MICHIGAN STATE UNIVERSITY EXTENSION EDUCATORS' PERCEPTIONS OF THE USE OF DIGITAL TECHNOLOGY IN THEIR WORK

By

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ABSTRACT

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This research study examined Michigan State University Extension educators' perceptions of the use of digital technology in their work. It used a mixed method of research which included a mailed survey and interviews of selected respondents. A census survey using Dillman's Total Design method was sent to 290 field staff of Michigan State University Extension. Of these, 272 completed and returned the survey instrument for a 94% rate of return. Semi structured interviews were conducted with 15 of the respondents to provide in-depth qualitative data to enrich the understanding of the issues for the researcher. The mailed survey instrument was examined for validity by a panel of experts and pilot tested on scale items to assess reliability. The mailed survey included questions on access to technology both at work and at home, preparation for the use of technology, actual use of technology, usefulness and ease of use, confidence and comfort in use and general and technical support for the use of technology. Low, medium and high total use respondent were compared and analyzed. Results show that although Extension Educators consider themselves to be well prepared to use technology and said it was highly useful to them in their work, most use of technology was limited to e-mail, word processing, file attachments and cell phones. Only a small minority use web technology, wikis or had published educational materials on a website or the MSUE

portal. Staff sometimes furnished their own digital technology tools if they thought they were highly useful. Barriers to use of newer technologies were sited as lack of access, lack of support, lack of time to learn new technologies. Low users sometimes said they would only use technology if it was required and they preferred one-on-one tutoring to learn how to use technology. Low users recognized that they were themselves a barrier to the use of technology. Medium users said clientele preferred face-to-face education and would not use technology. They often viewed technology as "somebody else's problem". High users were the only group to use web based digital technology and they were able to integrate the three spheres of Mishra and Koehler's TPACK model of technology use; expertise in technology, pedagogy and content. High users were more apt to be self taught, client oriented and to have a grasp of the affordances of various technology applications. They preferred advanced classes on web page design, as well as photo and video editing and production. Recommendations were to provide local and regional training which includes practical ways to use technology to enhance programming, identify regional sources of support, integrate technology use into the MSUC culture and encourage the use of technology by highlighting creative solutions to use and providing opportunities for playful use. Better access must be provided and technology support should be easily accessible. Further research recommendations include case studies of individual counties, case studies of high users, research on difference by programming area and the development of documented technology solution to programming needs which could be accessed by educators looking for ideas.

This dissertation is dedicated to my father,

H. Charles Scott,

who knew I would pursue my doctorate

before I did but didn't live to see it happen,

and my dear sister,

Alison,

who passed away the day before I defended.

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CHAPTER I

INTRODUCTION TO THE STUDY

This study sought to understand the use of digital technologies by Michigan State University Extension educators in their work. The section that follows provides a historical context for this study and ends with a set of key issues that needed to be studied and a chapter-by-chapter guide for the dissertation that follows.

Background

The Cooperative Extension Service (CES) is a publicly funded, nonformal educational outreach system of the land-grant universities. The CES had its beginning in the late 19th century when the United States was an agricultural society. The agricultural colleges (precursors of the land-grant universities) carried out their mission of bringing education to the people in farming communities through demonstrations, as introduced by Seaman Knapp. Knapp later drafted the bill that became the Hatch Act, which created agricultural experiment stations. Within 2 decades the Smith-Lever Act of 1914 was passed, formalizing the CES. The new CES mission as worded in the Smith-Lever Act was to "aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics and to encourage the application of the same" ("Smith Lever as Amended in 1962," 1914). Extension educators (at that time called Extension agents) traveled to farms to teach farmers to use new techniques, knowledge, and concepts of modern agriculture and research-based science. Early Extension education was offered by agents during farm and home visits and small-group meetings at which new techniques were demonstrated to farmers, homemakers, and youths (Seevers, Graham, Gamon, & Conklin, 1997). As the years

progressed, various technologies were introduced slowly to Extension programming, in much the same way technology was used in public schools (Cuban, 1986). Telephone, radio, and television were early technologies adopted to one degree or another, but the mainstay of Extension continued to be farm and home visits and small-group presentations.

Today the United States no longer is an agricultural society, but Extension is still a major delivery system for the land-grant universities. In today's world, changing life styles have affected the way Extension does business and the content of their programming, although the mission remains similar to the original. Almost a century after the Smith-Lever Act was passed, the mission of Extension, as defined by the Extension Committee on Organization and Policy in 1995, is "to enable people to improve their lives and communities through learning partnerships that put knowledge to work" (Anderson et al., 1995).

In 1999 a commission funded by the W. K. Kellogg Foundation was created by the National Association of State Universities and Land-Grant Colleges (NASULGC) to help define the direction public universities should go in the future and to recommend an action agenda to hasten the process of change. The commission was charged not only with defining and bringing to public attention the kinds of changes occurring at land-grant universities today, but also with analyzing necessary reforms and suggesting ways to accomplish them and monitor the results. The commission adopted a concept of lifelong learning that they defined as a "learning society." This learning society calls upon land-grant universities to help citizens extend their knowledge, understanding, and skills through access to continuous learning, distance education, and asynchronous

education with the use of technology (W. K. Kellogg Commission, 1999). The commission also called upon land-grant universities to invest in technology and education for their faculty (which includes CES educators). Smith and Kelley (1997) wrote that in a learning society the role of Extension educators is no longer one of traveling to farms and homes to demonstrate new techniques, but rather, Extension educators will produce educational products and work in an information-rich marketplace. Therefore, they will need new skills and competencies to succeed.

Trying to respond to growing demands from clientele with a smaller workforce, and needing to become a more flexible and responsive "learning society," Extension administrators in many states have made investments in information-technology hardware and have looked for new ways to organize staff to facilitate communication and the diffusion of research-based information. Extension administrators also have struggled with ways to use information technology to help a restructured CES deal with staff reduction and increased demand for education in a world where information is exploding. Harriman and Daugherty (1992) explained that the computer had transformed education as radically as the printing process once did. They said Extension publications may become an archaic method of delivering information. They went on to promote the benefits of satellite technology, which they said could bring national experts to local communities at little cost, and suggested that telecommunication networks will be the future of Extension. This prediction has proven to be close but not completely on target. Over the past 20 years, in Michigan, major investments in technology hardware to support the move toward becoming a learning society have been in satellite-dish communications and later video desktop conferencing for county offices. Unfortunately,

the fate of these two technologies has been similar to that of similar technologies in the classroom, as described by Cuban, Kirkpatrick, and Peck (2001). That is, they were used far less than expected and eventually were replaced with newer information technologies such as computers and websites.

In 1986, from a national perspective, Extension professionals held the first annual conference dedicated to the use of information technology in Extension, which they called the Extension Instructional Technology Conference. The conference was held in Blacksburg, Virginia, at the Donald Brown Center for Continuing Education; 53 Extension professionals attended. This might be called the first attempt to acknowledge information technology as a key component in Extension delivery systems. Then, in September 2001, the Extension Committee on Organizational Policy (ECOP) created a regional taskforce that developed a workshop on an Extension vision for the southern states. A year later, a national committee appointed by ECOP recommended a national information technology network, which resulted in a draft of a plan they called "eXtension." In 2003, the Cooperative State Research, Education and Extension Service (CSREES) sponsored regional meetings of Extension professionals working with information technology, and the National Extension Directors and Administrators endorsed the concept. Start-up funding was provided beginning in 2004, and Dan Cotton was hired as the first eXtension director. (http://about.extension.org/about/history/) This initiative began with the networking of the (ECOP), NASULGC, and CSREES to further develop a prototype of this electronic concept of Extension, which they called eXtension. The prototype is a website that demonstrates how content could be developed (Initiative, 2006) collaboratively and then, using metadata tagging, could be made easily searchable.

Then with branding elements provided by partner institutions, it could be localized and personalized into a user-friendly portal instance.

In this prototype, the use of wikis (simple, collaborative websites) is combined with the concept of communities of practice, which will be created and then will work to develop the content. In addition, the eXtension system launched a Frequently Asked Questions (FAQ) initiative to collect, sort, and publish questions and answers submitted by Extension educators. As of December 2005, more than 1,000 individuals had registered and more than 3,100 FAQs had been submitted (Initiative, 2006). Closer to home, in 2005, Michigan CES launched a web portal that can be used to share files, communicate via streaming video conferencing, and publish articles and other documents such as slide shows. A portal system might offer many opportunities for growth of the organization, but educators must be able to use it efficiently to maximize the return on the investment (Reese, Straus, & Murray, 2005).

At both the federal level and in individual states, there are challenges, including providing technical training and technical support and motivating educators to accept new and innovative ways to use the systems to deliver or augment Extension programming. These educators must perceive information technology as useful to their work and find it easy to use such technology to accomplish their goals. Whereas, historically, information technology was used in Extension to transmit knowledge, in the future Extension must become a learning organization (Senge, 2000) in order to survive and thrive. A learning organization is one in which people continually expand their capacity to create the results they truly desire, new and expansive patterns of thinking are nurtured, collective aspiration is set free, and people continuously learn how to learn

together. The disciplines of a learning organization include systems thinking, personal mastery, mental models, shared-vision building, and team learning.

As Extension educators make the shift from transmitting knowledge to clientele to being part of a learning organization, they will become facilitators of learning communities (Wenger, White, Smith, & Rowe, 2005). Learning communities are communities of practice in which groups of people have a shared interest in a particular topic (i.e., dairy farmers in West Michigan), a passion for the topic (such as improving herd health), a desire to deepen their knowledge and expertise on the subject, and frequent interaction with each other on an ongoing basis.

The Cooperative State Research, Education and Extension Service (CREES) defines a community of practice as a virtual network of subject-matter-content providers consisting of faculty, professional and paraprofessional staff, county educators, industry experts, clientele, and government agency representatives who share knowledge or competence in a specific content area and are willing to work and learn together over a period of time to develop and share that knowledge in the forms of educational products and programs. They list specific functions of a community of practice as including:

- Helping meet the knowledge needs of their respective communities of interest or clientele.
- Stewardship of the available knowledge for their specific content area, including revisions, updates, and maintenance.
- Best-practice development of educational products and programs.
- On-going engagement with their corresponding community of interest.
- Innovation in content-area knowledge and delivery.

Statement of the Problem

Early technologies that were used by Extension educators often were easy to use and therefore transparent to the educators. However, today's new, more complex information technologies are not as transparent and require a new and changing skill set to use them effectively. Information technology has created a new workplace that requires a skilled workforce that is not only technologically literate but also fluent. With the explosion of information technology and especially the Internet and easy access to information, CES faces increasing competition and must become a more customer-driven, cost-effective, and flexible organization that is agile and responsive to consumers' expectations. Information technology today offers the potential for distance learning through asynchronous and synchronous interactions and publishing and document-sharing options such as web publishing and file sharing. Today's Extension educators must not only be knowledgeable about content and learning theory, but they must also be expert facilitators of learning through the use of information technologies. In order to use information technology effectively, they will need support of the organization as well as opportunities for professional development, which can best be provided if the CES leadership understands beliefs, attitudes, knowledge, and understanding of and about information technology and how technology can be used to create a more effective learning environment.

Purpose of the Study

The researcher's purpose in undertaking this study was to understand Michigan Extension educators' perceptions of the usefulness of information technology in accomplishing their goals as educators, as well as their perceptions of the ease of use of

the information technologies that they choose to use and are required to use. The researcher also was interested in learning how these perceptions influenced their intention to use information technology, their actual use of information technology, and their need for support and training in the use of information technology.

Research Objectives

To accomplish the study purpose, the specific research objectives were:

1. To describe the following demographic characteristics of Michigan State University Extension (MSUE) educators: gender, age, years of work experience with MSUE, major program assignment, position held in the organization, geographic area of coverage of responsibilities, and highest level of education attained.
2. To identify and describe perceptions of MSUE educators regarding:
    a. the **usefulness** of information technology in their work.
    b. the **ease of use** of information technology in their work.
3. To identify and describe the technologies that MSUE educators have available for their work.
4. To identify and describe the perceptions of MSUE educators regarding:
    a. their preparedness for using technology in their work.
    b. their behavioral intention to use information technology in their work.
    c. their actual use of information technology in their work.
5. To identify and describe the perceptions of MSUE educators regarding:
    a. the general support of their use of technology for programming by MSUE.

b. the technical support they receive.

6. To identify and describe the perceptions of MSUE educators regarding their need for training and professional development in the use of information technology in their work.
7. To analyze information obtained about MSUE educators in order to facilitate:
   a. the design and planning of in-service training in information technology.
   b. the support of Extension educators in their use of information technology.

Definition of Terms

The following terms are defined in the context in which they are used in this dissertation.

Behavioral intention: The intention to use a target information technology in the future.

Communication technology: Digital information technology for communication, including but not limited to cell phones, e-mail, and instant messaging.

Digital technologies: Information technologies that use digital coding to store, transfer, or share large amounts of information, such as cell phones, computers, and the Internet.

Extension educator: Academic board appointed field staff of MSUE, including County Extension Directors, District Extension educators, and County Extension educators.

Information technology: The study, design, development, usage, implementation, support, or management of digital-based information systems.

Internet technologies: Digital information technology for websites, blogs, portals, and wikis.

Perceived ease of use: The degree to which a user expects the targeted information technology to be free of effort.

Perceived usefulness: A user's subjective view of the probability that using a specific information technology will increase his or her job performance within an organizational context.

Presentation technology: Digital information technology for making presentations, including PowerPoint presentations.

Organization of the Study

This dissertation is organized into seven chapters. Chapter I included an introduction to the problem under investigation, as well as an explanation of the research objectives and definitions of key terms. A review of the applicable literature is the focus of Chapter II. The research methodology and data-analysis methods are explained in Chapter III. Results of the study are presented in Chapters IV and V, whereas discussion of the results is presented in Chapter VI and conclusions drawn from the study findings and recommendations for further study are set forth in Chapter VII.

CHAPTER II

REVIEW OF LITERATURE AND RESEARCH

This literature review is divided into five sections. It begins by examining organizations and how new, digital information technologies have affected them. This information will help explain the changes in organizations in today's fast-paced, information-driven global economy and how information technology is influencing them. Here the researcher examines three specific types of information technologies that affect learning organizations: synchronous learning, asynchronous learning, and publishing. The next section covers theories of technology diffusion and its relationship to the adoption and use of information technology in organizations. The third section is a review of literature on human behavior, attitudes, and intentions relevant to the acceptance of information technology, including the social science Theory of Reasoned Action and the related Technology Acceptance Model. This is followed by an examination of information technology specific to education, particularly the historical use of information technology in education, how educators have used information technology, and why educators use or do not use such technology. Included is a discussion of research on the use of information technology by classroom teachers, university professors, and Extension educators. This is followed by a review of the research on who uses information technology and why they do so, as well as their perceptions, attitudes, beliefs, and experiences related to that technology. In the final section of Chapter II is an examination of literature on learning theory and professional-development needs and how this relates to information-technology support in educational organizations. The final section also examines the model of Technological Pedagogical

and Content Knowledge (TPACK) and how this may help us understand more about the needs of educators, as well as their understandings and beliefs about the usefulness of information technology in their work.

Organizations and Information Technology

Organizations today face fierce competition, unprecedented rates of change, and new challenges to become more flexible and agile so that they can continue to thrive. Part of that change is being driven by developments and improvements in the use of information technology made possible through computers. In 1965, semi-conductor pioneer Gordon Moore predicted that microchip density would double every 2 years, resulting in a corresponding increase in the speed and power of computers (Gleick, 1999). The storage capacity of computers has been increasing at an even faster rate, doubling every 13 months (Walter, 2005). Rapid and relentless change means that new products, markets, and even companies appear, change, and sometimes disappear in shorter and shorter periods of time. Much of this change is fueled by computer power that is now linked with access to knowledge and information available through the Internet, which was used by an estimated 1.5 billion people in 2008.

Knowledge has become the central focus of the new global economy. In this competitive world, organizations are seeking new ways to redefine their structures and incorporate information technology for the dissemination of knowledge. This is especially important for knowledge organizations such as the CES, whose goal is to provide education that can transform lives and whose product is research-based information. High-performing organizations require that knowledge and information no longer be limited to upper management or the top of a hierarchical structure. Knowledge

must be available and spread widely across a flattened organizational structure that allows for employees who are skilled in sharing, collaborating, and managing resources and who have access to information they use for the purpose of carrying out the organization's mission.

Agile organizations aggressively embrace change and use technology to help them be more responsive to their customers. "Agility is dependent on the initiative of people and on their skills, knowledge and access to information" (Goldman, Nagel, & Preiss, 1995). In this information age, it is technology that enables people to access information in new ways and more quickly than ever before so that organizations can become proactive in meeting their customers' needs.

Senge (2000) asserted that, in order for organizations to be competitive in the new millennium, they must become learning organizations "where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspirations are set free, and where people are continually learning how to learn together" (Senge, 2000). In a learning organization, information technology can be used to make learning more efficient and effective as knowledge is shared effortlessly across the organization. This, in turn, can result in more flexibility, agility, and responsiveness.

Information technologies in knowledge organizations can be divided into three major components in terms of the types of learning activities they support (Wenger et al., 2005). Extension services need to evaluate each of these in terms of their staff and clientele needs, for technology will be used only if it is useful, cost effective, easy to use, and widely available. Extension must examine these information technologies through

the lenses of social, cultural, and organizational issues in order to decide which technologies are best for a given situation. Furthermore, Extension must understand the affordances provided by technology in order to make the best use of it (McCrory, 2006). Some of the affordances of technology are representation, information, transformation, collaboration, and the ability to transcend time and space.

Synchronous educational interactions are those that occur in real time, much like television or radio news broadcasts. Information technologies that are synchronous include slide/video presentations, whiteboards, podcasts, chats, and instant messages. Publishing, which used to involve production of print media such as Extension bulletins or manuals, now includes electronic file sharing, object management, document repository, newsletters, and static web pages. Asynchronous interactions are archived and stored materials, including media such as CD-ROMs, web pages, emails, faxes, videotapes, LISTSERVEs, wikis, weblogs, RSS feeds, discussion boards, and downloadable information (such as SparkNotes) for hand-held digital media players.

Synchronous interactions are similar to many methods that were used in the past, but with enhanced technology. They can be useful in presenting complex technical information, and the Internet can provide access to information that might not otherwise be available to clientele with the use of hypertext links to additional sources of information to expand and enhance a presentation. Information technology also allows for excellent representation of such complex matters as the dissection of animals or identification of plants and insects.

Publishing is another technology that Extension has long used. Information technology, however, not only provides access to published information and the use of

search engines to sort, filter, and select such information. It also allows for quick and easy publication via web pages and electronic portfolios of staff. A web presence can enhance Extension educators' credibility with local stakeholders and foster institution-wide reflection, learning, and improvement. In this information-rich world, Extension educators must be able to provide accurate, research-based data quickly and easily to their clientele, who will go elsewhere if educators cannot deliver. Here the affordance is information. By publishing to the web, Extension positions itself as authorities and resources. New software for publishing fosters collaboration. For instance, using the newest version of Adobe Acrobat Reader, a writer can convert his or her original document into a pdf file and then send it to multiple people via e-mail, along with a way for them to download the latest version of Adobe. This will enable them to open the document and make comments right on the page, regardless of their operating system or software. The document can be returned to the writer via e-mail, and all of the readers' comments can be imported into one file for comparing and contrasting. This allows for collaboration among many writers who have varying levels of technology available to them.

Asynchronous interactions such as weblogs (blogs), wikis, RSS feeds (really simple syndication), discussion boards, and e-mail lists are perhaps the most powerful technologies with the most affordances, but so far they are the least likely to be used by Extension educators in their work. Weblogs or blogs are simple text-based web journals that allow anyone to post articles, news, views, and photographs. These user-friendly platforms are one of the fastest growing segments of the web in terms of public participation. Extension educators can use digital photographs and stories on blogs to

enhance their program delivery and make it easy to show a new product, field conditions, or how to use a particular piece of equipment while also allowing clientele to add comments, questions, and their own ideas and pictures. A wiki (the Hawaiian word for quick) is a simple, collaborative website. Every page can be edited by anyone, allowing for maximum flexibility. RSS allows users to syndicate news and the content of news-like sites, including major news sites like Wired, news-oriented community sites like Slashdot, and personal weblogs. Almost any web-published information that can be broken down into discrete items can be syndicated via RSS (for instance, the "recent changes" page of a wiki or even the revisionist history of a book or Extension bulletin). Some affordances provided to Extension clientele and staff by asynchronous technologies are the ability to learn in one's choice of location at one's own pace, quick and easy filtering of information via syndication in a format designed for the learner (such as "hot topics"), minutes of recent meetings available quickly afterwards, document check-out/version control, reminders, community calendars, news that is up to date and immediately available, and forums for discussion and reflection.

Because Extension educators of the future will be facilitators of learning who are creating communities of practice, we must understand how information technologies can support and enhance their activities. Extension educators will need information technology that helps communities of practice with tasks of interacting, publishing, and tending. Interacting entails discussing issues, brainstorming, and collaborating across time and space. Publishing must be simple and easy, with multiple repositories for pictures, text, and data. Tending means that community members need to be nourished and supported personally by creating both a community and an individual presence that

can be seen and felt. It is the responsibility of Extension educators and the entire organization to understand how information technology can enhance and support these tasks in pursuit of the mission of Extension now and in the future.

The Diffusion of Technology

Research on the diffusion of technology into society and organizations is not specific to information technology, but it serves as a useful model for purposes of studying the diffusion of information technology. The early study of Ryan and Gross (1943) in which they examined the adoption of hybrid seed corn by farmers in Iowa served as the beginning of research on technology diffusion. Although innovation-diffusion theory (Rogers, 2003) is used to illustrate how technology moves from invention to widespread use or nonuse, the characteristics that affect diffusion also can be used in examining acceptance or adoption of information technology within an organization (Carr, 1999).

Fichman (1992) reviewed 18 empirical studies on the diffusion of information technology. He found that five characteristics that affect diffusion are relative advantage, compatibility, complexity, trialability, and observability. Relative advantage is the extent to which a given information technology offers improvements over currently available tools. Compatibility is how consistent the information technology is with users' social practices and norms. Complexity is ease of use or learning the information technology. Trialability is the chance to try out an innovative information technology before making a commitment to its use. Observability is the extent to which a user can observe the information technology's outputs. In addition, according to innovation-diffusion theory, those who adopt any new technology can be categorized into five groups according to

their rate of adoption or acceptance of the technology. These five groups are innovators, early adopters, early majority, late majority, and laggards. These groups may be plotted over a normal distribution curve, with innovators representing 2.5% of the population, early adopters 13.5%, early and late majority 68%, and laggards 16%, as shown in Figure 2.1.

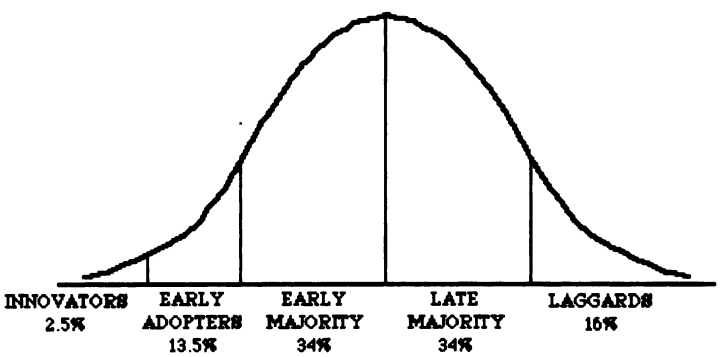

Figure 2.1 Bell-shaped curve showing categories of individual innovativeness and percentages within each category as depicted by Rogers (2003).

Any adopter's willingness and ability to adopt an innovation will depend on his or her awareness, interest, evaluation, trial, and adoption. Some of the characteristics of each category of adopter as described by Rogers (2003) include:

- Innovators–adventuresome, educated, use multiple sources of information, greater propensity to take risk in general, younger
- Early adopters–social leaders, popular, educated
- Early majority–deliberate, traditional, many informal contacts
- Late majority–skeptical, traditional, lower socioeconomic status
- Laggards–neighbors and friends are main sources of information, fear of debt, older

In studying adoption patterns of faculty, Jacobsen (1998) found that early adoption of information technology was influenced by hands-on experimenting and trouble-shooting, support from other colleagues on campus, and informal networks of friends and family who provide support. She suggested that the use of computers for one purpose may encourage enthusiasm for further use. Furthermore, Jacobsen discovered that those who are limited adopters may be so because they lack support and training and that colleague-supported training is a viable way to encourage diffusion of information technologies.

