, D.C.: U.S. Department of Education National Center For Education Statistics.

Wangen, N. (1982). The relationship of receptivity to change to personal characteristics and organizational perceptions of teachers in small schools. Paper presented to the American Educational Research Association, New York City, N.Y.

Williams, F.R., Rice, R.E. & Rogers, E.M. (1988). Research Methods and the New Media. New York: Free Press.

ACKNOWLEDGEMENTS

I would to thank my major professor and friend, Dr. Michael R. Simonson, for his enthusiasm, ideas, and effort. With his support, I was able to accomplish my goal. He put forth many extra steps and extra energy for me.

I would like to thank the other members of my Program of Study Committee, Dr. Constance P. Hargrave and Dr. Joan Herwig, for their interests, suggestions, and support.

I would also like to express my gratitude to the educators in the Iowa public school district who took the time and effort to complete the survey instruments, without their help my investigation would not have been possible.

Finally, and mostly, I would like to thank my best friends, my family, for their love, understanding, and encouragement. They continued to show faith in my work and my effort.