An innovator or early adopter of a particular technology might not be an early adopter of another technology. Innovations spread through society in an S-curve, as early adopters select the technology first, followed by the majority, until use of a certain technology or innovation is common. This was diagramed by Rogers (2003), as shown in Figure 2.2.

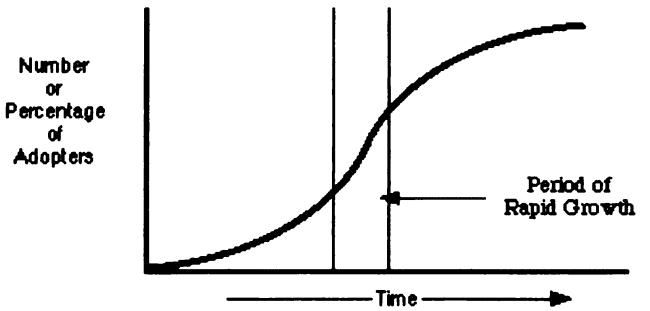

Figure 2.2 The growth of actual use of a new technology over time, as described by Rogers (2003).

The speed of adoption of technology is determined by the speed at which the technology takes off and the speed of later growth of adoption. Some technologies

initially have a higher speed of adoption, whereas others might not be adopted early but become more deeply entrenched in society and organizations over time. Less expensive technologies might be adopted quickly but not last, whereas more expensive technologies might be adopted at a slower rate of speed but persist longer, especially if they benefit from being a networked technology. For example, computers with Internet access are networked, and the more such computers exist, the more useful they become by virtue of their connectivity. A disruptive technology (Christensen, 1997) is a new technological innovation, product, or service that eventually replaces the existing dominant technology in the market, despite the fact that the disruptive technology is both radically different from the leading technology and often initially performs worse than the leading technology according to existing measures of performance. For example, weblogs or wikis might be disruptive technologies (Coates, 2004) for Extension, replacing traditional websites, newsgroups, or other information technologies.

Acceptance of Information Technology

Information technology will be used only if it is accepted. Therefore, it is important to understand how technology comes to be used and how and why employees of an organization make decisions about how they will use information technology. To comprehend their decisions and the underlying motivators, it is important to understand attitude and behavior theory and how it relates to people's beliefs, choices, intentions, and actions.

During the late 1950s and 1960s, much research was conducted on attitude theory and behavior. Researchers Ajzen and Fishbein began measuring and attempting to predict behavior in laboratory and applied settings, which resulted in their Theory of

Reasoned Action (Ajzen & Fishbein, 1975). According to this theory, a person's behaviors or actions are based on two factors, one being personal in nature and the other reflecting social influence. The personal factor is one's attitude toward the behavior, which can be described as the person's judgment about whether the behavior is good or bad. The social-influence factor is the person's perception of the social pressures to perform the action. Because this is a perception, it is subjective. Attitude and social influence combine to create intentions, which in turn result in behaviors. Beliefs are defined as the "individual's subjective probability that performance of a given behavior will result in a given consequence" (Dillon & Morris, 1996). Ajzen and Fishbein asserted that their model can be used to understand and predict most human behavior.

Sheppard, Hartwick, and Warshaw (1988) conducted a meta-analysis of research on the Theory of Reasoned Action involving 87 studies on the intention-behavior relationship and the relationship between attitudes and subjective norms. The researchers found strong support for the overall utility of the theory for predicting goals and for predicting activities involving an explicit choice among alternatives. Sheppard et al. also found that the presence of choice among alternatives did not weaken the predictive utility of the model. In fact, overall, the model performed better when applied to activities involving choice. In addition, this meta-analysis indicated that measures of intention performed well in predicting behavior, although they did not do as well in predicting performance. The Theory of Reasoned Action has become a classic in social psychology and is the basis of much research on relationships among beliefs, attitudes, norms, intentions, and behavior (Stefl-Mabry, 1999).

Research on the acceptance of or resistance to information technology has been conducted in the field of management information systems. Researchers have attempted to predict how users will react to a new technology within an organizational context. Dillon and Morris (1996) defined user acceptance as the willingness to employ information technology in performing the tasks it is designed to support. Some individuals resist using information technology even when it might lead to enhanced performance (Swanson, 1988).

Arguably the most important and widely cited study on the acceptance of information technology is that of Fred Davis (1989), who developed the Technology Acceptance Model. This model is specific to information technology and was designed to be used to predict acceptance of information technology as determined by two factors: perceived usefulness (PU) and perceived ease of use (PEOU). The purpose of Davis's research was to develop better measures for predicting and explaining the use of information technologies. Davis focused on the two theoretical constructs of PU and PEOU and then developed, pretested, and validated the constructs in two empirical studies that have been replicated in many additional studies since that time.

Davis defined PU as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). Usefulness means that something is capable of being used advantageously. Therefore, for an information-technology system to be rated high in perceived usefulness, a user must believe there is a positive use-performance relationship. Users will tend to use the system to the extent they believe it will help them perform their job better.

Davis defined PEOU as the "degree to which a person believes that using a particular system would be free of effort" (p. 320). Ease was defined as that which is free of difficulty or great effort. When all else is equal, that which is perceived to be easier to use (than something of equal usability) is more likely to be accepted by users.

In the Technology Acceptance Model, external variables influence both PU and PEOU. PU and PEOU influence the attitudes toward the information technology and then the behavioral intention to use it. This influences actual use, as shown in Figure 2.3.

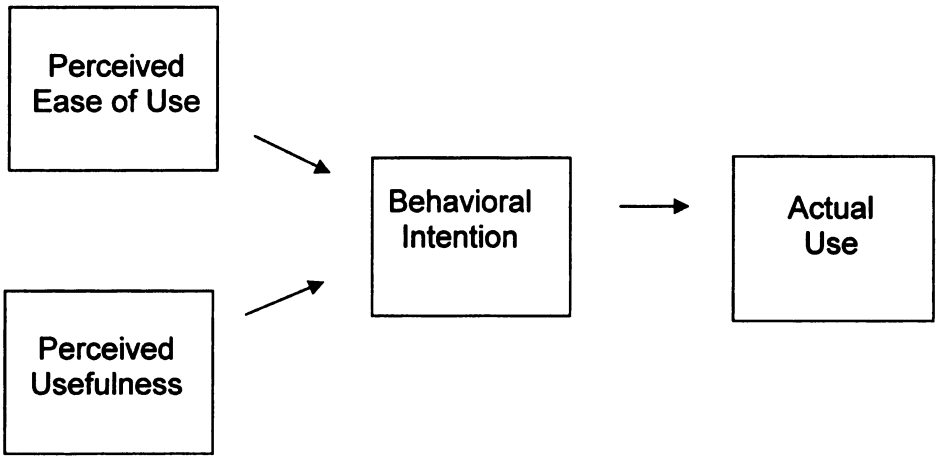

Figure 2.3: Technology Acceptance Model by Davis (1989).

Davis (1989) used the definitions of PU and PEOU to generate 14 items for each construct and tested for semantic content. He then refined and streamlined the measures of PU and PEOU; this resulted in two six-item scales with reliabilities of .98 for usefulness and .94 for ease of use. Davis found that usefulness was more influential than ease of use in predicting usage behavior and suggested that ease of use may be an antecedent to usefulness rather than a parallel, direct determinant of usage. Users may

overlook some lack of ease of use when there is perceived usefulness, but no matter how easy information technology is to use, it will not be used if it is not useful.

The Technology Acceptance Model has been tested and validated in numerous studies (Adams, Nelson, & Todd, 1992; Legris, Ingham, & Collerette, 2003; Malhotra & Galletta, 1999; Mathieson, Peacock, & Chin, 2001; McFarland, 2001; McFarlane, Hoffman, & Green, 1997; Szajna, 1996; Venkatesh & Davis, 2000; Wang & Bright, 2004) for more than 20 years. Although several variations of the model have been proposed, the predictive value of the model has been consistent even when used to look at use of the Internet and distance education through the updated Computer Attitude Survey and Web-based Attitude Survey as applied by Wang (2003). However some researchers have suggested that further study is needed to explain more fully how the model may be integrated into a broader picture that includes variables related to human and organizational culture and change processes, as well as to models of innovation diffusion (Alavi & Joachimsthaler, 1992; Taylor & Todd, 1996).

According to the Theory of Planned Behavior, attitudes, subjective norms, and perceived behavioral control determine intentions, which in turn influence behavior. The influences of peers and superiors might be antecedents to the subjective norm (Taylor & Todd, 1996). The culture of an organization, as well as attitudes of administrators and colleagues, can influence attitudes and behaviors of individuals and therefore can influence acceptance and use of information technology. In the Theory of Planned Behavior, factors relevant to individual users' acceptance of information technology are cognitive style, personality, demographics (such as age, sex, and educational level), and

users' situational variables, including training, experience, and involvement in development (Alavi & Joachimsthaler, 1992).

Information Technology in Education

Research in business and industry has been focused on the application of well-developed predictive theoretical models of acceptance and diffusion, whereas research on the use of information technology in education has used descriptive surveys and correlation analyses, as well as ethnographic and qualitative case studies. Most studies on the use of information technology in education have been specific to its use in formal educational settings such as K-12 school systems or university classrooms. Less research has been conducted on the use of information technology by Extension staff. Thus it will be helpful to understand better some of the issues identified through research if we first examine what is known about how, when, and why teachers and professors choose to use or not to use information technology in their classrooms.

K- 12 Education

The use of information technology in education has been documented by researchers interested in how and why teacher educators use information technology and how it has been integrated into K-12 school systems and classrooms, as well as into higher and lifelong education. Early forms of information technology that were studied were radio, followed by television and film. However, even though each of these early forms of information technology was thought to hold great promise for education, researchers found that the primary use of these information technologies (as reported by teachers) was to give teachers a break from active teaching in the classroom. Elementary

teachers most often used these technologies in the afternoons, when they also reported being tired (Cuban, 1986). Historically, the introduction of information technology in the form of computers into schools was based on a widespread belief that if enough computers were placed in classrooms, teachers would use them and that the key to increased computer use by teachers was the availability of computers. In the name of educational reform and accountability, the new world of technology was embraced. Programs aimed at putting computers into schools (starting with computer labs) began to spring up everywhere.

Computers were introduced to classroom education beginning in the early 1980s. In 1981 there was an average of one computer for every 125 students in public schools. A decade later the average was one computer per 18 students, and in 2000 it was one computer for every 5 students (Cuban, Kirkpatrick, & Peck, 2001). But after observing two schools in the Silicon Valley of California for 7 months in 1998 and 1999, Cuban et al. found that although the numbers of computers in classrooms had risen dramatically in response to calls for educational reform and the wishes of administrators, their actual use was still very limited. These schools had high access to information technology, and students attending the schools came from families for whom information technology was a part of daily life. Cuban et al. found that although there was sufficient access to information technology, teachers (for the most part) used it only sparingly in their classrooms. Most teachers were classified as occasional users or nonusers, and when they did use the computers they sustained rather than altered their existing patterns of teaching. The researchers found that difficulty of use relating to lack of time and breakdown of equipment were two of the biggest impediments to the use of information

technology, as reported by educators. Those educators who did use information technology with some self-described success reported it involved many hours of exhausting work beyond their normal preparation time. The same educators often changed careers sooner than those who did not use information technology. Cuban et al. concluded that until the problem of technology's constantly breaking down and the issue of time constraints are solved, technology will continue to be something that administrators think educators should use but that educators seldom really do use.

Frustration with the fact that computers were not being used as much as they could be and a need to understand the use of computers in education from the perspective of both administrators and teachers led the National Science Foundation to fund the Teaching, Learning and Computing (TLC) national survey, which was conducted in 1998. Administrators, technology support staff, and more than 4,000 teachers in grades 4 through 12 were surveyed (Becker, 2001). In this large study it was found that students were frequently using computers in classrooms in four contexts: when taking a course in computers, in pre-occupation or vocational training, in explorative exercises in elementary school, and in word-processing papers. Whether teachers used computers was influenced by their expertise, the number of computers in the classroom (ratio to students), the subject matter being taught, the students' ability, the socioeconomic status (SES) of the school, teachers' level of professionalism, their philosophy of teaching, and block class schedules (resulting in longer classes). Of these influential factors, the four most important were (in order) technical expertise, professional engagement, the ratio of computers to students, and teachers' philosophy (those having a constructional philosophy were more apt to use computers).

Low-ability students in low-SES schools were apt to use computers for drill and skill development, whereas students of high academic ability in high-SES schools were more apt to use computers for analysis and cooperative learning (Becker, 2001). The TLC study findings also indicated that the majority of students' intensive computer experience occurred outside of the classroom. Teachers who covered a small number of subjects in depth were twice as apt to use computers in teaching than were teachers who felt compelled to cover several topics in a year; teachers reported that they considered learning to use the computers as too time consuming. And although teachers' computer expertise was not necessarily a determining factor in their computer use, for the most part, teachers who used computers extensively themselves, especially for class preparations such as slideshows, were more apt to have students use computers in a variety of ways. It might be that these teachers recognized the usefulness of information technology in a learning environment, and their experience with that technology made it easier for them to use than was true for teachers with less experience.

In further analysis of the TLC study, Becker and Riel (2000) classified teachers according to four levels of professional engagement: teacher leaders (2%), teacher professionals (10%), interactive teachers (29%), and private-practice teachers (58%). These levels of professional engagement were based on teachers' self-reported conceptions of their roles as teachers in the classroom, school building, and community. The teacher leaders as a whole were better educated (graduate degrees and graduated from more selective colleges) and more professionally engaged than the other groups; private-practice teachers were the least engaged and had less education. These groups also differed in their philosophy of education, with teacher leaders being more apt to

view the role of teacher as facilitator of inquiry and private-practice teachers seeing it as transmitting knowledge. In every instance, teacher leaders were more apt to use computers for teaching and in ways that were more constructivist in orientation. Private-practice teachers were the least likely to use computers to teach, and when they did so, they used them to transmit information and knowledge. Teacher leaders were twice as likely as private-practice teachers to have students use computers to communicate, analyze data, and work collaboratively; the latter were more apt to use computers for mastering computer skills, and other basic academic tasks. The findings supported the hypothesis that teachers who are more professionally engaged (have better educations, interact more in their school and community) will use computers more frequently and in a more constructivist manner in their teaching.

Since the beginning of the new millennium, researchers investigating how teachers and administrators have integrated information technology into schools have begun to conduct more case studies. They have studied exemplary technology users and school systems in which information technology has been integrated successfully. In an ethnographic study, Windschitl and Sahl (2002) followed three teachers for 2 full school years and 3 months of a third school year at a small parochial school that had instituted a laptop-computer program. These researchers examined the relationship between the use of information technology in the classroom and teachers' beliefs about the usefulness of technology and their philosophies of education and practice. In this school, every student was required to have a laptop computer, and each teacher was provided with one. Teachers were selected for this study on the basis of their views about and experiences with information technology in instruction. One teacher already was exploring the use of

technology for instruction, the second was convinced of the usefulness of computers for administrative tasks but uncertain about their use in his math class, and the third had a very conservative perspective and was more interested in meeting curriculum and state standards than in using computers in the classroom. A constructivist classroom was used as the standard for teaching, and five elements were used to define it as such: (a) collaborative work by students, (b) teacher and student interests being a focus, (c) emphasis on understanding complex ideas rather than learning facts, (d) students' assessment of their own understandings, and (e) the teacher's willingness to learn in front of students.

Windschitl and Sahl (2002) found that the influence of information technology on the individual teachers' instructional methods was mediated to a great extent by their prior belief systems and support networks that had been established before the technology was introduced. Furthermore, they found that the information technology itself was neither a necessary nor a sufficient condition to change a teacher from a transmission perspective of learning to a constructivist perspective. The teacher who already had shown acceptance of information technology had more fully integrated its use into her classroom by the end of the study, whereas the teacher who showed little acceptance did not use the information technology to a great extent by the end of the study.

In *Technology and Science Teaching: A New Kind of Knowledge*, McCrory (2006) claimed that science teachers in particular have long been innovators in the use of information technology in classrooms but that the use of digital technologies has lagged behind its potential due to a missing piece of knowledge about the potential usefulness of information technology. She argued that teachers are missing knowledge about how

information technology can be used in classrooms, and they are lacking knowledge about specific portfolios of resources and tools that they can use in their classrooms via information technology. McCrory's findings corroborate the research as reported by Sandholtz and Reilly (2004) of the San Diego school system, which indicated that teachers would use information technology more when the emphasis was shifted from learning about the information technology to learning about ways to integrate it into a classroom for instruction.

McCrory (2004) described four categories of affordances for learning that can be provided by information technology: representation, information, transformation, and collaboration. Representation is providing depictions of ideas and processes that are difficult to represent without technology, such as geometric spatial problems or dissection of animals. Information is afforded by use of the Internet, where there is access to data that are not readily available in another form. Transformation changes the kinds of tasks students may be able to perform for school projects, enabling them to do such things as collecting data and experimenting. Collaboration is afforded by the communication connection of the Internet and the web. Students may collaborate with experts in a particular field or with students from another culture. McCrory also described affordances for teachers; they include boundaries, stability, authority, pedagogical context, and disciplinary context.

McCrory then posited that what teachers most need to learn about is what effective uses look like in practice. These would be ways to use information technology to do things that are either uniquely possible with or enhanced by technology, as well as uses of technology that are integral to the curriculum. In addition, effective uses of information

technology should focus on content (not the technology) or subject matter in which the information technology would be appropriate for the learning goal. In some cases, this might mean using an older technology that nevertheless is more appropriate for a specific task than a new technology. McCrory stated that teachers and students must accept that the use of information technology often entails hard work and in no way lessens the need for teacher involvement in the learning process.

Sometimes the best and most powerful information technologies are difficult to use and have a steep learning curve. These factors influence educators as they develop portfolios of information technologies for their work. It is difficult and time consuming to evaluate various information-technology options, and this may constitute teachers' biggest struggle, but it is one of the most necessary if they are to begin to use information technology effectively in their classrooms. Finally, McCrory argued that the needs of teachers are unique and cannot be compared to the information-technology needs of other professionals.

In an examination of the use of information technology by exemplary teachers who had been awarded technology grants, Zhao, Pugh, Sheldon, and Byers (2002) found that 11 factors affected the degree of success of the projects. These factors were technological proficiency, compatibility between teacher beliefs and the technology, social awareness, distance from school culture, distance from existing practice, distance from technological resources, dependence on others, dependence on technological resources, human infrastructure, technological infrastructure, and social support. This study was of a self-selected group of 118 teachers in Michigan, all of whom had applied for an information-technology grant; the application required them to propose innovative

ways of using information technology in their classrooms. The researchers looked at six characteristics of these teachers in relation to their proposed use of information technology. The characteristics were past and current behavior, what they wanted to do with technology, proficiency with technology, attitude toward technology, anxiety about technology, and teaching philosophy (pedagogical practice). The findings from the research project were not surprising. The teachers in this group were enthusiastic about the use of information technology, were frequent users of such technology, had little or no anxiety about using information technology, and were likely to be progressive in their teaching style with student-centered activities and flexible classroom environments. Zhao et al. viewed the attempt to characterize the population as a first step in understanding what qualities teachers need in order to incorporate information technology into their teaching practices.

Zhao (2001) concluded that innovations that were the furthest removed from teachers' existing practices and school culture were less likely to succeed, as were innovations that were more dependent on other people and resources. And although many people think of information technology as having the potential to revolutionize teaching, Zhao maintained that his findings indicated that teachers who take an evolutionary approach will be more successful in using technology than others because they will take smaller steps and experience less frustration. This research suggests that educators who are already competent in using information technology, who are less dependent on technological support, and who use the simplest of methods and technologies will have the most success.

In a longitudinal case study of the use of technology in a K-8 public school district in San Diego, California, Sandholtz and Reilly (2004) used documents, surveys, teacher journals, interviews, and observations as sources of data. These multiple data sources allowed for triangulation as the researchers looked for disconfirming and corroborating evidence, patterns, and explanations. The researchers cited the Apple Classrooms of Tomorrow project as finding five stages in teachers' progression through the integration of information technology, which is similar to the concept advanced by technology-diffusion theories. The stages are entry, adoption, adaptation, appropriation, and invention. Entry-stage experiences are critical to teachers' subsequent use of technology, and many teachers historically have failed to integrate information technology into their classrooms due to frustrations with technology early in their experience. This is because the teachers focused on their lack of technical expertise rather than on how information technology could be used (usefulness) in their classrooms. In the school system Sandholtz and Reilly studied, an unusual computer design was used. Instead of giving each child a laptop computer or furnishing classrooms with a number of desktop computers, the school system created an intranet system with thin-client technology. A thin client is a network computer without a hard disk drive; all application software, data, and central processing unit (CPU) power reside on the network server. This system provided many monitors for each classroom (a ratio of two students per thin client) but no disc space or memory. Almost all technical support, therefore, was provided by a central information technology office that maintained the system for the teachers. As a result, there were fewer technical glitches for teachers to deal with, and they had more

time for using the system. Teachers focused on instruction rather than on the information technology itself.

Sandholtz and Reilly (2004) identified five factors that facilitated teachers' focus on instruction rather than technology. They were:

- A school-district-owned network with fiber-optic links within the schools and both cable and wireless connections for homes and in many local facilities, with low-cost access available to almost all families with students at the school.
- A centralized server-based network. All hardware was located at the district office, where skilled technicians could oversee it constantly, resulting in quick responses to problems encountered by teachers.
- The use of thin-client hardware, which is less expensive and easier to maintain than personal computers because it has no hard drive or floppy discs. In addition, the thin-client hardware is much smaller, so it is easer to work around within the confines of a classroom.
- Superior technical support available for teachers around the clock, with four full-time technicians.
- A highly developed and comprehensive teacher development program that focused on teaching rather than on technical aspects and included classroom visits, hands-on training, group discussions, and participant collaboration.

Sandholtz and Reilly (2004) concluded that most schools have failed in their attempts to integrate information technology into classrooms because they have focused

more on teaching teachers about the technology itself than on how to teach with the technology. The researchers believed that if other school systems were to adopt a similar approach and were given a similar type of support, more teachers would move quickly through the five stages of development and would begin to use information technology more frequently and in more innovative ways.

This conclusion supports the contention of other researchers (Casey & Harris, 2004; Earle, 2002) who asserted that educational organizations need to focus on integrating information technology into the culture of the organization and spend less time on purchasing the newest and greatest technologies. Technology must be pedagogically sound; it must go beyond information retrieval to problem solving and must deepen understanding, allowing for new instructional and learning experiences that are not possible without it. Integrating information technology may not be about the technology but about usefulness, content, and effective instructional practices. Earle (2002) found that constraints and barriers to integrating information technology are access to hardware and software, time for planning and personal exploration, technical support, training and expertise, resistance, passivity, culture, vision, and leadership and support for integration into instruction. These barriers are both extrinsic to teachers (access, time support, resources, training) and intrinsic to teachers (beliefs, attitudes, practices, and resistance).

The literature on teachers' use of information technology indicates that when the focus has been on how to use computers, technology training has failed. What teachers might need most is knowledge of how to teach content more effectively through using information technology by learning how to integrate the use of information technology in curriculums in appropriate ways. Most educational programs focus on teaching educators

how to use information technology, not how to solve educational problems by using the technology. The focus on technology has overshadowed the learning from the past, which is that there is no one best medium; rather, the medium is the means and not the end. Teachers need opportunities to observe models of integrated use of information technology, to reflect on and discuss their evolving ideas with mentors and peers, and to collaborate with others on meaningful projects as they try out their own new ideas about teaching.

Extension Educators' Use of Technology

Over the last decade, most of the research on Extension educators' use of technology has centered on self-reports of how these educators feel about participating in educational programs using information technology. These reports have included their own in-service professional development, as well as their levels of anxiety in using information technology for work in relation to their preferred learning styles or communication styles. There also have been a few research reports on Extension educators' views of their clientele's preferences for types of educational delivery systems, including those using information technologies.

Extension educators become users of information technology when they participate in satellite or web-based professional development. In 1998 and 1999, Internet in-service training sessions were offered to county Extension educators in the southeastern United States. Staff who participated in these sessions were surveyed, and their previous computer and Internet experience as well as acceptance of using the Internet to learn was assessed (Lippert, Plank, & Radhakrishna, 2000). A subject-matter in-service program on soil acidity and liming was offered to 150 county Extension educators from six states.

The objective was to determine whether the Internet could be used successfully for distance instruction. Extension educators were given pre- and posttests to assess their knowledge gain as a result of participation; results clearly indicated that they did gain knowledge. A LISTSERV also was used for discussion, but only 31 agents participated; some sent only one e-mail, for a total of 168 e-mails. At the end of the training, participants were asked whether they thought "the use of the Internet can provide a leaning experience as effective as a face-to-face class"; 55% agreed or strongly agreed. The researchers proposed future testing to incorporate questions on learning style to determine whether there is a correlation between participants' personal learning style and their ability to use and attitude toward the use of the Internet for learning.

In another study, the campus Extension staff of Pennsylvania State University were interested in Extension educators' perceptions of distance learning because they believed it might be a more cost-effective way to deliver in-service education (Kelsey & Mincemoyer, 2001). A survey was mailed to all full-time county Extension staff in Pennsylvania ($N = 269$); with no follow-up reminder, there was an 85% response rate. This high response rate indicates a strong interest in the subject, although that interest might not necessarily be a positive one. Staff reported spending an average of 8.9 days on in-service education per year. They preferred regional face-to-face in-service over both going to campus and having locally offered distance education (satellite) delivery. One complaint about distance education via satellite was that it made it difficult to get to know other staff. However, the majority of respondents indicated that they were willing to attend a limited number of satellite education in-service offerings if it saved them driving time. As a result of this survey, Penn State began a pilot program of quarterly

satellite in-services, and in 3 years 11 broadcasts had been made, with a total audience of 535 county Extension staff.

Several studies of the usefulness of the web and e-conferencing as learning tools for Extension in-services have been conducted since 2001 (Edwards, McLucas, Briers, & Rohs, 2004; Futris, Adler-Baeder, & Dean, 2004; Muske, Goetting, & Vukonich, 2001; Twidwell, 2004). The subject matter ranged from couple relationships to forage crops. One study concerned a graduate-level class for Extension educators who wished to specialize in a given field of study (Twidwell, 2004). It used compressed video broadcast from the campus combined with group projects in which the students had to research information via the Internet to analyze a forage-based production problem. At the end of the course, when asked what type of in-service they preferred, 80% of respondents chose traditional face-to-face in-service; however, 68% said they would take additional courses taught via distance education even though they preferred other (low technology) methods.

Another study concerned an e-conference for Family Life agents (Futris et al., 2004) White papers from experts in the field were posted on-line and were available 2 weeks before the e-conference. Then participants logged on to use a bulletin board to converse via the computer. Most participants read the postings, but only 44% posted comments and questions. Following the conference, 30 agents completed an on-line evaluation in which 90% said they would use e-conferencing again. However, many agents said they would need to set aside more time for e-conferencing the next time they participated because they found it difficult to participate and balance work and home obligations at the same time.

Using the web as a training tool and resource for Extension educators was the focus of a study on the use of a family resource management website (Muske et al., 2001). Existing written Extension materials were modified to be incorporated into a web-based interactive and self-paced learner-directed experience. The design was to be used not only for learning the subject matter but also as a resource once the course was completed. Two different curriculums were provided on the website. One was on how to use a website for those with little or no experience in web navigation, and the other was more specific to the program, with a tour through existing family resource management websites as developed by Extension, government agencies, nonprofits, and commercial businesses. The initial training in the use of the site was done at a central location in a computer lab. A total of 55 Extension educators attended the training sessions, and 16 (29%) completed an on-line evaluation form. The Extension educators indicated their use of the web as a resource; 76% said they used it daily, and the rest said they used it two or three times a week.

After the initial training, the site was maintained, but campus staff reported that it was time consuming and complicated to do so because web links had to be updated and new resources found and added. Such a site, however, does give Extension the ability not only to be a resource but to screen links to help direct clientele (and staff) toward reliable research-based information that is similar to the kind of information or educational technology that is promised by a web portal presence.

In a paper presented at the Families, Technology and Education Conference in Chicago Illinois, in 1997, Swanson, Mead, and Haugan (1997) reported on a New York State Cornell CES project intended to support development of computer literacy among

staff and program participants through a 5-year project. The researchers conducted baseline and follow-up studies on Internet use. They reported large gains in the use of the web for program support and increased project communication. They believed that, in order to continue to be successful in the project, the participants needed ongoing training, more computers, and local Extension contacts for problem solving. Challenges Swanson et al. identified were a need for ongoing technical support and assistance, as well as a need to market and promote the use of computers and technology. They found that many staff did not use resources available to them because they simply did not know those resources existed.

Technology-training needs of Texas CES educators were the focus of a doctoral dissertation by Albright (2000). This is perhaps the most extensive research on the use of technology by Extension staff that has been reported to date. Albright compared and contrasted CES educators who used technology frequently and those who were nonusers or seldom users. She then tried to identify training that might help nonusers and seldom users become more proficient and frequent users of technology in their work. Albright found that, overwhelmingly, Extension educators reported not having taken an in-service class on technology in the past 2 years; in fact, they had taken few, if any, such classes during their careers due to lack of time and access. Training had been offered by Extension, but apparently it was not the kind of training these educators perceived they needed or wanted.

Albright (2000) also found a relationship between age and technology use; younger agents reported that they used technology more and had better skills than did older agents. When asked what kind of training they would prefer, educators indicated a

preference for web-based training. All Extension educators in the study ranked video and distance learning as their lowest preference for skills training. Albright believed that, on the basis of adult learning theory, the biggest impediment to learning technology was actually that Extension educators did not see a need for it. She believed that if they really wanted to learn about and use information technology, they would make the effort to find the time and to access the courses offered. Therefore, motivating Extension educators and showing them the potential of information technology may be an important factor in their future use of such technology.

Extension educators need to be familiar and comfortable with information technology if they are going to use it in their teaching and work. Hence, results of research on the use of technology for in-service training of Extension educators might provide important indicators of their willingness and ability to use information technology in their work. Discovering what interest Extension educators might have in learning at a distance is important for understanding their attitudes toward information technology. In their 2004 study, Edwards et al. investigated what Extension educators would like to pursue (and how) in the way of continuing education. They surveyed all Extension educators in Georgia ($N = 365$) to determine their level of interest in distance educational programming for their own professional development. Of those who replied, 74.8% reported a general interest in pursuing additional education at a distance; 58.8% were interested in earning a graduate degree at a distance, 43.7% in taking a certificate program, and 66% in taking a specific course. These findings indicated Extension professionals' high degree of interest in distance learning. When the same educators were asked to share their perceptions of their own competence with computers,

a correlation was found between these educators' perceived competence and their interest in distance education. As the Extension educators' perceptions of their own competence increased, so did their interest in pursuing a graduate degree through distance education.

Interestingly, this correlation contrasts with findings from a study indicating that Extension staff members believed that their clientele preferred different means of learning than they themselves did (Rodewald, 2001). In 2001, surveys were sent to 100 Extension agents and district specialists and 59 Ohio Department of Natural Resources (DNR) staff members to ascertain their perceptions of six delivery methods for educational materials. They were asked to rank their preferences and the perceived preferences of their clientele. The delivery methods were printed fact sheets, printed bulletins or manuals, on-line information, conferences and workshops, seminars, and video presentations. County Extension agents and DNR professionals preferred printed fact sheets first, followed by on-line information. Least desired were seminars and video presentations. However, when responding about their clienteles' desires, they ranked printed fact sheets first, followed by manuals, newsletters, and on-line information, in that order. Seminars and video presentations were least preferred. Rodewald speculated that an explanation for these choices might be that Extension educators are expected to know about a wide variety of subjects and have up-to-date information. Because information changes rapidly, the fact sheets can be modified and updated and mailed or handed out to clientele with minimum expense or effort. This contrasts with the perceived high degree of difficulty and amount of time involved in workshops and distance education.

It might be that Extension educators actually experience or have more anxiety about information technology (and computers) than is commonly believed. Two doctoral candidates examined computer anxiety in Extension educators and concluded that these educators did, indeed, feel anxious. Martin, Stewart, and Hillison (2001) reported that, in her doctoral research, Martin (1998) found that more than 44% of Virginia CES personnel responding said they felt very anxious, anxious, or mildly anxious. It was secretaries, not Extension educators, who reported the least amount of anxiety. There also was a correlation between age and anxiety, with older Extension educators feeling more anxious than younger ones.

In another doctoral study, Emmons (2003) examined the personal attributes and other factors that might influence the attitudes and expressed communication preferences of all county-based Extension educators in North Carolina. Emmons specifically investigated the relationship of personal attributes (age, gender, level of formal education, work experience, ethnicity, personality type, job responsibility, and computer experience) to computer anxiety, thoughts about computers, and communication preferences. Emmons found that computer anxiety did exist and was influenced by gender, age, level of education, computer experience, and job responsibility. Emmons recommended further study of the issues of anxiety and computer and technology use and cautioned that further research should be done using a noncomputer method for collecting data so as to reduce bias caused by respondents' being somewhat self-selected.

Owen (1999) examined and described the relationship of personal attributes and social-system factors to the adoption and use of the Internet by Extension field staff in North Carolina. Gender, age, level of formal education, tenure, experience, ease of

access, Jungian personality type, learning approach, and computer support were significantly related to participants' use of the Internet, whereas job responsibility, supervisory support, and a reward system were not. Owen also discovered that ease of access and previous computer experience were the strongest predictors of use of the Internet by field staff members. Personality type also was a predictor but not as strong.

What Professional Educators Need to Know

The literature on teachers and technology that was discussed in the preceding section points to the need for educators to understand ways of using information technology in their role as educators, as well as ways to integrate that technology into their educational plans. However, until recently, much of the research on educators' use of information technology has lacked a theoretical framework. Mishra and Koehler (2006) wrote that "in a complex, multi-faceted and ill structured domain such as integration of technology in education there is no single framework that tells the 'complete story,' no single framework that can provide all the answers" (p. 1020). However, their model depicting the intersection of technology, pedagogy, and content knowledge begins to form a framework that is useful in understanding the issues involved.

In their conceptual model of Technological Pedagogical and Content Knowledge (TPACK), Mishra and Koehler (2003) described the kind of knowledge required by educators when specifically addressing the need for integrating information technology into education. This model is based on the work of Lee Shulman (1986), who wrote extensively on the professional development of educators and who described pedagogical content knowledge. TPACK adds the component of information technology to Shulman's

model, and although the model was developed to describe the work of teachers, it is useful in understanding the integration of information technology into the work of Extension educators. In the TPACK model as shown in Figure 2.4, there is interplay among three types of knowledge essential to educators. They are content knowledge, technological knowledge, and pedagogical knowledge.

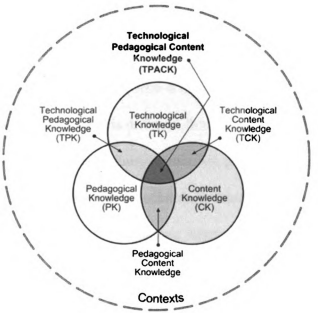

Figure 2.4: TPACK model showing interplay among content, pedagogical, and technological knowledge.

Content is the subject matter to be taught. Nutrition, herd health, integrated pest management, soil science, canning, pruning, and government policy are all examples of content knowledge that Extension educators might be called upon to teach or facilitate as a learning topic for clientele. Technology includes modern information technologies such as computers, the Internet, and digital video, as well as more common tools such as overhead projectors and Extension bulletins. Pedagogy refers to the practices, strategies,

or methods of teaching and learning. Pedagogy often is thought of as teaching and learning involving youths, although in Extension some say that the focus should be on andragogy, which is the science of adult learning. But for the purposes of this discussion, we will assume that the pedagogy portion of the model also represents andragogical knowledge. Knowles (1984) said that andragogy is not antithetical to pedagogy; it incorporates it into its system.

Information-technology integration necessitates understanding and negotiating the relationships among these three components of knowledge. Applying this model to Extension means that an Extension educator who is capable of negotiating these relationships has a form of expertise that is different from, and greater than, the knowledge of a disciplinary expert (say a dairy specialist), a technology expert, or an experienced educator. Effective information-technology integration for Extension would require developing an understanding of the dynamic relationship among all three components. This means that being fluent in the use of information technology for education requires more than expertise with the latest tools such as computers and software. Also needed is a keen understanding of how the information technology best interplays with the subject and learning needs. The TPACK model includes context as an important component, and this is represented by the learning environment, which in Extension would be the local county program.

Kelly (2008) described the types of technologies that educators use as communication technologies (cell phones, e-mail, and word processing), presentation technologies (PowerPoint), digital image technologies (used to create multi-media), and Internet and web technologies (web pages, blogs, search engines), which can be used to

gather information or to create and share information when data and knowledge are manipulated. These new digital information technologies, according to Mishra and Koehler (2008), are protean (may be used in many different ways), functionally opaque (their inner workings are hidden from those who use them), and unstable. The knowledge needed to use them is never fixed because they constantly change. A particular technology may be used on several levels, starting with mechanical use (the most basic and common) and progressing to integrated use and innovative or generative use (least common and most complex). Using technology in integrated or innovative ways requires a fluency of technology use in which users understand the affordances and constraints of a technology and can manipulate it to meet their needs within the context of the problem. Those achieving the highest form of information and communication technology literacy were described as "full spectrum frequency" users by Ching, Basham, and Jang (2005). These individuals have a high degree of use across the spectrum of technology types; communication, construction, and entertainment. If educators are full-spectrum-frequency users, innovative and generative in their use of technology for their work, and have a deep understanding of their programming content as well as learning theory, they can integrate the three spheres of Mishra and Koehler's (2006) Venn diagram TPACK.

Professional Development and Training of Adults

Many current writings support the work of Malcolm Knowles (Knowles, Holton, & Swanson, 2000) and his andragogical approach to adult learning. Andragogy is based on the following assumptions:

1. Adult learners bring life experiences to the learning process that should be acknowledged.

2. Adults need to know why they need to learn something, and how it is relevant to their lives.
3. Experiential, hands-on learning is effective with adult learners.
4. Adults approach learning as problem solving.
5. Adults learn best when the topic is of immediate value to them in their lives.

According to Cookson (1998), Knowles said that a difference between pedagogy and andragogy is that the basic design of a pedagogical model is a content plan, whereas the format of the andragogical model is a process design plan that consists of seven elements. The seven elements of the design process are:

1. Create a climate conducive to learning. This has two essential components: physical and psychological.
2. Involve learners in mutual planning.
3. Involve participants in diagnosing their own needs for learning.
4. Involve learners in formulating their learning objectives.
5. Involve learners in designing learning plans.
6. Help learners carry out their learning plans.
7. Involve learners in evaluating their learning.

The notion of andragogy as incorporating a design plan that is a joint effort by both learner and planner supports Houle's (1972) assumption that learning is a shared enterprise between the learner and the educator, as well as Nadler's (1982) Critical Events Model for professional training programs. This upholds the theory that the perceived needs of the learner are one of the most important elements in the design of any

professional-development plan, including those supporting the concepts related to the integration of information technology in education. Therefore, one of the first steps in any design plan for professional development is to determine the training needs as perceived by the learner. Types of needs that have been described are felt needs and normative needs. Felt needs are the needs expressed by the individual and can be divided into two types: deficiency needs and growth needs (Sork, 1987).

Summary of the Literature

In this chapter, the researcher examined literature pertaining to organizations in the age of information technology and ways that specific types of information technologies can support and enhance the new learning organizations to make them more competitive, flexible, responsive, and agile. Rates of adoption of innovation and technology were studied early on using Cooperative Extension's work with farmers. Later researchers concentrated on the adoption of digital and information technology. In addition, the researcher looked at studies in the social sciences related to human behavior and attitudes and how this research can illuminate understanding of workers' intentions to use information technologies. This notion has been supported by considerable research in the business world through information-systems departments that have tested the validity of the Technology Acceptance Model, which was first introduced by Davis (1989). The literature review also covered research on the use of information technology by educators ranging from elementary school teachers to Extension educators and university faculty. Although considerable research has been conducted on educators' use of information technology, there is no good working model that could be validated through replication of research. In fact, most of the research on the use of information technology by Extension

educators has used either Jungian personality types or computer anxiety as the variable, neither of which fits with what is known about the acceptance of technology or with the recently developed TPACK concept model. The unique needs of adult learners also have been examined and are applicable to any professional development program. There is a need to understand Extension educators' perceptions regarding the usefulness, ease of use, and intention to use information technology, as well as their perceptions of their own needs for support and training in the use of information technology.

CHAPTER III

METHODOLOGY

Introduction

To be able to describe how Extension educators perceive the usefulness and ease of use of information technology and their needs for training in the use of information technology, it was imperative to follow proper research protocol in the design and execution of this study. This study was exploratory in nature and was undertaken to understand and describe how Extension educators in Michigan perceive the use of technology in their work. A mixed-method research design was used, which included a census survey of the population as well as interviews with 15 participants using an open-ended, semi-structured interview protocol. A mixed-method approach combines the strengths of both quantitative and qualitative research methods and has become increasingly popular.

Emmons (2003) suggested that future research on the use of technology by Extension educators should include interviews to gain a deeper understanding of respondents' answers. A census survey was used in the quantitative portion of the research. This tool enabled the researcher to measure respondents' perceptions and prepare aggregate statistics concerning what technologies the respondents used, how often they used them, and how prepared they were to use them. The qualitative portion of the research had two components. The first was comments from the survey instrument. The second component was interviews that were designed to clarify and augment the survey answers and to provide an in-depth look at the issues involved.

A copy of the methodology section of the research proposal, along with copies of the survey instrument, all applicable letters of introduction and explanation that were sent to the population, and the interview protocol were submitted to the Michigan State University Social Science, Behavioral and Education Institutional Review Board. The study population, research design, instrument development, interview protocol, validity, reliability, data-collection procedures, processing procedures, and data-analysis procedures are discussed in the following pages.

The Study Population

The study population comprised all 296 MSU Extension educators; they included 75 County Extension Directors, 41 District Extension educators, and 180 County Extension educators. These Extension educators represented all MSUE programming areas: Agriculture and Natural Resources, 4-H, Children Youth and Families, Community and Economic Development, and Sea Grant. They were all based in the field and were geographically dispersed throughout Michigan's 83 counties. The entire population was selected for study because the size of the population was not prohibitive in terms of cost or effort.

All Extension educators employed by MSU on September 1, 2007, were included in the study, provided they had not retired, resigned, died, or taken an extended leave of absence before the initial survey packet was mailed, on October 24, 2007. The study population was verified using a directory module for the MSUE portal, and cross-tabulating it with lists provided by Regional Directors. The regional offices of MSUE notified the researcher of Extension educators who needed to be removed from the population due to resignation, retirement, or extended leave of absence. In some cases,

the county office gave the researcher the same information. The final count of 296 subjects comprised the research population. Microsoft Access was used to develop and manage the database and was merged with Microsoft Word for the purpose of personalizing letters and addressing envelopes.

Research Design

A mixed-method research design using both surveys and interviews was selected because it is the most effective and efficient means of gathering data with available resources. At the same time, it allows the researcher to gain an in-depth understanding of the phenomenon under investigation. The use of surveys is customary in researching individual respondents' attitudes and perceptions. A mailed instrument was used in this study because it has been found to yield a higher response rate than web-based surveys (Dillman, 2000) and because those members of the population who did not use technology might be less inclined to answer an on-line questionnaire, which could lead to nonresponse error. Interviews help the researcher understand the responses to the survey and can provide rich, thick descriptors of the issues involved.

Development of the Instrument

In developing the instrument, the researcher followed specific research protocol as described and tested by Dillman (2000) in *Mail and Internet Surveys; The Tailored Design Method.* The instrument was designed using Microsoft Word. The front cover included the title of the survey: *Perceptions of MSUE County Extension Directors and Extension Educators of the Use of Information Technology in their Work.* An MSUE logo was included as identification of the sponsoring organization. A note that the

questionnaire included questions about respondents' use of technology in both their professional life (work) and their personal life (at home) was on the front cover. Plenty of white space was included on both the front and back covers. On the back cover there was a request for respondents to provide additional feedback and comments on the topic. Also on the back cover, the researcher thanked the respondents and gave them an opportunity to participate in the interview part of the research by writing their name and phone number. They could also check a box indicating that they did not wish to be contacted for an interview. A copy of the instrument is included in the Appendix.

The researcher developed the survey items from the literature review, technology coursework, and experience as an Extension educator, along with input from a panel of experts relative to the face and content validity of the instrument. The instrument included a brief description of the survey, instructions for completing the survey, and explanations of how to answer questions as needed. A total of 157 questions were asked; 92 about technology use at work, 59 about technology use at home, and 7 pertaining to demographic data. Questions were arranged by topic and centered on (a) types of technology hardware provided for respondents' use, (b) types of technology hardware actually used, (c) preparation for the use of technology, (d) actual use of technologies for work, (e) usefulness and ease of use, (f) confidence and comfort using technology, (g) general support for the use of technology, and (h) technical support. In addition, there were questions about respondents' access to technology for personal use, actual use, frequency of use, and technical support. Demographic data including respondents' sex, region, highest degree earned, major, program area of responsibility, years of experience, and age were collected.

The section on access to technology included a list of 16 technology hardwares and asked if each was provided for use and if actually used. This section provided general information on what technologies Extension educators have to work with and what technologies are not provided but which they find important enough to provide for themselves. A sample is shown in Figure 3.1. There was also ample space to list additional technologies that the respondents might have access to.

ACCESS TO TECHNOLOGY FOR YOUR **WORK**

Directions: Considering your county where you spend most of your time, what technologies are **provided for your use** in your role as an Extension Educator or CED? And **what technologies do you use** (provided by either your office or by yourself)

	Provided for you?		Do you use?	
PDA (personal digital assistant)	Yes	No	Yes	No
Desk top computer	Yes	No	Yes	No
High speed internet access (cable or wireless)	Yes	No	Yes	No
IPod or other digital music device	Yes	No	Yes	No

Figure 3.1 Sample of survey instrument questions on access to technology.

Questions about the respondent's preparation for the use of technology asked them where their skills came from and gave them six choices to rate. A sample of the section on preparedness is included in Figure 3.2

PREPARATION FOR THE USE OF TECHNOLOGY

Directions: Tell us about your preparation for the use of technology. Where did your skills come from?	Not at all	To a small extent	To a moderate extent	To a great extent	Entirely
As part of your college education (undergraduate or graduate)	1	2	3	4	5
In-service courses/workshops offered by MSUE	1	2	3	4	5

Figure 3.2 Sample of survey instrument questions on preparation for use of technology

Actual use of technology was measured by asking the respondents to identify how often they performed 23 different tasks using technology with choices of never, once a month, once a week, more than once a week or every day. The tasks included simple communication technologies like using a cell phone to more complex tasks such as using web publishing software. A partial section from the actual use portion of the instrument is shown in figure 3.3.

USE OF TECHNOLOGY IN YOUR **WORK**

Directions: Consider now your personal use of technology in **your work.** Please answer the questions below as they relate to your position as an Extension Educator or County Extension Director. These questions pertain to your **actual use** of various technologies. *(Do not count times you give an assistant instructions to do it for you)*	Never	Once a month	Once per week	More than once per week	Every Day
Go on line to research a subject related to work?	1	2	3	4	5
Use a search engine? (e.g. Google, Ask)	1	2	3	4	5
Send e-mails to groups of people within MSUE?	1	2	3	4	5

Figure 3.3 Partial section of the actual use of technology portion of the instrument

The sections of the instrument that followed were on usefulness and ease of use, confidence and comfort, general support, and technical support. These sections all used Likert type scales measuring agreement with statements from 1 to 5 with 1 being strongly disagree to 5 being strongly agree. The instrument had 6 questions on usefulness and ease of use, 9 on confidence and comfort in the use of technology, 7 on general support for the use of technology and 6 on technical support for the use of technology. They were also asked what was the main source of technical support; local county, campus based or other. The section on general support defined general support as "how people

and administration support you in your use of technology, it does not refer to technical help that you may need when technology breaks down or when you cannot solve a problem related to technology". The technical support section gave instructions to answer about "who you go to when you have technical issues and need support or assistance with your technology".

The Interview Protocol

Fifteen participants who responded to the survey and indicated that they were willing to be interviewed were selected for personal interviews. Purposeful operational construct sampling was used. Webb, Campbell, Schwartz, & Sechrest (1966) referred to studying a number of such examples as multiple operationalism. Sum totals were created using the Statistical Package for the Social Sciences (SPSS) version 16.0, which represented actual reported use of 20 technologies at work and 20 technologies at home. A scatter diagram of the correlation between the two scores was created to be used in selecting participants to be interviewed. Using that scatter diagram, the respondent-identification numbers were highlighted in three sections. Cases were taken from those low in use, normal in use, and high in use. Five cases were from the lower-left section showing low use of technology both at home and at work, five were identified from the section showing high use at home and work, and five were taken from the middle section. The researcher then looked at these individuals' surveys to see if they were willing to be interviewed and continued until there were enough to meet the established number of each type of respondent. This approach of dividing the interview participants into three levels of use was used because it was important to identify differences in their needs and a random sample might have missed this critical variation.

The study employed semi-structured interviews because they are widely used in social science research and afford greater potential for participants to express their viewpoints than do formal structured interviews. The interviews focused on the participants' use of and experience with technology in their work, and their perceptions of technology's usefulness and ease of use. Participants were interviewed until the data exhibited signs of saturation and sufficiency. Saturation and sufficiency occur when enough participants have been represented to provide what the researcher believes is a well-portrayed picture of the phenomenon of interest.

An interview protocol, was written by the researcher in conjunction with the a member of the dissertation committee, and used in conducting the interviews. A sample of the interview protocol can be found in the Appendix. It included a place to record the number of the interview, the respondent survey number, date and time of the interview, and a check box to indicate if the respondent had returned a signed consent form before the digital recording device was turned on. The interview protocol form had seven questions, some with multiple parts. Below each question the researcher included notes on what to look for and probes to assist the researcher with follow-up. The question topics included:

1. Review of technologies used by the interviewee and how they were used along with the interviewee's perception of which was the most useful and the easiest to use.
2. The interviewee's thoughts about what other technologies they might use if they could and how they might include those technologies in the work.
3. How the interviewee decided to use technology and how they learned to use it.

4. Identification of major barriers to the use of technology.
5. How the interviewee could best be helped to learn to use a new technology.
6. How the interviewee thought technology might be integrated into their work in the future.
7. Anything else the interviewee thought might be important about technology that had not been covered in the interview.

A sample of one question on the interview protocol form is shown in Figure 3.4.

1. a) First of all please tell me about what technologies you use in your work and how you use them.

   Look for any technologies beyond e-mail, word processing, search engine or cell phone such as internet technologies and make note and probe for how they use it Then ask can you think of any others? Look for creative or unusual ways of using technologies and ask them to expand if found.

   b) Of the technologies you have talked about which one do you think is the most useful and why?

   c) Of these technologies which is the easiest to use? Why?

Figure 3.4 Sample question from interview protocol.

The researcher conducted the interviews by telephone to minimize distractions and maximize privacy. Before the interviews, the researcher informed participants of their rights and asked them to sign an informed-consent statement and return it. The researcher recorded the interviews on a digital voice recorder and later reviewed and transcribed the responses. As soon as possible after the interview, the researcher wrote up notes based on the themes that seemed to emerge in the interview. They were then

stored on the researcher's password protected computer for later transcription and analysis.

To maintain their anonymity, participants were assigned pseudonyms in all transcripts and field notes. All transcripts, field notes, write ups of discussions, and partial analyses were cataloged and archived in a three-ring notebook to provide an audit trail.

Researcher bias is a concern in any qualitative study, so the research used reflexivity or self-conscious analysis as a check-and-balance system. She examined her analysis for bias. In addition, she reviewed the data for alternative answers to questions that might disconfirm expectations and explanations (Johnson & Christensen, 2000).

Validity

With any research it is important to consider both internal and external threats to validity. Validity may be defined as the extent to which an instrument measures what it claims to measure. Because educational research instruments are designed to measure hypothetical constructs, care must be taken when operationalizing the constructs. In addition the researcher must consider threats to validity within the design of the research.

External validity refers to the generalizability or representativeness of the research findings. Smith and Glass (1987) identified three types of external validity: population validity, ecological validity, and external validity of operations. Population validity involves identifying the population to which the results are generalizable. It is related to the way the subjects are selected for a study, using appropriate sampling procedures. As this was a census survey, sampling issues did not apply and there was no need to generalize from a sample to a population.

Ecological validity is concerned with generalizing the research results to other situations. In doing so, the environment in which the research was carried out must be considered. The results of this study will apply only to MSU Extension educators and are not to be generalized to Extension educators in other states since Extension staffing patterns and technology support systems vary considerably by state. In some states, technology hardware, software, training, and technical support is supplied to Extension educators by the state office and not by local counties as it is in Michigan. Staffing patterns also differ by state. In many state Extension systems, all Extension educators have at least a master's degree, whereas, in Michigan many Educators have only a bachelor's degree. These two factors alone may make a critical difference in the use of technology by Educators in other states. However, the study can be easily adapted to and replicated in other states. The information technology used in other states might be different from but also might have many similarities to that used in Michigan. Therefore, if the study is replicated, the results of the studies could be compared, and the present study might help increase the credibility of additional studies.

Research studies are designed with specific operational definitions for the independent and dependent variables and specific procedures that are followed. Differences in results can be expected when researchers use different operational definitions and varying measurement procedures, resulting in a threat to the external validity of operations. How explicitly the independent and dependent variables have been defined and how well they operationalize the theoretical constructs are paramount to the external validity of operations. A panel of experts evaluated the instrument for both face and content validity. Validity is "the extent to which an instrument measures what it

is supposed to measure" (Ary, Jacobs, & Razavieh, 2002). The panel comprised of four experts with specialties in research, evaluation, Extension, education, and the use of technology in higher education from the College of Community, Agriculture, Recreation and Resource Studies, Communication and Technology Services, and the College of Education's Department of Educational Psychology. Their recommendations were incorporated into the pilot questionnaire.

The researcher field tested the design of the instrument by having an Extension program assistant fill it out in her presence so that she could note any problems with the design and ask the respondent to comment on parts or questions that seemed ambiguous or confusing. This enabled the researcher to determine the ease of answering the questionnaire and how long it took to complete.

Reliability

To test reliability of the instrument, the researcher identified 30 Extension program assistants and asked them to serve in a pilot-test group to complete and return the questionnaire. A copy of the cover letter requesting the pilot group's assistance may be found in the Appendix. Pilot-testing procedures followed the same protocol as that used for the actual target population, including a cover letter, a $1 token incentive, both a premailing and a follow-up mailing, and a return-addressed stamped envelope for the completed instrument.

Reliability is the extent to which an instrument yields consistent results (Ary, Jacobs & Razovich, 2002) Reliability of the instrument was established using coefficient alpha, an internal- consistency measure of reliability. This procedure measures the inter-item consistency or homogeneity of the items. Cronbach's coefficient alpha is one of the

most useful measures for attitude scales. No item had a coefficiency rating below .70 .

When the researcher conducted the validity and reliability tests, she did not ask current Extension educators to serve on the panel of experts or to participate in the pilot testing. In addition, the researcher asked those who participated in pilot testing for validity or reliability not to share any thoughts or comments about the instrument with current Extension educators.

Data-Collection Procedures

In conducting this survey, the researcher made every effort to follow proper research protocol. Essential elements of the research protocol are data-collection procedures, data-processing procedures, and procedures to ensure confidentiality and protection of the respondents. Data-collection procedures followed recommendations by Dillman (2000) and included a six-contact system with the components of introductory letter, e-mail support, initial mailing of the questionnaire, first follow-up thank-you post card, second follow-up questionnaire packet, final follow-up special mailing questionnaire packet, and processing procedures.

On Monday, October 15, 2007, a week before the first questionnaire packet was mailed, the researcher sent an introductory letter to the study population (see Appendix). The letter was introductory in nature, informing the study population of the purpose of the study and requesting their assistance. It alerted them to look for the questionnaire in the mail the following week. The researcher signed the letter and affixed a unique first-class postage stamp to the envelope.

The researcher sent potential respondents two e-mail messages expressing support and requesting their cooperation. The first e-mail was a message of support from the

Assistant Director of Extension, and it was timed to arrive shortly after the initial letter of introduction. The researcher then sent a second e-mail that was timed to arrive about the same time as the initial mailing of the questionnaire.

On Monday, October 22, 2007, exactly one week after the introductory letter was mailed, the researcher sent the initial questionnaire to the study population with a cover letter, a return-addressed stamped envelope, and a $1.00 incentive (from the researchers personal funds) as a small token of appreciation. Unique first-class stamps were affixed to both the packet and the return-addressed stamped envelope. Code numbers were hand written on both the questionnaires and the return envelopes to facilitate follow-up procedures and increase the rate of return. The cover letter explained the purpose of the study, requested respondents' assistance and cooperation, and ensured confidentiality (see Appendix). The letter expressly stated that participation was voluntary and that questions about the research could be addressed either to the researcher or to the University Review Board department at MSU. The letter expressed appreciation in advance for participation was personally signed.

On Monday, October 29, 2007, exactly one week after the initial questionnaire packets were mailed, the researcher sent a follow-up post card reminder to all of the potential respondents. This post card reminded them of the importance of the research and the fact that they had been sent a questionnaire, and thanked them for participating if they had already completed the survey. Unique postage stamps again were used. A copy of the post card is included in the Appendix.

On Monday, November 19, 2007, exactly four weeks after the initial questionnaire was mailed, a second questionnaire packet was sent to those who had not responded,

along with another cover letter and return-addressed stamped envelope. Code numbers again were used on the questionnaires and envelopes to facilitate follow-up procedures for a higher return rate. The letter accompanying this replacement questionnaire reiterated the importance of the research and asked for assistance. In addition, the researcher asked participants not to respond a second time if they had already returned their questionnaires. A copy of the follow-up letter is included in the Appendix.

On Monday, January 7, 2008, exactly 11 weeks after the initial questionnaire packet was mailed, the researcher sent a third and final follow-up letter and questionnaire packet to those who had not responded. This time the researcher used a special mailing procedure and Priority Mail status. This special mailing included a copy of the questionnaire, a return-addressed stamped envelope, and a final letter requesting assistance and cooperation. A copy of this third and final cover letter may be found in the Appendix.

Processing Procedures

The questionnaire design followed Dillman's (2000) preferred booklet format. The surveys were mailed in 10" x 12" envelopes so that the questionnaire, cover letter, and return envelope could easily be inserted along with the token incentive of $1.00. First-class postage was used for the questionnaire packet as well as for the return envelope.

The researcher rented a post office box in Grand Haven, Michigan, for official survey business. This enabled the researcher to keep the survey mailing separate from personal mail and helped maintain the respondents' anonymity. Using the codes on the questionnaires, the researcher marked respondents' names off the database as they were

received, then shredded the envelopes and kept the questionnaires in a locked file drawer. A running tabulation of the number of responses each day was recorded in an Access file and can be found in the Appendix.

Data-Analysis Procedures

SPSS version 16.0 was used to analyze the quantitative data from the survey. Questionnaire responses were entered into the database once all the completed questionnaires were received. Code numbers assigned to the questionnaires before the initial mailing were used to identify the individual respondents. After the data from each questionnaire were entered into the database, they were reviewed for accuracy. If more than one response was given to an item, the researcher did not include the answers to that item in the database.

Individuals who had not returned their questionnaires by the time data analysis began were deemed nonrespondents. Early and late respondents were compared to see whether the two groups differed on key variables. No significant differences were found, meaning that the findings could be generalized to the entire population. A *t*-test was used for scaled data and a Pearson chi-square for nominal data.

All comments from the back of the survey were retyped into a Word document. Each comment was tagged with the identification number from the instrument for demographic purposes and to indicate whether it came from a low, medium, or high user of technology, as identified using the scatter gram of correlation between home and work use. Comments were analyzed by coding the data to mark identifying concepts and themes and then using constant comparison until saturation was reached.

Questions for the interviews were developed from the research objectives and were used to probe further into why the respondents used the technologies they did and to better understand their reasons for using or not using various technologies. Data from interviews were organized and analyzed as a series of individual case studies. Chapter V contains three combined case studies, one each of low, medium, and high users of technology. Compiling the case studies enabled the researcher to focus on individual experiences with using technology while still recognizing the importance of the organization and their similar roles within it. The case-study approach is useful in studying contemporary issues that exist in real-life situations. Using information from multiple sources (quantitative survey data, comments, and interviews) and using constant comparison between sources allowed for triangulation of data, which helped to increase validity.

CHAPTER IV

RESULTS OF THE SURVEY

Introduction

Of the 296 Extension educators on the original mailing list, six were removed from the study due to extended illness, retirement, or separation of service to MSU Extension. Of the remaining 290 educators, 272 returned their questionnaires. The 18 who did not return their instruments were declared nonrespondents, giving the survey a 94% rate of return.

When survey responses were received, they were logged into a Microsoft Access database and assigned a number for purposes of tracking. Once the survey was closed, quantitative data from the questionnaires were entered into SPSS 16.0 for analysis. All comments from the questionnaires were typed into a Word document, and at the end of each comment the assigned questionnaire number was noted. All identifying information was removed from the questionnaires and kept separate in a locked office to protect the identities of the human subjects.

Both quantitative and qualitative data obtained from the questionnaires have been combined in this chapter to help the reader understand better the human subjects behind the numbers. Results are reported regarding the demographic characteristics of the respondents, their access to technology, how prepared they were to use technology, their actual reported use of technology, the usefulness and ease of use of the technology, barriers to use, general support, and technical support.

Demographic Characteristics of the Population

Of those responding to the survey, 173 (63.6%) were female and 99 (36.4%) were male. MSU Extension is divided into five geographic regions, which are, from north to south, the Upper Peninsula, the northern Lower Peninsula, the central region, and the south west and south east regions. Michigan is more densely populated in the Lower Peninsula and particularly in the southern half, which is represented by the central, south west, and south east regions. These regions are staffed somewhat in proportion to their populations, as shown in Table 4.1.

Table 4.1

Distribution of Educators by Region ($N = 272$)

MSU Extension Region	Number in Region	Percent
South west	69	25.4
South east	65	23.9
Central	65	23.9
North	44	16.2
Upper Peninsula	29	10.7
Total	272	100.0

All MSU Extension program areas were represented, including 76 (27.9%) County Extension Directors; 60 (22.1%) Children, Youth and Family educators; 58 (21.3%) Agriculture and Natural Resources educators; 56 (20.6%) 4-H Youth educators, 12 (4.4%) Community and Economic Development educators; and 5 (1.8%) Sea Grant educators. Five respondents (1.8%) indicated they were some other type of Extension educator. (See Table 4.2.)

Table 4.2

Distribution of Educators by Program Area ($N = 272$)

Program Area	Number of Educators	Percent
County Extension Director	76	27.9
Children, Youth and Families	60	22.1
Agriculture and Natural Resources	58	21.3
4-H Youth	56	20.6
Community and Economic Development	12	4.4
Sea Grant	5	1.8
Other	5	1.8
Total	272	100.0

Although new hires into MSU Extension now must have a master's degree, before 2007 many Extension educators were hired who had only a bachelor's degree. Educational levels of the respondents ranged from a bachelor's degree as the highest degree to a doctorate. Of the respondents, 105 (38.6%) had only a bachelor's degree, 149 (54.8%) had a master's degree, and 18 (6.6%) had an earned doctorate. (See Table 4.3.)

Table 4.3

Distribution of Educators by Highest Degree Earned ($N = 272$)

Highest Degree Earned	Number of Educators	Percent
Bachelor's degree	105	38.6
Master's degree	149	54.8
Doctorate degree	18	6.6
Total	272	100.0

As shown in Table 4.4, ages of the educators ranged from 25 years and under (n = 4) to 56 and over (n = 71). The largest number of educators (n = 92) was in the 46–55 age group, representing 33.8% of the respondents. Almost 60% of the educators were age 46 and older.

Table 4.4

Distribution of Educators by Age (N = 272)

Age	Number of Educators	Percent
25 or younger	4	1.5%
26-35	56	20.6%
36-45	49	18.0%
46-55	92	33.8%
56 or older	71	26.1%
Total	272	100.0%

With 60% of the educators age 46 and over, one might expect that a large number of them would have had considerable experience with Extension. However, 50% (n = 136) of the educators had been with the organization 10 or fewer years. Further, as seen in Table 4.5, 22.7% (n = 62) had 21or more years of experience with MSU Extension.

Table 4.5

Distribution of Educators by Years of Experience with MSUE ($N = 272$)

Years of Experience with MSUE	Number of Educators	Percent
1-5 years	64	23.5%
6-10 years	72	26.5%
11-15 years	39	14.3%
16-20 years	35	12.9%
21-25 years	26	9.6%
More than 25 years	36	13.2%
Total	272	100.0%

Access to Technology and Specific Hardware

Participants were asked what technologies, in terms of actual hardware, they were provided with and what technologies they actually used. Because previous researchers (Davis, 1989) had found that people use those technologies that they perceive to be useful, it was important to determine whether there were technologies that were not provided but nevertheless were used by the respondents, and also whether technologies were provided but then not used.

Sixteen technologies were listed on the questionnaire. Respondents were asked whether each technology was provided for them and whether they used it. The technologies were personal digital assistant (such as Palm Pilot), desktop computer, high-speed Internet, portable DVD player, notebook computer, cell phone, color printer, IPod or MP3 player, global positioning system, scanner, CD-ROM burner, DVD burner, webcam, digital camera, USB flash drive, and digital video recorder.

The technology most often provided was high-speed Internet; 261 (96%) of the respondents said it was provided and used. The next most commonly provided item was a color printer (n = 237, 87%), followed by a CD-ROM burner (n = 235, 86.5%) and notebook computer (n = *282,* 84%). Next were digital cameras (n = 217, 79.8%) and USB flash drives (n = 214, 78.7%). Desktop computers were provided to and used by 204 (75%) of the respondents. Some educators had both a desktop computer and a notebook computer available to them. Also, in many cases, although a specific hardware was available to these educators, it might have been shared with other educators and hence not available on a daily basis or without scheduling its use.

One of the technologies least often provided for staff was a personal digital assistant or some sort of hand-held digital device used to integrate calendars, files, contacts. Only 44 (16.3%) of the educators reported having access to them. "I'd like to see what a PDA could do, but I haven't even held one in my hand," one respondent commented. Another said she had very limited access to technology and specifically PDAs, "Our 'high speed' is very slow, computers/projector old and out of date, website poorly maintained. We have no ability to use our laptops online/networked in our office, no access to PDAs or other technology outside of basic computers."

Respondents also were given space to indicate any technologies they used that were not listed on the questionnaire. Thirty-nine (1.4%) respondents noted "Other." The technologies noted as "Other" and itemized by respondents as used but not on the list given included LCD projectors (n = 23, .8%) and digital video cameras (n = 7, .02%). Other technologies specified by three or fewer participants included portable public

address systems, zip drives, fax, microscope, Turning Point, external hard drives, weather station, and satellite dish.

Table 4.6

Technologies Provided to Educators ($N = 272$)

Technology	Number of Educators who had the technology provided for them	Percent of Educators who had the technology provided for them
High Speed Internet Access	261	96.0%
Color Printer	238	87.5%
CD Rom Burner	219	86.5%
Notebook Computer	231	84.9%
Digital Camera	217	79.8%
USB Flash Drive	214	78.7%
Desktop Computer	206	75.7%
Scanner	170	62.5%
Webcam	165	60.7%
DVD Burner	142	52.2%
Cell Phone	120	44.1%
Portable DVD Player	73	26.8%
Personal Digital Assistant	44	16.3%
Global Positioning System	36	13.2%
Digital Video Recorder	8	2.9%
Ipod or MP3 Player	5	1.8%

Source of Technology

An issue to which numerous respondents alluded was the source of technological equipment. For the most part, the counties are expected to provide technological hardware for MSU Extension educators. As one respondent pointed out, "Funding for hardware is sometimes an issue, as the county feels MSU should provide it and vice-versa. One County Extension Director called the researcher within a few days of receiving the questionnaire and commented that the question concerning "provided for you" was difficult for her to answer because, although her county ultimately paid for the technology, it happened only because she fought so hard for it. She noted on her questionnaire: "1st question–'provided for you'--I had to find funding sources for the various technologies that we have at the office."

In comments they made on the back of the questionnaire, educators also pointed out that although an item of technological hardware was provided, it might have been shared with other staff members and not readily available for use. "We also only have one laptop computer and one digital camera for a very large staff. I never use the laptop because it is hard to get, and I use my own digital camera for picture taking. We are definitely encouraged to use [technology] but access does not always equal out."

Some staff provided the technology for themselves, which sometimes resulted in the perception that technology was underfunded. "Extension under-funds technology and depends on my self-funding much of my computer needs, which is a strong signal that technology is not important to Extension administration! It is common to not have funds available for replacements of basic tools like computers even if it is used and needed to provide daily Extension programs." Some educators said they found funding to pay for

the technologies they wanted to use. "I'm entrepreneurial in obtaining funds to purchase technology for use in my job–If I "waited" for it to be furnished by MSUE or county gov't, it probably would never be available. I think you'll find this with most all employees who have and use technologies." Private donations were noted as a way to pay for technologies: "Although officially purchased by my county, some of the funds have come from private business donations." Another respondent said he provided what they he needed for himself personally. "I consider cell phone, laptop, projector, flash drive, and digital camera to be essential tools but are all of personal purchase and maintenance. I made it a personal priority to obtain." Another respondent said the same thing: "I often use my personal technology for business reasons because I do not have adequate funding to purchase business technology."

Inequities in Access

Some respondents described access to technology or the lack thereof as varying among counties. "It would be nice if all Extension offices had the same availability and access to technology. For example, it sometimes makes it difficult when one office has a laptop that is brand new and another has an old laptop from 1998. Also, it makes people feel like it's personal when they are in the office that is out of date, and others are able to use new software that is associated with the most current technology and they are stuck with equipment that is not compatible with current technology."

Several comments evidenced a perception that some counties had more access to technology than did other counties. "The staff use of technology completely depends on the amount of money a county can spend on technical tools. Big counties have more, small counties have less. This will always create a gap until it is addressed." Another

said, "The biggest problem that I see facing us on this technology issue is making sure that everyone who needs or desires to learn in this format has adequate access to it." And one educator said she had access to all the technology she needed but noted, "There seems to be a real disparity among some relative to technology. Some educators seem to get a new computer every couple of years. Others limp along with an outdated computer until it crashes so routinely that the computer is just not reliable; then they scrape together dollars from three or four sources just to update. This issue needs to be addressed by the organization." One respondent even suggested that this situation could lead to inequities in performance assessments: "Use of technology is not consistent due to variability between county Extension offices. Extension values technology, but remains dependent on county resources. Potential exists for inequity in performance evaluation due to the discrepancy."

Access in General

Respondents were asked whether they agreed with the statement "I have sufficient access to technology for my work." They were to respond using a 5-point Likert-type scale, with 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. The mean was 3.55, with a standard deviation of .916. A majority of respondents (n = 176, 65.2%) agreed or strongly agreed they had sufficient access to technology.

Preparedness

Two sections of the questionnaire were designed to learn about how prepared the respondents were to use technology. They were asked to rate their preparation from six possible sources: college, MSU Extension in-services, independent learning,

interactions with other staff in their office, people outside of Extension, and courses outside of Extension. Respondents also were asked how prepared they felt to use technology in their work, as well as a series of questions about their comfort and confidence in using technology. In general, when asked whether they felt adequately prepared to use technology in their educational programming, respondents scored a mean of 3.59 with a standard deviation of .75. Almost half (n = 126, 46.5%) thought they were prepared to a small or a moderate extent. Only 29 (10.7%) reported that they were entirely prepared to use technology in their educational programming.

Source of Knowledge

The most common source of respondents' knowledge about the use of technology was independent learning, followed by interactions with other staff. The third most common source was friends and family outside of MSU Extension. The sources from which they were least likely to get their knowledge about technology were any types of classes, whether offered by MSU Extension, organizations other than MSU Extension, or as part of their formal education in college. (See Table 4.7)

Table 4.7

Source of Preparation for the Use of Technology

Source of Technology Preparation	Mean	Standard Deviation
Independent learning	3.45	0.90
Interactions with other staff	2.99	1.04
Friends and relatives outside MSU Extension	2.61	1.05
In-service, or courses offered by MSU Extension	2.43	0.97
As part of college education	2.16	1.16
Courses offered by organizations outside MSU Extension	2.03	0.98

Means were calculated on the basis of the following 5-point Likert scale: 1 = not at all, 2 = to a small extent, 3 = to a moderate extent, 4 = to a great extent, 5 = entirely

Comfort and Confidence With Using Technology

Most educators (n = 219, 80%) in the study agreed or strongly agreed that technology enhanced their ability to teach their clientele. As shown in Table 4.8, they also were confident in their ability to use technology to teach, learn new technologies, and use technology effectively in their work. However, half (n=136) of the educators were neutral or did not think they had adequate training in the use of technology and only 5.5% (n = 15) strongly agreed they had adequate training. The majority (n = 209, 77.4%) of educators said they were neutral or did not have enough time to learn new technology skill, whereas only five individuals (1.9%) strongly agreed they had enough time to learn new technological skills.

Table 4.8

Educators' Degree of Comfort and Confidence in Using Technology in Their Work

Statement	Mean	Standard Deviation
Technology enhances my ability to teach my clientele	4.09	.76
I am comfortable using technology to educate others	3.96	.78
I am comfortable with learning to use new technologies	3.96	.79
I am comfortable with computer technology	3.93	.83
I use technology effectively in my work	3.90	.74
I like to experiment with using technology in new ways to enhance my work with clientele	3.67	.98
I am developing expertise in the use of technology in education	3.59	.83
I've had adequate training in the use of technology	3.29	.94
I have adequate time to learn new technology skills	2.60	.98

Means were calculated on the basis of the following 5-point Likert scale:
1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

Actual Use of Technology

Respondents' actual use of technology was measured in two separate sections of the questionnaire. The first section addressed the actual use of the hardware to which educators had access. They were asked to answer "yes or no" to whether they used the technology. The respondents' actual use of specific technologies is shown in Table 4.9.

Table 4.9

Educators' Actual Use of Technology

Technology	Number of Educators used the technology	Percent of Educators who used the technology
High-speed Internet access	263	96.7%
Color printer	252	92.6%
Notebook computer	244	89.7%
USB flash drive	244	89.7%
Cell phone	234	86.0%
Digital camera	234	86.0%
Desktop computer	209	76.8%
CD-ROM burner	204	75.0%
Scanner	157	57.7%
DVD burner	128	47.1%
Portable DVD player	100	36.8%
Personal digital assistant	66	24.3%
Webcam	61	22.4%
Global positioning system	59	21.0%
Ipod or MP3 player	47	17.3%
Digital video recorder	23	8.5%

Differences Between What Was Provided and What Was Used

Four technologies were not always used, even if educators had access to or were provided with them. The technologies were CD-ROM burners, scanners, webcams, and DVD burners. The largest difference between access/provided and used was with regard to webcams; 165 (60.7%) of the respondents had access to them but only 61 (22.4%) had used them.

Table 4.10

Technologies Provided but Not Always Used by Educators

Technology	Number who had access	Percent who had access	Number who used it	Percent who used it	Difference
CD-ROM Burner	219	86.5%	204	75.0%	15
Scanner	170	62.5%	157	57.7%	13
Webcam	165	60.7%	61	22.4%	104
DVD burner	142	52.2%	128	47.1%	14

Over the past 2 decades, MSU Extension has made investments in technology that educators sometimes have viewed as not being what they needed. Some respondents mentioned this in the Comments section of the questionnaire. As one respondent pointed out:

> MSUE has made a few major investments in technology that were never effectively utilized and even were considered somewhat burdensome in some instances (satellite dish/download satellite broadcast programming; desktop video conferencing that never worked, yet was expensed to county budgets). It is sometimes difficult to implement campus-based technologies in remote/rural areas with limited access to technology infrastructure and less access to technology support through the county.

This was echoed by another respondent who said

> Extension should be sure that all offices embrace a certain technology before spending money on it. For example, in the mid-1990s, every office received a satellite for digital conferencing. This was used only a few times by most offices. Other groups got more use from the dish than Extension. A big waste of money.

Another said, "Much of the technology provided to counties (satellite dishes, desktop video conferencing, Portal) has been done without county input as to what they need. This top-down approach does not work well in MSUE."

The technology with the biggest difference between provision and use was cell phones; the technology was not provided, but it was used. Only 119 (44%) of the educators had cell phones provided for them, but 234 (86%) or almost twice as many used cell phones in their work. This number could be even higher because a number of respondents noted that they would use a cell phone if they could, but that there was very little cell phone coverage where they worked. This was primarily the Upper Peninsula of Michigan but included some of the counties in the northern Lower Peninsula, as well.

Tasks Performed Using Technology

To determine how often the educators in this study used technology and, more specifically, how they used technology, they were asked to rate how often they used 23 specific technologies (1 = never, 2 = once per month, 3 = weekly, 4 = more than once per week, 5 = every day). These questions were related to ways in which they might use the technological hardware to which they had access. Respondents also were given space to write in additional technologies. Only one respondent added a technology, and that was social networking sites, i.e., Facebook. The technologies for which educators were asked

to rate their use ranged from common ones such as cell phones and e-mail to web applications, including blogging and creating web pages. The instructions specified that respondents were to report only their own use of the technology, not how often they gave instructions to an assistant to use the technology for them. For instance, some staff members might write an article and then give it to an assistant to place on the MSU Extension portal rather than doing it themselves. In this case they were not to include that technology.

For purposes of discussion, the 23 technologies were divided into three groups: (a) the seven most often used technologies, (b) the nine technologies with medium reported use, and (c) the seven least used technologies. The seven most commonly used technologies, in order of use from most often used to least often used, were word processing, using search engines such as Google, using cell phones, sending attachments with an e-mail, doing online research, sending e-mails to groups of people within MSU Extension, and using spreadsheets such as Excel. They are listed with their means and standard deviations in Table 4.10. The only technology that was used by all of the respondents was going online to research something for work; however, three educators reported never having used a search engine such as Google. Of the seven most commonly used technologies, the one that the most educators had never used was spreadsheet software such as Excel and Access. Thirty (11.1%) educators reported never having used spreadsheet software, and another 63 (23.2%) reported using spreadsheets once a month or less often. The second technology that numerous educators had never used in their work was a cell phone. Nineteen (7%) respondents reported never having used a cell phone for work, and another 13 (4.5%) used a cell phone once a month or less

often. Word processing to create a document was the technology the respondents used the most often, and even though 4 (1.5%) educators reported never using word processing to create a document, 188 (69.6%) used word processing to create documents every day. This was followed by using a search engine such as Google (M = 4.35) and using a cell phone (M = 4.27) as the second and third most commonly used technologies.

Table 4.11

Technologies the Educators Used Most Often

Technology Used	Mean	Standard Deviation
Use word processing to create a document	4.54	.82
Use a search engine such as Google	4.34	.88
Use a cell phone	4.27	1.21
Send a file as an e-mail attachment	4.19	.95
Go online to research a subject related to work	4.02	.93
Send e-mails to groups of people within MSUE	3.97	1.20
Use spreadsheets such as Excel or Access	3.20	1.29

Means were calculated on the following 5-point Likert scale: 1 = never, 2 = once a month or less, 3 = once a week, 4 = more than once a week, 5 = every day

The nine technologies in the medium-use group, from most often used to least often used, were using a fax machine, getting directions online or using mapping sites, looking up a phone number or address online, creating with or using presentation software (such as PowerPoint), registering for a conference online, using a database (e.g., Blue Ribbon database for 4-H), converting a document to a pdf file, using desktop publishing (such as Publisher), and updating an online calendar (e.g., Google calendar). The means and standard deviations for the use of these technologies are shown in Table 4.12.

At least some of the educators had never used every one of the technologies in the medium-use category. The majority (n = 150, 55.4%) had never updated an online calendar. Many others had never used either databases (n = 114, 41.9%) or desktop publishing (n = 89, 32.7%).

Table 4.12

Technology that Educators Used Midrange

Technology	Mean	Standard Deviation
Use a fax machine	3.16	.93
Get directions online or use mapping sites	3.05	.98
Look up phone number or address on line	2.95	1.24
Create with or use presentation software	2.64	.98
Register for a conference online	2.29	.78
Create or use a database	2.23	1.39
Convert to pdf using Adobe	2.10	1.17
Use desktop publishing such as Publisher	2.03	1.02
Update online calendar	1.97	1.34

Means were calculated on the following 5-point Likert scale: 1 = never, 2 = once a month or less, 3 = once a week, 4 = more than once a week, 5 = every day

The seven technologies that respondents used least often were, in order from most often used to least used, were managing a LISTSERV, publishing on a web page or blog, publishing on the MSU Extension portal, using web publishing software (such as Dreamweaver or Frontline), using graphic software (such as Corel), instant messaging, and updating or changing a wiki. Their means and standard deviations are listed in Table 4.13. The vast majority of respondents had never done these things or did them once a

month or less often. Several respondents did not know what a wiki was, and one wrote in the space next to it "a what?"; another wrote, "I don't even know what this is." Almost all of the respondents (n = 264, 97%) reported never having edited a wiki. Similarly, 242 (89%) had never used instant messaging, 236 (86.7%) had never used web publishing software, 229 (84.8%) had never used graphic editing software, 205 (75.6%) had never published anything on the MSUE portal (by themselves), and 198 (73%) had never published anything on either a web page or a blog. Furthermore, those who had used these technologies employed them less often than other technologies. MSU Extension's main online presence is their portal, yet only 9 (2.3%) of the educators published something themselves on the portal once per week or more often. The other 57 (21%) educators who did publish on the portal did so once a month or less often.

Table 4.13

Technologies That Educators Used Least Often

Technology Used	Mean	Standard Deviation
Set up or manage a listserve	1.54	.93
Publish on a website or a blog	1.38	.75
Publish something on the MSU Extension portal	1.29	.59
Use web publishing software	1.25	.75
Use a graphics editing program	1.24	.67
Exchange instant messages	1.20	.69
Edit a wiki	1.04	.29

Means were calculated on the basis of the following 5-point Likert scale: 1 = never, 2 = once a month or less, 3 = once per week, 4 = more than once per week, 5 = every day

The respondents were divided into three equal groups by total scale of use and the mean of their reported actual use was plotted on a radar chart for the sake of visualization of the differences. See figure 4.1

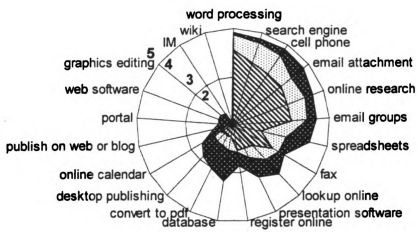

Figure 4.1 Radar chart depicting actual use of three groups of Extension educators using scale of 5 = every day, 4 = twice a week, 3 = weekly, 2 = once a month or less, 1 = never Lowest third = Middle third = Highest third =

Usefulness and Ease of Use of Technology

When asked the general question about the usefulness of technology at work, a large majority of the respondents said they agreed or strongly agreed that technology was useful in their work ($M = 4.80$, $SD = .41$). However, it should be noted that this response referred to technology in general and included respondents' perceptions of using word processing, e-mail, and cell phones, which were their most commonly used technologies.

The educators were not as positive about the ease of use of technology at work (M = 3.91, SD = .83). One technology that respondents specifically mentioned in comments as being difficult to use was the MSU Extension portal. One respondent said, "The portal is so cumbersome that I gave up on it long ago. The designers tried to blend the goals of providing easy access to information to the public with sophisticated intra-organizational communications; it doesn't work." Another also cited the portal as being difficult to use: "I think we have made technology (especially the portal and EIS) needlessly difficult and frustrating to use. We do not have a good search engine on our portal, which makes it difficult for us or the public to find information." One respondent wanted to use the web and the MSUE portal but found it difficult: "I would like to be able to use the web and MSUE portal to communicate with clientele and distribute information more effectively, but the portal technology is cumbersome enough that I only use it minimally."

Barriers to the Use of Technology

The questionnaire did not specifically ask respondents to identify barriers to using technology. Individuals selected for interviews were asked to specify what they saw as major barriers to their use of technology, and their answers are discussed in Chapter 5. However, analysis of the comments section of the questionnaire did reveal several barriers to the use of technology; these include time to learn, individual negative attitudes toward technology, and a perception that clientele would not use technology. There were also numerous comments on the lack of training and lack of technical support, which respondents considered barriers to their use of technology. The first four barriers are discussed in the following paragraphs; lack of technical support will be discussed in the last section of this chapter.

Lack of Time as a Barrier

In the comments section of the instrument, numerous respondents cited time or lack thereof as being a major barrier to their ability to use technology. One said, "Time is the big issue. Takes time to learn, and I feel we don't have a lot of extra time in Extension to learn new techy [sic] things." Several educators cited not only time but specifically time to travel to training, "Preparation–More training would be great, but not if you need to drive 2.5 hours to get there. Not enough time." This sentiment was echoed by another respondent who said, "I would like to see more opportunities for technology training that did not require long traveling (more than 2 hours round trip)." Others said that they had little time and found a gap between the time they learned (presumably at a remote location) and when they returned to the office. "I find that trainings are helpful but I lose something when I return to my county office." Another respondent was aware of technology workshops available through MSU and MSU Extension but said, "The problem lies with having the time to practice or there are just too many things that occur between the opportunity to use what you learned and when you learned it."

Several cited a learn-as-you-need-to-know approach, apparently due to lack of time. One said, "I find the most difficult aspect of use of technology is having and taking the time to try to keep up with new changes and advancements. I usually learn as I 'need to know' to use the technology." Another said, "My tech training has largely been learn as you go. When I have had assistance, I have been able to glean enough information to keep going and progressing. We are so busy doing our jobs, there is little time to take for adequate training, so it's been do and learn."

Sometimes it appeared that the educators genuinely wished they had more time to learn but felt overloaded with programming responsibilities. One said, "Regarding confidence and comfort in tech use: I wish I had more time to experiment and learn!" Another expressed the desire to learn but found that other responsibilities took over. "Basically, I wish I had more time to get advanced technology training. However, my program work load demands 70% to 80% of my time monthly in hands-on program delivery. The other 20% to 30% of my time is in program administration."

Attitudes and Beliefs as Barriers

Some respondents referred to their age or to how long they had been working in the comments section. It seemed they used their age as a reason for not using technology more. For instance, one educator explained, "I did not start using any of the technologies listed until I was in my 40s or 50s, so it's all been new learning for me." Another said, "I was in college in the 60s, so I didn't have any computer training. I learned as needed in my job. I'm a retired teacher and am having to learn technology that I haven't had to use when teaching (reporting systems, etc.)." This comment seems to imply that younger workers might have had more training through their schooling. Another respondent seemed to be looking forward to retiring and not using technology: "When I retire in several years, technology for me will only be a line phone, no computer/no cell phone."

Other educators appeared to recognize that their attitude was more of a barrier than their age. One respondent noted she was like her grandmother:

> My grandmother did not drive . . . she didn't want to learn. As a youngster, I thought it was so odd and un-adventuresome not to want to learn to drive (the technology of the early 1900s)! Now, although I use technology at work as needed, I realize that I don't think "that way" and have no inclination/interest in

> "hacking" to figure it out like some of my co-workers. I think perhaps I have a bit of my grandmother in me!!!

Another admitted to a lack of interest in using technology.

> I truly believe technology is important in my job–however, I do not have an interest in sitting at a computer for hours to learn new things (this is why I have a competent secretary to assist me). I am in awe at what is out there in the market and what we can do on a computer, but again I have no desire to be a "high tech" person. I am one who "gets the job done" and have help with computer needs such as flyers, info, etc.

Some respondents either said they thought technology was a mixed blessing or simply preferred a more personal experience and believed they lost that in using technology. "I still like the personal phone contact or face to face," said one. Another said he appreciated that MSUE values personal interaction:

> I consider technology a mixed blessing. Person-to-person communication seems to decline as technology use increases. Often the technology gets in the way of meaningful communication, teaching and learning. I appreciate the fact that while MSUE promotes use of technology in communication, teaching and learning, we still value personal (real, live, non-digital) interaction.

That attitudes influenced use of technology even was noted by one respondent who pointed to others as not using it: "My office has incredible access to technology and technical support from our county, but my CED and over half my office **refuse** to use it and make it difficult to integrate new technology into our office lives." Another also talked about other people: "People are leery about using new teaching techniques for fear of failure or looking incompetent."

Clientele as a Barrier

Clientele's being poor, rural, or old were some of the barriers to use of technology cited by a number of respondents. "I find that in some cases technology is not effective with some of my older clients, while the younger ones expect it," stated one educator. Another noted, "Farmers don't utilize the computer as much as other populations. This affects my ability to communicate with them using some media platforms. I expect that to change as older farmers retire or pass away and the rising generations take their place."

Low-income clients were mentioned as a barrier by several respondents. One said, "I primarily do home visits, so I can't use PowerPoint in low-income homes. I recently began to take out a portable DVD player." Another respondent echoed this sentiment: "We work with low-income audiences. We are observing that PowerPoint presentations are not as effective as they once were. Clients seem to look upon them as "just another screen" and are not attentive much of the time. I can hold their attention better by just talking to them." Clients just were not very receptive to changes, according to one educator:

> I thought I would use technology (particularly presentation software and digital projector) more often than I have. I live and work in a rural community, and while a majority of our customers (4-H leaders and members) do have internet access, a number of our key leaders (volunteers) are not very receptive to such changes. My impression is that PowerPoints annoy them, quite frankly, even when they're done well (concise bullet points, not read word for word, etc).

Training as a Barrier

When asked to rate their agreement or disagreement with the statement that the training they needed in technology was available to them, 178 respondents (65%) were either neutral, or disagreed or strongly disagreed. Only nine respondents (3.3%) strongly

agreed that such training was available to them. A number of respondents noted in the comments section that lack of readily available training was a problem for them. One believed that underuse of technology was directly connected to lack of training: "I think that technology, especially web meetings and such, is terribly underused. We need to increase the training available so we can use these things and help to reduce the amount of time and $ used on travel."

One respondent cited lack of training on use of the portal (even though portal training had been offered). "The portal was a good idea, but no training has been provided to staff on its use (other than those that manage it for the office). I have just begun to explore it on my own." The respondent went on to say, "Most of my technological use has been trial and error or learning it from my secretary."

Another educator said that almost no technological training was available: "Technology training offered through MSUE is essentially nonexistent. Best ways to offer training would be through fall conference or regionally." Being able to get into training sessions was also a barrier to some respondents. "MSU libraries' tech support is great. Their class offerings look great, but notice of them comes out without enough lead time to fit into an already full schedule, and campus people get the notice one to three days earlier, so sessions are full the day we get the class listings."

Some respondents listed specific needs for training. One said, "I would like to see training offered in information management–how to organize and retrieve the information overload we seem to accumulate." Another said she needed "to learn more about designing and maintaining web pages. I also need to gain a better understanding of managing and using digital images." Yet another asked for "support on advanced-level

programs" and went on to say that Extension needed to offer advanced training for techniques in Photoshop, Publisher, and Direct Publishing software to "facilitate the development of fact sheets, bulletins, etc."

General Support

Questions about general support for technology in the educators' work focused on their perceptions of MSU Extension's support of their use of technology. Specifically, questions concerned the educators' perceptions of support from MSU Extension administrators, whether they were actively encouraged by MSU Extension to use technology to enhance programming, whether the training they needed was available to them, and whether they were encouraged to find new and innovative ways to use technology to enhance their educational programming. Respondents were asked to rate their level of agreement or disagreement with several statements on a 5-point scale... Means and standard deviations for these statements are shown in Table 4.14.

Table 4.14

Educators' Perceptions of Their General Support From MSUE

General Support from MSU Extension	Mean	Standard. Deviation
MSUE actively encourages the use of technology to enhance programming efforts	3.80	.84
MSUE administration supports the use of technology in Extension	3.74	.92
I am encouraged to find new and innovative ways to use technology to enhance my educational programming	3.32	.85
The training I need to improve my technology skills is available to me	3.01	.95

Means were calculated on the basis of the following 5-point Likert scale: 1 = not at all, 2 = to a small extent, 3 = to a moderate extent, 4 = to a great extent, 5 = entirely

Technical Support

According to 195 (71.7%) of the respondents, technical support was provided by local county support persons. Another 15 (5.6%) mentioned campus-based support, and 58 (21.3%) of the Extension educators chose "Other." Those indicating "Other" on the questionnaire were asked to elaborate, and the most common listings were friend, family member, and local computer store staff.

Educators' perceptions of the support they received were measured with six statements. Respondents used the same 5-point scale to indicate their agreement with each statement. Means and standard deviations for the statements are shown in Table 4.15.

Table 4.15

Educators' Perceptions of Their Technical Support

Statement	Mean	Standard Deviation
I have adequate support for problems that arise	3.49	.99
I have adequate access to technical support	3.37	1.06
I might use technology more if I had better support	3.21	1.09
My technology support person responds immediately to my request for assistance	3.11	1.08
I rarely need to seek technical support	3.00	.99
My support person shows me techniques for how to integrate technology into my programming	2.46	1.07

Means were calculated on the following 5-point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

Technical support for Extension educators is necessary to enable them to reach their best potential in programming. Not all of the respondents believed they needed technical support, but some did. One educator stated simply, "I need lots of help with technology."

The majority of respondents used local county technical support and reported that, in most cases, it was adequate for their needs. As one educator expressed it, having good professional support was essential: "Problem solving halts all progress. Need a way to deal w/tech problems on an immediate or at least timely basis. These problems usually are not common and aren't in 'average everyday' computer work. These problems usually take 'professional' tech support to handle." Another educator expressed appreciation for local support by saying, "Our office houses the county Technology Coordinator and works hard to keep our staff current w/programs and equipment. He also teaches Word, Word Perfect, Access, PowerPoint, and many other classes. I feel fortunate to be able to use him for questions." In contrast, another person stated, "I am able to use technology well in spite of county 'assistance.'"

Other educators indicated that getting technical support for small counties was a problem: "Lack of technical support is a major issue for small counties, in particular. No technical support is provided by the county governmental office, and the MSUE county office budget is too small to allow contracting with a tech support person." Another educator said she had no support locally but called campus when she needed it: "Regarding tech support: I don't very often need it, but when I do there is no one to call on. Occasionally I still call Luke Reese, even though this is no longer his role."

Sometimes technical support was not in line with the educator's actual need. One put it this way: "I've had difficulty getting support folks to help me do what I want to do.

At times it's 'Let's change this, turn that upside down.' I need simple, to-the-point support, and campus support needs to understand that County Extension offices don't always have the newest and fastest equipment or the $ to upgrade."

Summary

Analysis of the data indicated that although most educators believed technology was useful to them in their jobs, their actual use of technology primarily was restricted to the use of cell phones and computers for word processing and e-mail, and presentation software such as PowerPoint, which was used for face-to-face presentations. The use of Internet technology, especially web pages, blogs, the MSUE portal, and Wikis was very low with only one fourth of educators using these technologies at all. Those that did use them usually did so once per month or less often. Access to technology hardware was provided by local counties and almost all educators had access to the basics of either a desktop computer or a laptop computer and high speed access to the Internet, however access to peripherals varied considerably. In many cases, Extension educators provided technology for themselves if they want to use it and it isn't available. There is a belief that an inequity exists between counties with smaller counties having less technology than larger counties which might lead to a disadvantage for those educators working in smaller counties. Perceived barriers to using technology were; lack of time, attitudes about themselves and technology, beliefs about clientele and lack of training. Preparation to use technology came most often from independent learning, followed by interactions with other staff, and friend and family. In-service classes offered by MSUE were the 4th most common source of preparation for using technology, followed by their college

education and lastly classes offered by organizations outside or MSUE. In general educators believe that MSUE supports the use of technology, but many believe that some technology investments have been a poor vision and not very useful to educators. The MSUE portal is described as being difficult to use and not particularly useful. The most common source of technical support is the local county with a little over 70% of educators indicating the local county was their main source of technical support. A small number (about 5%) indicated their technical support came from campus. The rest looked to outside sources for their technical support and often turned to family or friends. The technical support that is given is sometimes sufficient, but not always with some educators indicating that they needed better support and most saying they would use technology more if they had better technical support. Results of the interviews with low-, medium- and high-technology-use educators are discussed in the next chapter. This discussion provides a deeper and richer understanding of the issues involved in educators' use of technology.

CHAPTER V

INTERVIEW RESULTS

This chapter contains the results of the interview portion of the study. Each interview consisted of eight questions, with follow-up probes to help understand the answers when necessary (see Appendix). Due to time limitations, just 15 of the 272 survey participants were interviewed. Interviewees were chosen on the basis of their survey results of responses concerning the level of technology use, as well as other factors such as gender, programming responsibility, educational level, age, and geographic location. The interviews were conducted by telephone and recorded digitally. Responses were later transcribed to aid in the analysis.

There were 15 interview participants, nine females and six males representing all program areas of MSU Extension. Two were County Extension Directors. Educational levels ranged from 1 participant with a doctorate, 3 with a bachelor's degree, and 11 with master's degrees. One was under 25 years old, three were 26 to 35, four were 36 to 45, five were 46 to 55 and two were over 55 years old. Two were from the Upper Peninsula, two from the Central region, three from the North region, and four each from the South East and South West regions of MSU Extension. The interview participants' use of technology at work and at home ranged from low use to high use, with five in the bottom third, five in the middle third, and five in the upper third. The levels of use were arbitrarily divided into three even groups by thirds. This selection provided a sample that was approximately representative of the 272 survey participants. A scatter plot diagram was used to identify individual cases and selection was based on demographic criteria.

As shown in Figure 5.1.

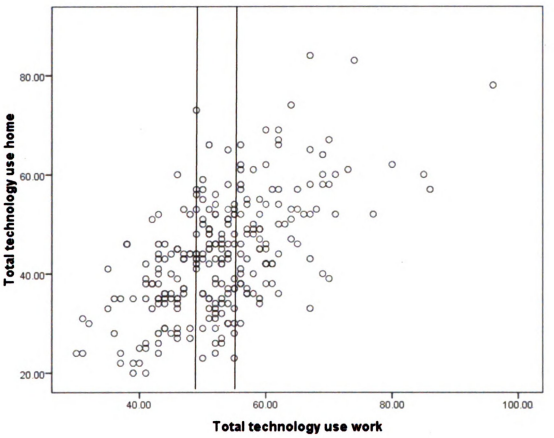

Figure 5.1 Scatter plot of correlation of educator's actual use of technology at home and at work used to identify individuals for purposes of interviews.

Low-Use Participants

Types of Technology Used

All of the low-use interview participants used word processing to create documents such as letters and brochures. They also used e-mail, although they were not always able to describe their e-mail system very well. All of them talked about using e-mail to communicate with other staff and clientele. One person with a dual county assignment said there were challenges with using two different e-mail systems. She explained that

both of her e-mail accounts were "filtered through MSU" but that they were different to use. This individual described going out of one system into another. "If you ask me what that is, I know one is Outlook and, um, all I know is push these keys and so forth to get into the other one" (Case 234).

The interview participants reported some familiarity with desktop publishing, e.g., Publisher, and presentation software such as PowerPoint. However, only one of them had actually prepared their own PowerPoint; all of the others had only presented PowerPoints that had been created by other staff. These were premade PowerPoints from another source, such as campus, or in some cases the interviewees had given the information they wanted on PowerPoint to an assistant, who had then created it for them. One had difficulty remembering what it was called and said,

> I don't even know what the terminology is, where I can flash it on the wall like an old overhead. PowerPoint? That is a useful tool for bigger crowds that I have, but then again that is . . . those are already packaged. Rarely do I use one that I created. I may use one where a page or two I created that is specific to my county. And I don't create them, my secretary does, and I just tell her what it needs to say and she does that for me." (Case 234)

Another interviewee said that although she had had some training in PowerPoint, she had not done more than play with it a little bit. However, she went on to say that she did know how to set up the projector and play someone else's PowerPoint (Case 201).

Other technologies that this group of interviewees specifically described using were scanners, digital cameras, conference calls, the Internet for finding information, and the MSUE portal or county websites. One individual had never used a digital camera, although he had scanned images. Scanned images typically were used in brochures and newsletters, although one individual had used scanned and digital images in PowerPoint presentations. The Internet was mentioned as a source of information, but one

interviewee said he tried to stay away from the Internet. "It's one of those deals where if I am using it and I'm on it, I'll use it for two hours, so I am careful with the Internet" (Case 40).

None of the low-use interview participants had ever placed an article, picture, or link on the MSUE portal, a local county website, or any other Internet page. When asked about the MSUE portal, one said he had a very minor presence there, and it was used mostly as a way for people to find him when they needed information. In all cases, any document that was placed on the MSUE portal had been put there by an assistant. One interviewee talked about a calendar of events that her secretary placed on the county website.

Usefulness and Ease of Use

Answers to the question about what was the most useful technology for work were equally divided between e-mail and some sort of word-processing or presentation software. Two interviewees said e-mail was the most useful but that they really used word processing (either Word or Publisher) the most for their work. With regard to what technology was the easiest to use, two said e-mail, one said PowerPoint (referring to making presentations with it), and the other said correspondence through either e-mail or writing letters using Microsoft Word. One participant did not specify but said, "What I use is easy to use, nothing complicated," meaning that she would use it only if it was easy to use (Case 234).

Technologies They Would Like to Use

In response to the question about what other technology the participants had thought of using but had not used, one said, "Nothing, not really, maybe a laptop but no, not really" (Case 40). Two said they had participated in Adobe Connect but had not used it themselves and did not think they were knowledgeable enough to do it themselves. Another participant said she had not used PowerPoint and remarked, "I know that is something I really should use and I need to work on that, learn how to use it" (Case 201). The same participant also expressed interest in learning to use Excel. She had attended an evaluation workshop where there was demonstrated "a particular software [SPSS] where you can input your data and create graphs and like that." She said she thought it would be very helpful if she could get that software and use it. A participant who was a 4-H educator expressed interest in being able to put 4-H forms on a website so that people could submit them online.

The Choice to Use Technology

For the most part, the interviewees in the low-use group had decided to use technology because they needed to. They specifically said, "If I have to" or said it was a requirement of their work. One said he would decide to use a technology because it would be imperative to what he was going to do that week. "It is usually because I need it that week, and therefore there is great inspiration to finally figure it out. I rarely ever put a schedule ahead of me, like next month I'm going to learn this; it is something comes along that forces it on me" (Case 58). Another said that she would decide to use something because she saw a need for it to improve her work.

How They Learn

One participant said that if he was required to use a technology he would go to a class on how to use it. Another said he needed to learn hands-on. "I stumble through it with a little help, but I probably therefore never learn the whole thing efficiently, but if I can get it done the next time, that's all right with me" (Case 58). He went on to say that he preferred printed manuals but wasn't always able to use them. Another participant related how she had bartered for one-on-one tutoring by bringing in an educator from another county for a day. That educator then talked her through some technology issues. In exchange, the interviewee taught the other educator how to do Extension Information System reports and how to quilt. Finding one-on-one tutoring was popular because classes did not seem to help once individuals were back at the office computer. "I prefer somebody to walk me through it. I am a visual person, so I like it written down step by step. But walk me through it first and talk me through it and then give me the written and let me try it. And then it is trial and error until I get it" (Case 234).

Barriers to Use

When asked about barriers to their use of technology, all of the participants mentioned time constraints, but they also went on to describe how they themselves often were the barrier.

> It might be that I am so overwhelmed with what I have, what I'm doing now, that I might not need it. Using it [technology] would make things more complicated. I don't know, it tends to be overrated, depending on the effectiveness of one's work, because some people might not need technology to do their work. (Case 40)

Two interviewees said they were too old, even though they were younger than many high users. "I think I'm just far enough behind that I would consider myself the

previous generation, and it is a matter of frustration and time with working with it. Time is most important because I have so many other things to do" (Case 58). Another talked about time but also financial resources to be able to purchase some technologies even though she had a new computer. She said:

> And there is the natural resistance to trying something new, kind of the fear factor coming from an older generation where we didn't have this kind of stuff. Sometimes it seems a little overwhelming, but once I've learned how to use it, it's . . . I love it, it's fun and I enjoy it. (Case 201)

Another interviewee echoed the time factor but went on to say that figuring out the logistics would be a challenge and also talked about losing the personal touch. "My gut feeling says no; . . . you lose that interaction that you get when everyone is in the same room, and you lose that personal touch" (Case 234).

Future of Technology and Their Work

One interviewee did not see himself using technology any more in the future than he currently did. He did say he thought the Internet might be used for web conferences in the future but that he did not have time to figure out how he could implement technology in his programming, "not with the job responsibilities that I have" (Case 40). Another said he thought he would use more e-mail communication and have more information available on either a county website or the MSUE portal, but he did not see himself as the person who would put it there. He saw his role as "providing information mainly. I'm hoping I can figure out how to get office staff to get it there. I don't want to put it there, but I'd be happy to generate stuff" (Case 58). Another interviewee said she expected MSU Extension to continue to adopt new technologies. "One thing we are using a lot more now is conference calls. I know I've been on two this week, and my boss on one today. With the increasing cost of gas, I see us using that whenever possible" (Case 201).

The other low-use participants both talked about the future use of conferences done online (to save money), but said they did not know how to do those or whether they would be used more by MSU Extension in the future. They did not indicate any specific technology that they would like to use themselves in the future.

Medium-Use Participants

Types of Technology Used

All of the medium-use interview participants reported using computers for word processing, e-mail, Publisher for brochures and newsletters, PowerPoint for presentations, and the Internet to research information using search engines. They also mentioned using Excel and web seminars such as Adobe Connect and placing items on a website that was either a county site or the MSUE portal. Three said they posted on the web for clientele use. However, when asked to provide more details, they said they gave directions to an assistant or secretary to do it for them, so they did not actually do it themselves. One explained, "I personally don't use any web-related software; someone else does that" (Case 9).

Two interviewees described previously or currently using personal digital assistants. One of them used a BlackBerry and had a calendar on it that was synced with a computer. Another reported that she used to have a Palm Pilot but found it was not as useful as she had hoped. "You can open a monthly planner and see a month at one time and you can find a meeting easily, but trying to find it on the Palm was too difficult. There were features about it that I really liked, so if they ever fixed that I would go back to it" (Case 259). She had returned to using a regular cell phone instead.

One of the participants said she was using web technology to do on-line training of volunteers. This consisted of a PowerPoint training module that had been placed on the MSU Extension portal. Along with it was a Word document designed to quiz the learner before and after using the training module. She hoped to make the training more interactive but said she needed assistance from someone on campus to make that happen; she did not know how to do it herself.

Usefulness and Ease of Use

Two participants said that Microsoft Word was the most useful technology to them, followed by e-mail. Both said they had to write letters and do their own correspondence and relied heavily on Word to get their work done, citing lack of secretarial support. Another said e-mail was the most useful technology because of the ability to communicate by sending messages to both clientele and colleagues at times when they would not be available to talk. However, one participant did not want to be pinned down on just one technology and said the most useful technology was the computer and all that it encompassed, meaning "all of the word processing, PowerPoint, and the databases, as well as the Internet and online technology for communications, teaching, and research" (Case 259).

The easiest technology to use was either e-mail or some other type of word processing, such Word or Publisher. One interviewee mentioned Microsoft Publisher as something she was just beginning to explore. "Now that I'm getting the hang of Publisher, I'm finding I use that a lot more. It is easier to manipulate, so I'm starting to use Publisher much more frequently" (Case 9). Another participant said she thought e-mail was easy: "You know, PowerPoint requires some knowledge, and maybe because

you are forced to use e-mail every day you get good at it, whether you want to or not" (Case 252).

Technologies They Would Like to Use

Having an online presence, teaching online, or conducting web seminars using Adobe Connect were of interest to all of the medium-use interview participants. One had taken a class in using Adobe Connect. "I went to an Adobe Connect workshop, but I don't feel I am expert enough in it to be an actual presenter. I would like to learn more so I can be the one doing the presentation" (Case 182). Another was familiar enough with Adobe Connect to mention it by name and said she hoped it would be enough of an improvement over previous types of web conference technologies that it would be worth the trouble to learn. She talked in detail about previous versions of web conferencing from the mid-1990s and how they were too expensive and did not work well enough to be useful. Another interviewee did not specify the method but said she would like to try teaching online. She said, "I really haven't taught anything that way myself. I think it would be a really cool way to share some of the programming I do" (Case 252). The same participant was specific in naming another technology she wanted to use, which was Outlook Exchange to share calendars. "I know on campus they have Outlook Exchange and I would really love to be able to use that to share with my office staff so people know what is coming up and what I am doing."

The Choice to Use Technology

Participants sometimes decided to learn to use a new technology because there was no choice, and in other cases because they simply wanted to learn it or to use something

to which they had been exposed. Several mentioned having seen a technology demonstrated or hearing about it at a meeting and then thinking about trying it. One said she saw Adobe Connect demonstrated at a regional meeting and knew someone who was having a workshop on it in another county, so she became interested even though she did not feel comfortable using it on her own (Case 182). Another said her use of new technologies was motivated "partly because I enjoy it. I like seeing what the new technology can do, and I am interested in seeing what it can do and how I can apply it. Part of it, though, is someone tells me I have to do some of these things." Some participants were not sure whether what they had seen might be of use to them but said maybe in the future they might use a certain technology. "Blogs and all that jazz are completely brand new to me. I can see where the people that are on our advisory committees, such as the crew that you have to talk with constantly I can see down the road where that could be beneficial" (Case 9).

How They Learn

Most of the medium users of technology liked a combination of classroom training and one-on-one help to learn how to use a new technology. All of them said they needed to try out the technology and learn as they did so, rather than just using a manual or learning in a classroom. None of the members of this group of interviewees said they were self-learners. "I learn better with someone helping me. I don't do as well if I have to learn it totally on my own. Classroom training certainly helps, but it doesn't help me as much as sitting down with someone" (Case 259). Another said it needed to be a combination, with the ability to actually try out what was being taught and then having support later on. Trainings without support later on can make it difficult to learn; as one

person said, "I find that trainings are helpful, but I lose something when I return to my county office" (Case 44).

One participant described how she had learned both Publisher and Excel using a combination of classroom learning and assistance from others in the office or the county information services staff:

> Publisher, I had an office staff person show me what they knew. I had to do it hands on, and I had to practice it for myself and have them right there. I have also had our county information support guys help answer some questions. For me, just going to a training doesn't work, because it's usually part of a textbook or whatever, and people show you something on the screen but you don't get to do it yourself. I need to do it myself. With Excel I did go to the county training for Excel, and you get back and you pull up something you really want to use or dabble with, and I could hardly remember a blasted thing, so I called and had a tutorial. I had the IS guys come out to me, and I said, "This is what I want to do, teach me how to do this." That works great. (Case 9)

Barriers to Use

Time was the first barrier mentioned by every interviewee in this group. Additional barriers to using technology were lack of technical support or access, lack of training and not knowing how to do something, and not enough money to purchase equipment or software. Some also pointed to clientele as a barrier because they perceived them as not being ready to use technology or not having access to it. One participant just did not want to use some of the newer technologies.

Sometimes even if there was enough time, there was no support. "Technical support is needed, too, because if I get into something and I'm not having success or it isn't working, there is nobody. I can't run and get the IT guy to help me because there is none" (Case 182). Two other participants specifically mentioned going to their sons (who did not work for MSU Extension) for help because they had no one else to turn to.

One had her son install a wireless network in the county office. "Why should I have to call my son? Why isn't there someone I can call? It frustrates me to no end" (Case 252). Another expressed frustration that the county was blocking access to some technologies. In some cases, even registration systems that MSU Extension had in place were blocked by the local county network. Gaining access required going to the County Extension Director, who then went to the county department to ask them to allow access.

One participant seemed to know it would take a lot of time to learn to use the technology but acknowledged that using technology might save time in the long run.

> I know it would take a lot of time to set it up and to input data. I bet initial set-up would be very difficult for me to find the time to do it, even though it might save me time later. Also, lack of having the skills and not really knowing if there is software to do it, and how to use it and that type of thing. There would be a learning curve there. (Case 252)

All but one person in this group also said that even if they had the time and knowledge to use technology, they would face either resistance from clientele or would not be able serve clientele as well because of their lack of desire to use technology or access to it.

> If you take your programming to the people, you have to adapt to where the people are. A large percentage of the people we work with are not the forward people of the world. They do not have access to the technology, and they are not interested. They are interested in where their next meal is coming from. (Case 44)

One interviewee put it this way: "We're still a real face-to-face county" (Case 182). Another said, "We still have a huge clientele here that are not all using computers and the Internet. That is still an issue" (Case 9).

When asked about using web pages or a web presence, one participant echoed some of the low users by saying she really did not have the interest. "In our county we need to

have someone that would be available to work on the web site and so forth, but me . . . I don't have time and I personally don't want to do it" (Case 252).

Future of Technology and Their Work

Most of the interviewees in this group said they envisioned more use of technology by MSU Extension in the future for staff conferences and to share information with staff. But their outlook on the future use of technology for themselves in their work was more mixed. One participant wanted to see a countywide system for communication that used some sort of social networking site or educational application. "Google Education is the one I've seen that has the most features and is free and is fairly user friendly. You could set up a website and sign up all the 4-H members and volunteers in the 4-H program with password access and use that for communication and other applications" (Case 259). However, she said she hoped such a communication system would not replace face-to-face meetings.

Other participants said they envisioned some conferences being done online, but they also expected technology would not replace much of their work with clientele. "Many of our people don't have Internet access in their homes, so as far as doing meetings, that would be great if I could do it, but I can't see it. It's hard for me to envision that actually happening" (Case 182).

High-Use Participants

Types of Technology Used

This group of interview participants listed quite a number of technologies that they used and were able to do so quickly. All of them used word processing and e-mail, but

they also used chatting (IM), online calendars, various databases, and equipment and software for creating online content such as educational videos, podcasts, and websites. Some used the MSUE portal as their main web presence, but more often they used either a county website or an alternative MSU site.

Equipment used included laptop computers, desktop computers, digital cameras and digital video cameras, scanners, LCD projectors, and personal digital assistants such as Palm Pilot. Specific software and web systems these participants mentioned were Microsoft Word, Excel, Access, PowerPoint, Publisher and Microsoft Outlook synced with a Palm Pilot, Zope (an open-source application server), Propaganda (for creating and editing audio files and podcasting), Corel (to edit digital images and prepare web broadcasts), Word Perfect, and Web Expressions and FrontPage (two web design softwares). One also subscribed to the Nexis system and multiple LISTSERVs to assist with finding court cases and summaries. Not all in this group currently used a cell phone, but those who did not, expressed interest in owning some sort of phone that was also a digital assistant to use for retrieving information from the Internet. One participant had tried to use Adobe Connect once with some success but did not think it was particularly user friendly. This individual said he would prefer to use MSU Global instead.

All of the interviewees in the high-use group described online teaching and learning, although in a variety of ways. One had taught using PowerPoint and had taken class members online to complete a food-safety tutorial as part of a workshop presented in a church. All of the others described using technology to create online learning modules or educational broadcasts that were either interactive websites or podcasts of audio and video lessons they had created. One had worked at another land-grant

university five years ago, where the use of IP video was common. He said although he would like to use that type of technology, MSU Extension was not as advanced as the other university, so he was not able to do so. He had, however, taught web design and e-commerce classes to clientele.

Usefulness and Ease of Use

One participant said that Outlook was the most useful because it was the "most multi- functional" of the technological tools she used (Case 172). She also said it was the easiest to use. Another interviewee said she could not figure out what to do without her Palm Pilot, but went on to say that when people (clientele) called she needed the Internet, so actually the Internet was the most useful (Case 14). She went on to say that the tools were all easy to use and just had different nuances. Another high-use participant said that because all the technologies he used were integrated, it was difficult to say which was the most useful because everything he did came back to using the computer in general. "I can't use the scanner without the laptop, and virtually everything I use that for goes into the computer to use later on either a PowerPoint or a web site" (Case 196). Nor did this individual know which tool was easiest to use because he was self-taught, so he used what he had learned to use.

One participant said he could only say what he hoped would be the most useful. That was the videos he was producing, because they would be on the Internet where "people can access them 24 hours a day 7 days a week, and they are on a variety of subjects" (Case 90). He said he was leaning more toward the types of things that people could access at their convenience. His said his focus was on what was easiest for clientele and not himself.

Another participant answered quickly: "Without my computer I'd be dead" (Case 239). He said he relied on the Internet to access every university bulletin library and publication system, which he needed to be able to give his clientele up-to-date (fewer than three years old), research-based information. "So when I'm looking for something it has to be very relevant and relatively concise, and then I can attach it to an e-mail and they can get it right away, so without the Internet I wouldn't have access." He reported having a fair amount of "facility" with everything he used and could only talk about what he had trouble with. He went on to say that he tried to "muddle around" with Access and Expressions Web, and as a result he could make them work but could not explain to someone else how to use them. This indicated to him that he needed more training on those tools.

Technologies They Would Like to Use

Technologies the high-use interviewees said they would like to use were varied. One said she recently had downloaded Google Earth and was beginning to think about ways she could use it, but she did not yet have a specific plan for its use. "I found it interesting and thought I would check it out, so I am exploring it on my own" (Case 172). Another said she would like to do more online training but did not think she could do it personally; she said, "I would like to see MSU do more of that" (Case 14). Another participant said he had been avoiding getting a cell phone because he did not want to be available "24/7," but now he was very interested in being able to use a cell phone that would access the Internet, such as the iPhone. When he had better cellular service in his area, this was something he would purchase.

High-use participants expressed interest in having more of an online presence and the ability to work with technologies that could make that happen. One described his 30-year career with Extension and said, "I used to teach a class that got up to being 30 hours long. Well, I can't do that every year, so if I can put that type of information in some type of form that people will use, then I don't have to teach it every year. They can just go online and take a look" (Case 90). Another interviewee wanted to be better at using Expressions Web and Cascading Style Sheets for web design. He would also like to be able to put his own material on the county website, rather than having to go through someone else since it seemed less efficient to ask someone else to do it. "I've never been given access to the MSUE portal so I could [have the ability to] put it up, but I am not allowed to" (Case 239). "I can sit down and put it up on the website in maybe an hour, but to give it to someone else it would take an hour to write it up and then an hour to explain it, and it would . . . it's really not worth my time."

The Choice to Use Technology

For the most part, this group used technology simply because they wanted to try it, such as the participant who said she had just downloaded Google Earth because she found it interesting, even though she did not know how or whether she would use it in future programming (Case 172). Another said she found 98% of her own information from the Internet. She described teaching her daughter to research a question about what she found in their backyard pond, so it was natural for her to use technology in her work (Case 14). Another participant was specific in describing his decision to use technology: "Deciding is, do I need it? The more I need it, the more I want to learn it. If it really saves me time that qualifies as need, or if it saves us staff time. If we were using it on a

regular basis as an organization, then I would definitely learn it and actively want to use it [a given technology]" (Case239).

How They Learn

High-use participants were almost entirely self-taught, although they did like professional-improvement classes and workshops when they could get to them. They also went online to find answers or teach themselves how to use technologies.

One interviewee said she liked professional-development classes and frequently used reference manuals as well as the "web," but she acknowledged she was mostly self-taught (Case 172). Another interviewee gave a similar answer: "Classroom would be my first option. It's a close second in terms of self-taught" (Case 196). He went on to say he would like to attend some of the classes offered by the MSU Library but that notices of such classes came out so late that they usually were full before he could sign up. "I'd still like to be better at constructing a database, but because I have never been able to do that [sign up], I can't."

One interviewee said she had never taken any class on the use of technology:

> I teach myself. I just try to figure it out. I've never taken a class on anything. If I can't figure it out, I use the Help section, or if I still can't figure it out there, I go online and go to, like, Microsoft online, and if I still can't figure it out, then I'll ask someone here. I try to figure it out because that works better than if I ask someone. I think I remember it better if I figure it out on my own. If I go through those channels . . . it's just my weird brain. (Case 14)

Another described learning to produce educational videos and audio files:

> Basically, what I did was I would watch television and notice how they were doing things, and I would look at other educational videos and how they did things because we have had a video library for years and a loaning library in our office for probably 15 years now. I would look at the videos and I would copy what they did. As far as the software is concerned, I went out to one source, found

> software packages, and came home and started using it, so [I'm] pretty much self-taught. (Case 90)

Another participant described blocking out a month on his calendar to teach himself a new software program or to practice with web design. He said he learned by playing around with technology, although he added that he barely had time to get his work done, let alone playtime. "Basically, I'm pretty well self-taught, but I've taken classes. A lot of those classes, it isn't that I learned a lot, it is mostly that I learn a few new tricks" (Case 239). He said he preferred classes to be incorporated into other meetings, "Like when there is a class, say two hours on Photoshop during annual conference. It doesn't have to be complete; sometimes just a primer is all I need."

Barriers to Use

Time and money as well as support to do what they wanted to do were the barriers to the use of technology that high-use participants cited most commonly. Some described support in general terms, whereas others were more specific, especially about the notion of "turf" [his word] or being told they could not do something. One participant cited conductivity and lack of storage space for large amounts of data as barriers.

When this group of interviewees said time was a barrier, it did not necessarily mean that they lacked the time to use technology as much as that the technologies they were using were more time intensive than some others. For instance, one participant described in detail creating online videos. "Trying to do this yourself is tough. What I have learned is that when I'm doing a video, if I want to be efficient then it is best for me to write a script. I may not always follow it exactly, but it helps to lay out your thoughts" (Case 90). He went on to describe the lengthy process of shooting close-ups, adding

scene changes, lighting and sound, at which he said he was not professional. "It is what it is right now. Yes, time, because I'm pretty good at picking up on technology."

One interviewee said, "I think [a barrier is] lack of support amongst leadership and staff that don't feel comfortable using it [technology]. I might feel fine exploring a new technology, but I think there is a lot of resistance on the part of other folks." She went on to say that the leadership needed to come from MSU Extension both locally and statewide and that her county was further along than MSU Extension. She said the platform on which to place educational technologies "doesn't support a lot of that easily" She went on to specify, "Leadership for doing anything outside the existing system is lacking" and said she would be told she could not use any other platform (Case 172). Another participant described turf (his word) issues as being a "huge" barrier, with money as a secondary barrier. He went on to cite not being allowed to place items on the MSUE portal as being a big issue for him but said that after fighting the battle for five years he really did not care anymore (Case 239).

Several interviewees said that money was not available for creating online educational content and that they also had to purchase some equipment personally. One explained,

> Cost is probably the biggest barrier. I'd like to have the biggest and the fastest, and obviously that is limited. I would like to have an integrated Palm Pilot phone, but that is pretty costly, and I pay for my own Palm Pilot so that is a personal cost for me. I guess money would be the biggest barrier to taking some of the next steps to technology. I don't think it is a knowledge issue. I think I could learn it. (Case 14)

Another individual gave a similar response: "I want a BlackBerry with a wireless printer" (Case 239).

Future of Technology and Their Work

This group of participants talked a lot about taking MSU Extension online to learners of the future by creating a web presence or utilizing technology to access information, thereby providing a quality experience for clientele. In some cases they simply hoped to take their current educational programs and make them more easily accessible and web based (Case 172), and in others they described in detail how they saw themselves providing answers and problem solving for clientele.

One interviewee said she had a vision of an online presence in a type of blog or chat where she could answer clientele's questions in real time via chat or by taking them to various Internet links. "I think we need to because this is how folks are learning." She went on to say, "I'd like to see MSU take a greater stand on what is research based and providing that information in our program areas, like really good web links." She said she did not necessarily mean that is where MSU Extension was going to go but where she thought it should go. "I think we are doing the best we can. We invest so much of our money into our people, and my county has to pay for it [technology]. The county budget is shrinking and it is hard to take this next step without an investment from the university" (Case 14). Another said, "Obviously, the technology for teaching and learning is going to be on demand. It may be that might require us to charge something for it." He described seeing an educational module online at another university "where you can watch a lecture on your screen and you see the speaker and the PowerPoint and you go through it just like you were there. You see the speaker off to the side, and you see the main stuff. The good ones have an outline at the bottom of what's gone by and what's coming up, and you can skip ahead" (Case 90). He said there are professional

companies that will produce that type of material but that "Extension is playing around with the rudimentary-type stuff like that, but it's just not advanced enough for what I call prime time." A third participant also saw web-based learning modules as a future direction for Extension, but "I say that with reluctance. I say that because I've now done that enough times that I am extremely aware of how much more work it is to put something on the web. It is a much bigger investment of time and effort. I think society is moving in that direction whether we want to or not. The web based is four times the amount of commitment than producing the same content face to face" (Case 196).

Envisioning the future, one participant said that although he grew up in a generation that read books, his children's generation are more likely to get their information from the Internet and to do so without being in any specific spot.

> So I can see if people remain in gardening and they are out there and see something on their tomatoes, they want to know what it is now. They are not going to wait for someone who is going to be in the office Monday through Friday from eight to five, but if they can go to the Internet and look at a page where they can see the insect and say "that is my problem" and click it and they get a video or download some written information, or even a little audio clip that says "you have this, this is how you deal with it." (Case 90)

Participants described being able to get a lot of information to many people as a need. One said e-mail made it a lot easier and faster than trying to send hard copies out via regular mail. "We get a lot of information from around the world, and there is a tremendous amount of information. It is like an hourglass and we are the middle section, so it is like a bottleneck. We need to find a way to widen that part, and probably the Internet is the most reasonable way to do that" (Case 90). Another interviewee described a future in which he would be able to access publications with a wireless device to give clientele what they need. "I want to be able to pull up the publications that I want, and I

can see working out in a truck with a wireless printer that plugs into an ac adapter or the lighter and just going to town. That's the way to do it" (Case 239). He also noted that he wanted to go beyond working online and provide a more individualized experience for his clientele: "I think that the nature of our work is that it needs to be high touch, so using the technology to create a high-touch experience that's incredibly rich in knowledge is key."

Summary

MSU Extension field staff's responses from the interview portion of this study were presented in this chapter. The participants (n = 15) represented all program areas and regions of the state. The participants were divided into three groups on the basis of their reported level of actual use of technology. Each group was asked the same questions, and their responses were summarized in this chapter, starting with the low users, then middle users, and finally high users. The participants' voices frequently were reflected in direct quotations to convey their perceptions and experiences with technology in their work with MSU Extension. These perceptions and experiences varied greatly by level of use and provided insights into the individual participants' abilities, attitudes, and beliefs regarding technology. Table 5.1 gives a summary of the interview results.

Table 5.1

Summary of Interview Results *(N=15)*

	Low Use Participants	Medium Use Participants	High Use Participants
Actual Use of Technology	Word processing, e-mail, limited use of Power Point and Publisher (can't always create their own PP slides)	Word processing, e-mail, Publisher, Power Point, internet search, Excel, Adobe Connect	Word processing, e-mail, IM, on line calendars, data bases, digital camera, digital video, Palm Pilot, Zope, Proganda, Corel, WP, Web Expressions, Frontline
Usefulness and Ease of Use	Word Processing and e-mail were most useful and easiest	Word processing and e-mail as well as PowerPoint.	All aspects of computers, and internet access for online teaching and learning
Technology they would like to use	None or possibly more of the same	Adobe Connect Outlook Exchange for calendars Possibly online learning	Phones that are integrated into their computers, wireless printers, high end equipment
Choice to use technology	Because they have to mostly	See someone else using it or hear about it	Sometimes try new technologies for fun and then figure out how to use them. Will it save them time? Be more efficient?
How they learn	One-on-one tutoring or hands on class	Class with follow up assistance one on one, learn by doing but need someone to guide them	Mostly self taught, read manuals, go on line to find the answer, play with the software, Like professional development classes combined with conferences.
Barriers to Use	Their attitude, lack of confidence, thinking they are the old generation	Think clientele prefer face to face, lack of skills, lack of desire, somebody else's problem	Money, time for production, lack of support for going out of the box, lack of platforms to put work on
Future of technology and their work	Maybe no change or possibly some web conferences to save money	Web conferences via Adobe Connect or possible SNS for 4-H, possible learning on line, but no specific vision	Wireless conductivity, on line learning modules that can be accessed from any location (on an iPhone etc) High touch enhanced with high tech that is rich in knowledge Learner oriented

CHAPTER VI

DISCUSSION OF THE RESULTS

Introduction

In the previous two chapters, the researcher described the results of the study survey and interviews in both quantitative and qualitative terms. The demographics of the MSUE educators as well as their access to technology and actual use of technology for their work were discussed in Chapter IV. Also described were their perceptions of usefulness and ease of use and of their preparedness to use technology, as well as perceptions of support from both MSUE and local sources. The results of the interviews conducted with 15 of the educators were reported in Chapter V, providing a more detailed description of how educators used technology, and their perceptions of usefulness and ease of use. The issues were discussed in detail, using the educators' own voices to describe how they decided to use technology, how they learned to use it, and what they saw as barriers to using technology. Ideas educators had about the future of technology in their work also were shared. This chapter contains an examination of the results described in Chapters IV and V in light of the literature discussed in Chapter II and what is known about today's knowledge organizations, the adoption of information technology, acceptance of information technology, use of information technology by educators, and what we know about professional development and training of adults. This literature was used to analyze findings from this study concerning MSU Extension educators' access to technology, preparedness to use technology, actual use of technology, perceptions of usefulness and ease of use, and support and training.

Access to Technology

A review of the literature as discussed in Chapter II revealed that access to technology has been found to affect how much and in what way educators use it. Previous research on the use of technology by school teachers (Becker, 2001; Cuban et al., 2001; Zhao & Frank, 2003) indicated that although providing technology for teachers did not guarantee they would use it, those teachers who had to share technology scheduled its use with some central source (such as a computer laboratory); further, those who were not in close proximity to technology were less apt to integrate it into their classrooms. In 1999, Owen found that in North Carolina Extension, ease of access to technology was a predictor of actual use by educators.

In Michigan, providing technology for individual Extension educators traditionally has been the responsibility of the local county. MSUE has invested in technology for the organization as a whole through purchases of systemwide technologies. These include satellite dishes purchased for every county in the 1990s and more recently, in 2005, the MSUE portal, which provides shared workspaces, and web publishing of any type of file, including text documents, PowerPoint slide shows, and video and audio files. However, the counties where the educators worked were expected to provide personal computers, Internet access, and digital technology peripherals such as cell phones, personal digital assistants, printers, scanners, and software. Access to the MSUE portal as a publishing platform was controlled by local county policies.

The results reported in Chapters IV and V indicated that, at the most rudimentary level, MSU Extension educators had adequate access to technology hardware and the Internet for most of their needs. All (100%) had a computer (either a desktop or

notebook and in some cases both), and 96% had high-speed access to the Internet in their offices. However, these were not always provided for them by the county, as would be expected. It was not unusual for educators personally to purchase technology or generate funds through writing grants in order to meet their needs for access. Furthermore, educators reported that computers and other peripheral technologies often were outdated and sometimes shared with other educators, making availability of these tools sometimes problematic if they had to make arrangements for use or if the tools were too outdated to be dependable and efficient. That educators often purchased equipment for themselves or were entrepreneurial in obtaining funds through writing technology acquisitions into grant applications showed that the counties did not provide them adequate access to technology. In fact, "if you want it badly enough, buy it yourself or find someone to pay for it" seemed to be normal operating procedure for Extension educators when it came to technology. All but four technologies (CD-ROM burners, webcams, scanners, and DVD burners) were used more often than they were provided because educators purchased the technology themselves or went out of their way to find a funding resource themselves.

Although the majority (65%) of the educators agreed their access to technology was adequate, access to technology was uneven. Some educators in larger and presumably more urban counties reported having more access than those in smaller, more rural counties. This created a sort of digital divide among educators, with some reporting that they thought their counterparts in bigger counties had better access to technology. Access to hardware was not the only issue that was uncovered in the research. In certain instances, local county IT staff placed limits on access to some Internet sites, and some educators had no ability to place items on the MSUE portal personally because local

policies controlled access . Such limitations to access caused frustration among some educators, which could lead to less use of technology.

Preparedness to Use Technology

Having technology expertise, being more educated, being professional engaged, and being adequately prepared to integrate technology into educational programming have been shown in previous research to be strong predictors of actual use of technology. This has been evidenced in studies of teachers' use of technology in education, as well as in research on Extension educators' use of technology. In fact, in the National Science Foundation's Teaching, Learning and Computing survey, technical expertise was the most influential factor in teachers' successful use of technology (Becker, 1998). Becker also discovered that teacher leaders who were better educated (had graduate degrees) and more professionally engaged (interacted more in their schools and communities) were more prepared to use technology. Even exemplary teachers who were awarded technology grants were more apt to be successful when they were well prepared (Zhao et al., 2002). In previous research on Extension educators' use of technology (Albright, 2000; Edwards, 2004; Emmons, 2002; Gregg, 2002), relationship was found between being prepared to use technology and Extension educators' use of technology.

According to their own online portal (http://www.msue.msu.edu/portal) MSU Extension considers preparedness to use educational and information technology one of ten core competencies for exemplary Extension educators. MSU Extension's core-competency initiative was launched in 1993-94. In 2001, MSU Extension conducted a comprehensive review of educators' professional development needs with the goal of creating an integrated, organization-wide system to serve the needs of educators. A self-

assessment component was added in 2006. Each core competency includes indicators of competency, a list of learning activities for developing the competency, and a list of key written resources. It is up to the educators to use self-assessment and create their own professional improvement plans each year with support from their supervising County Extension Directors or regional supervisors.

Almost half (46%) of the educators who participated in this study thought they were prepared to a small or a moderate extent to use technology in their educational programming. Only 10% reported they were entirely prepared to use technology in their programming. The most common source of knowledge about the use of technology was independent learning, followed by interactions with other staff. The third most common source of knowledge was friends and family outside of MSU Extension. The sources from which respondents were least likely to obtain their knowledge about technology were any types of classes, whether offered by MSU Extension, organizations outside of MSU Extension, or as part of their formal education. None of the educators described using the materials provided through the MSUE professional development library to increase their preparedness, although they were not specifically asked about this resource.

It is not a surprise that the educators did not learn to use technology as part of their college education because the majority graduated from college before digital technology was integrated into college curricula. This is evidenced by the fact that 78% of the educators were 36 or older, and 50% had more than 10 years of experience with MSUE. Having an advanced degree has been found to be an indicator of being prepared to use technology, with teachers who have master's degrees being more inclined to use technology than those who do not have advanced degrees. And although in most states a

master's degree is a minimum requirement for employment as an Extension educator, until recently this has not been the case in Michigan. At the time of this study, only 62% of MSU Extension's educators had a master's or doctorate degree.

Half of the educators were neutral or did not think they had adequate training in the use of technology; only 6% strongly agreed that they had adequate training in the use of technology. Lack of training often was linked with lack of time to attend training, especially because most training involved a lengthy drive to a distant location. There was also a lack of time to play with and figure out new technologies. This was a factor the majority (77%) of educators said was an issue. Certainly the role of Extension educator is time consuming and complex, similar to that of teachers. Cuban (2001) said that the two major barriers to teachers' use of technology was lack of time and lack of technical support and that until these issues were resolved, technology would be something administrators think educators should use but that they seldom really would use. Casey and Harris (2004) advised that organizations need to focus more on integrating technology into the culture of the organization and less on purchasing the latest and greatest technology. They believed it was an organizational problem that led to a lack of time for planning and personal exploration of technology, as well as to other barriers such as lack of training and expertise of educators, and called for a change in organizational culture, vision, and leadership regarding technology integration.

Actual Use of Technology

Research on the diffusion of technology into society and organizations served as a useful framework for studying the diffusion of information technology in Extension. However it should be noted that the rate of change of technology has increased

exponentially in the last decade and some of the previous research on technology adoption may need to be reevaluated. Interestingly, it was the early research of Ryan and Gross (1943) in which they examined Extension's role in the adoption of hybrid seed corn by farmers in Iowa that was the inception of research on technology diffusion. Although innovation-diffusion theory (Rogers, 2003) is used to illustrate how technology moves from invention to widespread use or nonuse, the characteristics that influence diffusion also can be used in examining acceptance or adoption of information technology in an organization (Carr, 1999). Rogers (2003) claimed that Extension has been reported to be one of the world's most successful change agencies and said, "the agriculture extension model is an integrated system for the innovation-development process" (p. 165). It follows, then, that if Extension educators are in the business of encouraging change and adoption of new practices among clientele, they themselves would be early adopters and innovators on Rogers's bell- shaped curve of technology adoption.

Similar rates of adoption of technology were found in the Apple Classrooms of Tomorrow project (Sandhotz & Reilly, 2004), in which researchers identified five stages in teachers' progression through the integration of information technology, which were similar to the concept advanced by technology-diffusion theories. The five stages are entry, adoption, adaptation, appropriation, and invention.

Actual use of technology by Extension educators can be analyzed by examining the types of technologies the educators used and how often they used them, as well as by examining the ways the educators used technology. Types of technologies that educators used included communication technologies (cell phones, e-mail, and word processing),

presentation technologies (PowerPoint), digital-image technologies (used to create multimedia products), and Internet and web technologies (web pages, blogs, search engines), which can be used to gather information or to create and share information when data and knowledge are manipulated. All of the Extension educators in this study used the communication technologies on a weekly or even daily basis, showing that they were at the adoption phase for these technologies. Presentation technologies were used by most of the educators, but many were still in the entry stage, in which they were just learning to use the technologies. This was evidenced by the fact that they knew how to set up a PowerPoint presentation and use one created by someone else, but were not yet at the stage where they could create such presentations.

The actual use of digital image editing and web and Internet technologies, however, showed very different results. Michigan Extension educators had adopted Internet search engines as a method of finding information for their work. Most used search engines or went online to look for information, either daily or more than once a week. However, some low users still had not adopted Internet technology, as evidenced by the educator who said he tried to stay away from the Internet. "It's one of those deals where if I am using it and I'm on it, I'll use it for two hours, so I am careful with the Internet." He went on to explain that he had a difficult time locating what he needed and found this frustrating. Frustration might have been preventing this educator from moving through the stages of adoption. Entry-stage experiences were found to be critical to subsequent use of technology, and many teachers historically have failed to integrate information technology into their classrooms due to frustrations with technology early in their experience. This is because the teachers focused on their lack of technical expertise

rather than on how information technology could be used (Sandholtz & Reilly, 2004). Jacobsen (1998) said that those who are limited adopters may be so because they lack support and training.

When it came to the publishing or creating processes afforded by the Internet, most Extension educators were not even at the entry level of adoption. A majority of them never had carried out most web-publishing tasks; 97% never had edited a wiki, 89% never had exchanged instant messages, 85% never had used graphics editing, 76% never had published anything on a website or blog, and 73% never had published anything on the MSUE portal. Most of those who had published on a website or the MSUE portal did so once a month or less often, suggesting they were early in the entry or adoption phase. This group had a tendency to expect someone else to put material on a website (either the MSUE portal or a county website). Koehler and Mishra (2008) referred to the practice of expecting someone else to do the technical part as an SEP or "somebody else's problem" notion of technology. They viewed the job as an Extension educator in a county versus one as a program leader on campus or a specialist in technology as being in different domains, each with its own specialty.

A small minority of Extension educators in the study used all of the communication technologies employed by the other educators, but they also used instant messaging, online calendars, and personal digital assistants, and were engaged in creating online content consisting of web pages, audio files, and multimedia presentations. These educators had moved past the adoption phase and were skilled in adaptation, appropriation, and invention with technology. They were the innovators and early adopters on Rogers's (2003) curve.

These educators were using technology in integrated or innovative ways, which requires a fluency of technology use in which the user understands the affordances and constraints of a technology and can manipulate it to meet their needs within the context of the problem. Ching, Basham, and Jang (2005) described such educators as "full spectrum frequency" users, who had a high degree of use across the spectrum of technology types. If educators are full-spectrum-frequency users and innovative and generative in their use of technology for their work, and they have a deep understanding of their programming content as well as learning theory, they can integrate the three spheres of Mishra and Koehler's (2006) Venn diagram TPACK.

Usefulness and Ease of Use of Technology

Many researchers investigating the use of technology have determined that usefulness and ease of use of any individual technology are predictors of its acceptance. (Davis, 1989; Legris et al., 2003; Mathieson et al., 2001; Szajna, 1996; Wang & Bright, 2004) Research on the acceptance of or resistance to information technology has been conducted in an attempt to predict how users will react to a new technology within an organizational context. Dillon and Morris (1996) defined user acceptance as the willingness to use information technology in performing the tasks it is designed to support. Some individuals resist using information technology even when it might lead to enhanced performance (Swanson, 1988). Davis (1989) said that users will tend to employ the technology to the extent they believe it will help them perform their jobs better. This was a familiar pattern in the comments and interviews in this study when educators said they would use technology, "If I have to" or said technology was a requirement of their work.

This research showed that almost all MSUE educators used and therefore had accepted communications technologies such as word processing and e-mail and to a lesser extent cell phones. Most also used presentation and publication technologies such as PowerPoint and Publisher to prepare and present educational material to their clientele with a reasonable amount of facility and fairly often. However, many low users reported not being able to create or having little working knowledge of these technologies other than how to set up their PowerPoint presentations or to direct an assistant to make changes for them. Investigation of use of presentation technologies by Extension educators indicated that they found those technologies useful in their work.

Most educators also used the Internet to search for information on a daily basis. However, the majority did not use and never had used most Internet web technologies, even though they had the basic equipment (computers and high-speed Internet access) to do so. This lack of use of Internet technologies has been shown to be due to the educators' own lack of knowledge and preparedness, as well as a belief that the technologies would not be used by their clientele and/or would be difficult to use. Many believed this type of technology use in Extension, if it is used in the future, would be up to "somebody else," presumably one with knowledge of technology and desire to use it than they have.

It is interesting that those educators whose use of technology was low or medium compared to high-use educators often said that their clientele would not use or would have limited access to technology, and they cited that as a reason not to use some technologies. In contrast, educators with high technology use described technology as being a useful tool to reach clientele and something that enabled them to provide more

customized educational material in new and innovative ways. Those high-use educators viewed clientele as wanting to access the information in new ways and described their jobs as almost requiring that they deliver information to clients with the speed, customizing, and asynchronous affordances of the Internet.

Educators referred to using only technology that was easy to use. A number of educators said that one source of frustration was that the MSUE portal was difficult to use, and some high users even said they had "given up" on it. Davis's (1989) Technology Acceptance model demonstrated that both usefulness and ease of use were important predictors of individuals' intention to use and actual use of any particular technology, which explains the relatively low use of the MSUE portal by most educators.

General and Technical Support and Training

Previous researchers have reported that general support of technology by the leadership of an organization and superior technical support and training are important predictors of technology use (Albright, 2000; Becker, 2001; Emmons, 2003; Sandholtz & Reilly, 2004; Zhao, 2003). Taylor and Todd (1996) said that the culture of an organization, as well as attitudes of administrators and colleagues, can influence attitudes and behaviors of individuals and therefore can influence acceptance and use of information technology.

MSU Extension has demonstrated a commitment to the use of technology by investing in systemwide technology (the portal) and by including education and information technology as a core competency for educators. Educators indicated they agreed that MSUE encouraged the use of technology to enhance educational programming, and that MSUE administration supported the use of technology. However,

there also was evidence of frustration with both the portal and lack of access to equipment, training, and technical support. MSUE's policy whereby personal technological equipment and software were provided by the counties created a digital divide between counties because local budgets and technical expertise varied considerably. This was noted in both comments and interviews.

Goldman (1995) said that agile organizations aggressively embrace change and use technology to help them be more responsive to their customers. This sentiment was echoed by Senge (2000), who said information technology can be used to make learning more efficient and effective as knowledge is shared effortlessly across the organization. This, in turn, can result in increased flexibility, agility, and responsiveness. The flattened organizational structure of Extension in Michigan can serve to make it flexible and responsive to local concerns. However, it is important that all educators have equal access to technology, training, and support. In order for this to be possible, though, there needs to be equal access to technical and training support for employees.

The study findings indicated that technical support usually (72%) was supplied to educators by their local county office; another 5% of educators got their technical support from campus. This left 23% or almost one fourth of all Extension educators who had to seek technical support from other sources, which included friends, family members, local private sources, or colleagues; such support usually was less than adequate. Previous researchers have found that even when individuals were exemplary users of technology (Zhao et al., 2002), technological proficiency, distance from technological resources, and dependence on technological resources were predictors of success. Those closest to support and with the most support had the greatest success in implementing new

technology into educational programs. In the Apple Classroom of Tomorrow (Sandholtz & Reilly, 2004) project, researchers found that having a centralized technical support system that allowed teachers to concentrate on integrating the technology into their education resulted in fewer technical glitches, thus giving teachers more time to work and play with the system.

Quality technology support, according to Dexter, Anderson, and Ronnkvist (2002), consists of access to one-on-one personal guidance, opportunity to participate in technology-oriented professional support among peers, professional development content focused on instruction, and access to resources. Educators in some counties within MSU Extension were fortunate to have excellent local support that was available to assist them in problem solving and learning new skills. However, many educators believed they were lacking effective support and said they would use technology more if they had better support as well as support people who better understood their programming needs. This study has indicated that Extension educators believed they would use technology more if they had better access to the training they thought they needed and often were frustrated by not knowing how to do what they wanted to do. The organization of MSU Extension has been shown to be supportive of educators' using technology, but some educators perceived that Extension had misdirected their support by providing technology that was difficult to use and not necessarily what the educators believed they needed. In addition, although some counties appeared to be providing excellent technical support for their educators, many others were unable to do so, leaving educators, especially those in smaller counties, to struggle on their own or to seek out friends and family members to assist them.

Training is essential to the proficient use of technology in education, as has been demonstrated by previous researchers in both K-12 education and Extension. Adult learning theory (Knowles et al., 2000) involves a process-design plan make a number of assumptions about adults: Adults bring their own life experiences to the process that need to be acknowledged, they need to know why they need to learn something and why it is relevant to their lives, they prefer experiential hands-on learning, they approach learning as problem solving, and they learn best when the topic is of immediate value in their lives. In research on technology use by Extension educators in other states, Albright (2000) found that the majority of these educators had not attended any in-service workshop on technology in the previous several years, even when it was offered to them. Albright concluded that although the educators were offered training, they did not see a reason for it; thus, motivating might be an important factor in getting educators to attend training. The educators in the present study indicated that they learned best in a hands-on setting combined with access to one-on-one follow-up assistance. They said the training they needed was not available, or if it was, they were unable to attend due to time constraints or distance.

Extension educators have been offered training on use of the MSUE portal, even though some educators said they were not allowed to attend or had no access to the training. In addition, a self-assessment tool and books on information technologies are available through the MSUE professional development library. However, because the majority of Extension educators are not using Internet technologies or the portal, it is clear that additional and alternate training needs to be provided to them.

Summary

In this study, the researcher investigated the perceptions of MSUE educators regarding the use of technology in their work. Educators' access to technology, their preparation to use it, and their actual use of technology have been described in quantitative terms and in their own words. The researcher also examined Extension educators' perceptions of usability and ease of use of technology and their perceptions of general and technical support and training that they had and needed. It was found that although the educators had access to basic technology and were creative in obtaining what they needed and wanted to use, many thought they needed better access to technology. The majority of educators used communication technologies on a daily basis and were comfortable with using them. All of the educators used presentation technologies, but most did so at a mechanical level without integrating or being generative in their use. Only a minority of educators used Internet and web technologies, and 75% never had placed content on any kind of website themselves. Many educators were frustrated by lack of training and thought using more advanced technologies was somebody else's problem and not something either they or their clientele were comfortable with. However, some educators were creating multimedia content and finding new and creative ways to integrate technology into their education and strongly believed it could help them provide better and more easily accessible education for their clientele. These educators need more training that would help them discover ways to integrate technology into their educational programming. This training needs to be combined with better technical support that is local and easy to access, to assist Extension

educators in reaching their goals. Recommendations for training and for future research are presented in the next chapter.

CHAPTER VII

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this chapter is to review the objectives of the study and the method of investigation, to summarize the major findings, and to present conclusions and recommendations both for support of the use of technology by Michigan Extension and for further research.

Summary of the Study

Need for the Study

The Cooperative Extension Service is an organization reported to be one of the world's most successful change agencies. Its mission is to help people improve their lives through an educational process that applies knowledge to critical needs, issues, and opportunities. At the heart of Extension's mission is its ability to be flexible, creative, and innovative in finding ways to meet the needs of citizens through education. Educators work within the context of local counties, where there are many constraints as well as opportunities. Extension educators' jobs are demanding and time consuming, and these individuals work in local communities that vary considerably. The tools of a successful educator have changed over time, and as the technology available to them has become digital it has also become opaque, protean, and unstable. In today's world, using technology for education appropriately and effectively is becoming increasingly difficult.

Purpose of the Study

The researcher's purpose in this study was to understand MSUE educators' perceptions of the usefulness of technology in accomplishing their goals as educators, as

well as their perceptions of the ease of use of the technologies that they chose to use and were required to use and how this influenced their intention to use information technology, their actual use of information technology, and their needs for support and training in the use of technology.

Objectives of the Study

Research objectives for the study were:

1. To describe the following demographic characteristics of Michigan State University Extension (MSUE) educators: gender, age, years of work experience with MSUE, major program assignment, position held in the organization, geographic area of coverage of responsibilities, and highest level of education attained.
2. To identify and describe perceptions of MSUE educators regarding:
    a. the **usefulness** of information technology in their work.
    b. the **ease of use** of information technology in their work.
3. To identify and describe the technologies that MSUE educators have available for their work.
4. To identify and describe the perceptions of MSUE educators regarding:
    a. their preparedness for using technology in their work.
    b. their behavioral intention to use information technology in their work.
    c. their actual use of information technology in their work.
5. To identify and describe the perceptions of MSUE educators regarding:
    a. the general support of their use of technology for programming by MSUE.

b. the technical support they receive.

6. To identify and describe the perceptions of MSUE educators regarding their need for training and professional development in the use of information technology in their work.
7. To analyze information obtained about MSUE educators in order to facilitate:
   a. the design and planning of in-service training in information technology.
   b. the support of Extension educators in their use of information technology.

Limitations of the Study

This study was exploratory in nature. The findings were limited to the perceptions of Michigan Extension educators, and it was assumed that the educators were truthful and open in their responses to the survey and the interviews. There may be additional factors not considered by the researcher or not evident in the findings that might have affected the outcome of the study.

Summary of Major Conclusions

The conclusions that follow are based on the findings from this study and the review of literature and previous research.

Almost all (96%) Extension educators had access to the basic technologies of computers and high-speed access to the Internet. However, access to additional peripheral technologies often was lacking, and many educators provided these for themselves out of personal funds or through writing grants. Opportunities need to be provided for Extension educators to have access to the technologies they need in order to be more effective in their work.

Almost all educators had adopted communications technology, but most were still at the entry stage in the adoption of Internet technologies, especially any kind of web publishing technology. Educators sometimes explained their lack of use of Internet technologies as being because they did not want to use technology, found it difficult to use, or they believed their clientele preferred a face-to-face method of learning. Most Extension educators believed Internet technology was something that somebody else should take care of for them. This somebody else was their secretary, local county support staff, or MSUE technology staff.

Technical support for the use of technology usually was provided by the local county. However, Extension educators' perceptions of that support were mixed; some were very satisfied, whereas others were frustrated by lack of adequate support. One quarter of educators turned to family, friends, local private sources, and colleagues for their technical support because it was not provided to them. Better technological support is needed.

Many Extension educators had experienced frustration in working with technology, and especially with working with the MSUE portal. Previous research has indicated that once people experience unresolved frustration with a technology, it is difficult to get them to try to use the technology again. Because the MSUE portal was designed to be the primary platform for Internet applications for Extension in Michigan, it follows that this frustration might have caused some educators not to use Internet technologies as much as they might have otherwise.

A small number of the Extension educators in this study were creative, innovative, and generative in how they used technology in their work. These educators might serve

as an excellent resource for low- or medium-use educators if given an opportunity to share their expertise and might be able to demonstrate specific successful experiences that can serve as a basis for future training and support.

General Recommendation

1. Considering that MSUE has moved away from campus areas of expertise to a model of creating areas of expertise throughout its personnel system, a priority of MSUE in the future should be to ensure that all board-appointed personnel are competent in the use of digital and Internet technologies in order to remain technically competent and make sure that clientele have the most up-to-date information.
2. In order for MSUE to be more effective and responsive in the future and to have the potential for maximizing its efforts, a high priority should be given to making technology a part of MSUE culture.

Recommendations for Training and Support

1. Provide additional training to support the use of technology by Extension educators in Michigan. This training needs to emphasize the integration of technology, content, and learning strategies and must help educators recognize the many affordances of Internet technology for their work.
2. Develop a resource guide giving practical ways to use technology to enhance educational programming in Extension, with links to available resources that are free or inexpensive.

3. Incorporate technology, as appropriate, into all Extension conferences, where educators will see it demonstrated and can assess the affordances of the technology.
4. Identify one Extension educator from each region and program area who is successfully integrating technology into programming and employ their assistance as mentors and trainers for other staff. Create an area-of-expertise technology team with these staff members and assist them with implementing educational programs and technical assistance for local counties.
5. Work with County Extension Directors to identify local technological support and training needs and assist them in securing needed technical assistance and training.

Recommendations for Support of Low-Use Educators

1. Emphasize ways technology can meet educators' needs and the needs of their clientele.
2. Demonstrate easy, inexpensive (free) ways to use technology to enhance programming so they can be successful.
3. Identify technology mentors to assist with both technology support and training to reduce frustration.

Recommendations for Support of Medium-Use Educators

1. Develop better local and regional technology support so educators are willing to take more risks.
2. Provide more complete access to technology and more regional training.

3. Emphasize usability of technology for local programming and benefits to clientele

Recommendations for Support of High-Use Educators

1. Be sure all high-use educators have access to the MSUE portal or an alternate form of website development.
2. Provide in-depth classes on web page design, image editing, and video and audio editing while integrating content and learning theory.
3. Emphasize design, creativity, and innovation in technology integration.
4. Give educators who integrate technology into their programming recognition for their accomplishments.

Recommendations for Further Research

This study was exploratory in nature and has provided a description of how MSUE educators use technology in their work, their access to technology, perceptions of its usefulness, and their needs for support and training. This study adds to the literature regarding the use of technology by Extension educators, but it was not a comprehensive investigation of the subject and was limited to the perceptions of Extension educators in one state. There are many opportunities for further research that would add to the body of knowledge and provide more information about ways in which educators can use technology more effectively in their work, as well as how support and training might encourage and enable educators to move from limited mechanical use of technology to a more generative and innovative level of use. Suggestions for further research are:

1. Case studies of individual counties that might serve as models for support of technology use. This approach has been used successfully in research on the use of technology by teachers in a school setting and could be adapted to Extension.
2. Research on technology use by programming area, using focus groups of individuals to gather data on challenges of using technology within the constraints of a particular programming effort.
3. Case studies of high-technology-use individuals to provide models for how educators develop their ability and skills in using technology effectively and creatively.
4. A longitudinal study of Extension educators' use of technology before and after an appropriate in-service training that integrates technology into educational programming to examine the effect of the in-service.
5. Research on technology use in multiple states to examine how organizational structure or support of technology use can affect the actual use.

APPENDICES

E-Mail Supporting Research

Subject: Support for Technology Study

Greetings

This week you should receive a survey packet in the mail entitled "Perceptions of MSUE County Extension Directors and Extension Educators of the use of Technology in their Work". This study consists of two parts. The first is a census survey, meaning that all County Extension Directors and Extension Educators on staff as of February 1, 2007 are being surveyed. The second part of the study will involve interviews of selected staff.

Elizabeth Wells, Graduate Student in Agriculture and Extension Education in the Department of CARRS at Michigan State University is conducting the research in partial fulfillment of the requirements for her Ph.D.

The survey is designed to take an in depth look at the technology staff have available and how they use it as well as their thoughts about the usefulness and ease of use of technology in their work. Data gathered from this study will be used to further plan and guide our organizations use of technology in the future.

Completing the survey will take just 20 minutes of your time. It can be returned in the self addressed stamped envelope provided for your use. A high rate of return will help insure that this study is reflective of our staff's perceptions of technology.

Please take the time to complete the survey and return it. Your assistance will be greatly appreciated.

Thank you for your support of this important research project.

Sincerely,

Dr. Steven Lovejoy
Assistant Director MSUE

October 2007

(First Name, Last Name
Street Address
City, State, Zip)

Dear (First Name),

On behalf of MSU Extension and in partial fulfillment of requirements for the degree of PhD. in the Agriculture and Extension Education in CARRS I am conducting a survey of all MSU Extension Educators and County Extension Directors.

The purpose of the survey is to assess and analyze perceptions of Extension Agents regarding the use of technology in Extension. The survey will also assess personal use of technology, including ease of use, usefulness and actual use.

If would be very helpful to me if you would complete and return the enclosed questionnaire. I anticipate it will take about 20 minutes to complete the questionnaire. Your participation is voluntary and at any time during completion of the questionnaire you may decline to respond to any given item. If you choose not to participate in this study or only partially participate, it will result in no harm or adverse effect for you.

Some selected respondents will be invited to be interviewed so that I may gain a more in depth understanding of the topic. If you are willing to be included in the group of participants who may be interviewed, you may write your name on the back of the questionnaire in the space provided or you may call or e-mail me. If you are interviewed the interview will be taped and later transcribed. The results will be written up using no descriptions that would identify you and an alias will be used. All recordings and transcripts of the interview will be kept in a locked private office.

Your responses are confidential. The return envelope and questionnaire have an identification number that enables your name to be checked off the mailing list when the questionnaire is returned. The envelope will then be discarded and your name will never be place onto the completed questionnaire. The confidentiality of your response will be maintained to the maximum extent permissible by law. All returned questionnaires will be kept in a locked private office accessible only by myself and will be destroyed five years after the research is completed. Filling out the questionnaire and return it indicates your voluntary agreement to participate in this study

If you have questions regarding this study, please do not hesitate to contact me. I can be reached at my office phone of 616-846-8250 or e-mail at wellselz@msu.edu. If you have any questions about your rights as a participant, you can direct your questions to the Director of the University Social Science, Behavioral and Education Institutional Review Board (SIRN) Dr. Peter Vasilenk, Ph.D. at 517-355-2180.

I appreciate your help with this study. Thank you in advance. Enclosed you will find $1. as a small token of my appreciation for your time and effort. I would appreciate your completing and returning the questionnaire in the self address stamped envelope by November 1, 2007

Sincerely, Elizabeth Wells

Postcard Follow Up

Dear (Name)

Last week a questionnaire seeking your input about the use of technology in your work was mailed to you. As a County Extension Director or Extension Educator your opinions on this topic are important and can impact our organization for the future.

If you have already completed and returned the questionnaire, thank you! In not, please take the time to complete it today or as soon as possible. Your assistance with this study will be greatly appreciated.

If you did not receive the questionnaire or it was misplaced, please call me at 616-846-8250 or e-mail me at wellselz@msu.edu. Another packet will be mailed to you immediately.

Again, thank you for your assistance for this important study.

Sincerely,

Elizabeth Wells
Graduate Student in Agriculture and Extension Education

November 24, 2007

Xxxxxxx
Xxxxxxxxxx
xxxxxxxxxxxxxxx

Dear xxxxx,

About four weeks ago I wrote to you seeking your assistance with my study on the perceptions of the use of technology in your work as an MSUE County Extension Director or Extension Educator. As of today, I have not received your completed questionnaire.

The purpose of the survey is to assess and analyze perceptions of Extension Agents regarding the use of technology in Extension. The survey will also assess personal use of technology, including ease of use, usefulness and actual use. Your response is important since it will help us to chart future directions for the use of technology in our organization.

If would be very helpful to me if you would complete and return the questionnaire. I anticipate it will take about 20 minutes to complete the questionnaire. Your participation is voluntary and at any time during completion of the questionnaire you may decline to respond to any given item. If you choose not to participate in this study or only partially participate, it will result in no harm or adverse effect for you.

In the event that your questionnaire ahs been misplaced, I have enclosed a replacement. If you have already completed and returned the questionnaire, please accept my sincere thanks and do not respond a second time.

Be assured your responses are confidential. The return envelope and questionnaire have an identification number that enables your name to be checked off the mailing list when the questionnaire is returned. The envelope will then be discarded and your name will never be place onto the completed questionnaire. The confidentiality of your response will be maintained to the maximum extent permissible by law. All returned questionnaires will be kept in a locked private office accessible only by myself and will be destroyed five years after the research is completed. Filling out the questionnaire and return it indicates your voluntary agreement to participate in this study

If you have questions regarding this study, please do not hesitate to contact me. I can be reached at my office phone of 616-846-8250 or e-mail at wellselz@msu.edu. If you have any questions about your rights as a participant, you can direct your questions to the Director of the University Social Science, Behavioral and Education Institutional Review Board (SIRB) Dr. Peter Vasilenk, Ph.D. at 517-355-2180.

I appreciate your help with this study. Thank you for your assistance!

Sincerely,

Elizabeth Wells
Graduate Student in Agriculture and Extension Education

PERCEPTIONS OF MSUE
COUNTY EXTENSION DIRECTORS AND EXTENSION EDUCATORS
OF THE USE OF TECHNOLOGY IN THEIR WORK

Note: *Some of the questions in this survey refer to your use of technology in your professional life (at work) and some of the questions refer to your use of technology in your personal life (at home or elsewhere).*

Please return survey to
Elizabeth Wells
Box XXX
Grand Haven, MI 49417

ACCESS TO TECHNOLOGY FOR YOUR **WORK**

Directions: Considering your county where you spend most of your time, **what technologies are provided for your use** in your role as an Extension Educator or CED? And **what technologies do you use** (provided by either your office or by yourself)

	Provided for you?		Do you use?	
PDA (personal digital assistant)	Yes	No	Yes	No
Desk top computer	Yes	No	Yes	No
High speed internet access (cable or wireless)	Yes	No	Yes	No
IPod or other digital music device	Yes	No	Yes	No
Portable DVD player	Yes	No	Yes	No
Lap top computer	Yes	No	Yes	No
Digital camera	Yes	No	Yes	No
Cell Phone	Yes	No	Yes	No
Color printer	Yes	No	Yes	No
GPS (hand held or auto) global positioning system	Yes	No	Yes	No
Flatbed scanner	Yes	No	Yes	No
CD ROM burner	Yes	No	Yes	No
DVD burner	Yes	No	Yes	No
Webcam	Yes	No	Yes	No
USB Flashdrive	Yes	No	Yes	No
DVR (digital video recorder such as TiVo)	Yes	No	Yes	No
Other (describe)	Yes	No	Yes	No
1._____	Yes	No	Yes	No
2._____	Yes	No	Yes	No
3._____				

PREPARATION FOR THE USE OF TECHNOLOGY

Directions: Tell us about your preparation for the use of technology. Where did your skills come from?	Not at all	To a small extent	To a moderate extent	To a great extent	Entirely
As part of your college education (undergraduate or graduate)	1	2	3	4	5
In-service courses/workshops offered by MSUE	1	2	3	4	5
Independent learning (e.g. online, tutorials, books, on your own)	1	2	3	4	5
Interactions with other staff in your local office	1	2	3	4	5
From friends, relatives and acquaintances outside of Extension	1	2	3	4	5
Classes offered by organizations other than MSUE	1	2	3	4	5

Consider now how **prepared you are** for the use of technology in your work:

I feel adequately prepared for the use of technology in my educational programming.	1	2	3	4	5

USE OF TECHNOLOGY IN YOUR **WORK**

Directions: Consider now your personal use of technology in **your work.** Please answer the questions below as they relate to your position as an Extension Educator or County Extension Director. These questions pertain to your **actual use** of various technologies. *(Do not count times you give an assistant instructions to do it for you)*	Never	Once a month	Once per week	More than once per week	Every Day
Go on line to research a subject related to work?	1	2	3	4	5
Use a search engine? (e.g. Google, Ask)	1	2	3	4	5
Send e-mails to groups of people within MSUE?	1	2	3	4	5
Get directions on line or use mapping sites before traveling?	1	2	3	4	5
Use a cell phone?	1	2	3	4	5
Register for a conference, workshop or meeting on line?	1	2	3	4	5
Use a fax machine?	1	2	3	4	5
Publish an article on a web site or blog (*other than the Portal*)?	1	2	3	4	5
Update an online calendar?	1	2	3	4	5
Publish an article on the MSUE Portal?	1	2	3	4	5
Look up phone numbers, addresses etc on line	1	2	3	4	5
Use word processing software to create documents?	1	2	3	4	5
Use spreadsheets (e.g. Excel, Lotus)	1	2	3	4	5
Create or use databases (eg. Access, Filemaker,Outlook)	1	2	3	4	5
Create or use presentation software? (e.g. PowerPoint)	1	2	3	4	5
Use web publishing programs (e.g. Dreamweaver) to update/create a website	1	2	3	4	5
Use graphics programs (e.g.) Freehand, Illustrator, Fireworks)	1	2	3	4	5
Use desktop publishing programs (Publisher, Printshop)	1	2	3	4	5
Convert a document to Adobe?	1	2	3	4	5
Send a file as an attachment to a colleague?	1	2	3	4	5
Set up or manage a list serve (discussion group) for others/clientele	1	2	3	4	5
Exchange IM (instant messages) w/ colleagues or clientele?	1	2	3	4	5
Make changes or updates to a Wiki?	1	2	3	4	5
Other (specify)	1	2	3	4	5
1. _____	1	2	3	4	5
2._____	1	2	3	4	5
3._____					

USEFULLNESS AND EASE OF USE OF TECHNOLOGY

Directions: Please read the following statements and circle the one response that best reflects your level of agreement. Work includes all professional activities and home includes all personal activities.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Technology is useful to me in my **work.**	1	2	3	4	5
Technology is useful to me at **home.**	1	2	3	4	5
Technology enriches my **work** life.	1	2	3	4	5
Technology enriches my **home** life.	1	2	3	4	5
Technology **at work** is easy to use.	1	2	3	4	5
Technology **at home** is easy to use.	1	2	3	4	5

CONFIDENCE AND COMFORT IN THE USE OF TECHNOLOGY

Directions: Please read the following statements and circle the one response that best reflects your level of agreement.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have had adequate training in the use of technology	1	2	3	4	5
I use technology effectively in my work in Extension	1	2	3	4	5
Technology enhances my ability to teach my clientele	1	2	3	4	5
I am comfortable using technology to educate others	1	2	3	4	5
I am comfortable with computer technology	1	2	3	4	5
I am developing expertise in the use of technology in education	1	2	3	4	5
Incorporating multi-media enhances educational programming	1	2	3	4	5
I am comfortable with learning to use new technologies	1	2	3	4	5
I like to experiment with using technology in new ways to enhance my work with clientele	1	2	3	4	5

GENERAL SUPPORT FOR THE USE OF TECHNOLOGY AT **WORK**

Directions: Please read the following items and circle the one response that best represents your level of agreement. General support refers to **how people and administration support you in your use of technology**, it does not refer to technical help that you may need when technology breaks down or when you cannot solve a problem related to technology.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have adequate time to learn new technology skills.	1	2	3	4	5
I have sufficient access to technology for my work.	1	2	3	4	5
I receive a sufficient level of technology support in my county office.	1	2	3	4	5
MSUE Administration supports the use of technology in Extension.	1	2	3	4	5
MSUE Administration actively encourages the use of technology to enhance programming efforts.	1	2	3	4	5
The training I need to improve my technology skills is available to me.	1	2	3	4	5
I am encouraged to find new and innovative ways to use technology to enhance my educational programming.	1	2	3	4	5

TECHNICAL SUPPORT FOR YOUR **WORK** RELATED TECHNOLOGY USE

Directions: Tell us about who you go to when you have **technical issues** and need support or assistance with your technology in your role as an Extension Educator or CED. Answer the questions below as they relate to your main source of technical support.

Who is your <u>main source</u> of technical support?
(Select one) ☐ Local county technical support ☐ Campus based technical support
☐ Other (please specify) _____

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have adequate support for problems that arise.	1	2	3	4	5
My technical support person responds **immediately** to my request for assistance	1	2	3	4	5
I have adequate **access** to technical support	1	2	3	4	5
My support person(s) shows me techniques for how to integrate technology into my programming	1	2	3	4	5
I rarely need to seek technical support	1	2	3	4	5
I might use technology more if I had better support	1	2	3	4	5

ACCESS TO TECHNOLOGY FOR YOUR **PERSONAL USE**

Directions: Consider the technologies that you own or have available to you in your personal life. Do you own or have access to any of the following for personal use? (circle one) If you do have access or own these items, do you use them?

	Do you have access?		Do you use?	
PDA (personal digital assistant such as Blackberry or Palm)	Yes	No	Yes	No
Desk top computer	Yes	No	Yes	No
High speed internet access (cable or wireless)	Yes	No	Yes	No
IPod or other digital music device	Yes	No	Yes	No
Portable DVD player	Yes	No	Yes	No
Lap top computer	Yes	No	Yes	No
Digital camera	Yes	No	Yes	No
Cell phone	Yes	No	Yes	No
Color printer	Yes	No	Yes	No
GPS (hand held or auto) global positioning device	Yes	No	Yes	No
Flatbed scanner	Yes	No	Yes	No
CD ROM burner	Yes	No	Yes	No
DVD burner	Yes	No	Yes	No
Webcam	Yes	No	Yes	No
USB flashdrive	Yes	No	Yes	No
DVR (digital video recorder such as TiVo)	Yes	No	Yes	No
Other (specify) 1. _____	Yes	No	Yes	No
2. _____	Yes	No	Yes	No
3. _____	Yes	No	Yes	No

PERSONAL USE OF TECHNOLOGY

	Never	Once per month	Once per week	More than once per week	Every Day
Directions: Please consider your use of the following technologies for personal use at home or while traveling and circle the number that describes your level of use					
Use a cell phone?	1	2	3	4	5
Go on line to research an item of interest	1	2	3	4	5
Purchase an item on line?	1	2	3	4	5
Send pictures to someone via e-mail or post pictures on line?	1	2	3	4	5
Post messages to a discussion group involving a hobby or interest?	1	2	3	4	5
Send or receive group e-mails among friends or family?	1	2	3	4	5
Manage bank accounts or money on line?	1	2	3	4	5
Post to a personal web space or blog?	1	2	3	4	5
Use the internet to make travel arrangements?	1	2	3	4	5
Scan a document or picture?	1	2	3	4	5
Use e-mail to keep up to date with friends or family?	1	2	3	4	5
Use IM (instant messaging) or chat rooms?	1	2	3	4	5
Watch video clips of news or other items on line?	1	2	3	4	5
Download music or movies from the internet?	1	2	3	4	5
Play games ?	1	2	3	4	5
Use the internet to find or buy movie tickets or other entertainment?	1	2	3	4	5
Watch movies or television on a portable device (DVD)	1	2	3	4	5
Access contact information for friends and family on a computer or other digital device?	1	2	3	4	5
Send animated greeting cards?	1	2	3	4	5
Use a USB Flashdrive to save or move data	1	2	3	4	5
Record or playback television programs or use a DVR (digital video recording such as TiVo)	1	2	3	4	5
Other (Specify)	1	2	3	4	5
1. _____					
2. _____	1	2	3	4	5
3. _____	1	2	3	4	5

TECHNICAL SUPPORT FOR YOUR **PERSONAL** TECHNOLOGY USE

Directions: Tell us about who you go to when you have **technical issues** and need support or assistance with your technology for your personal use. Answer the questions below as they relate to your main source of technical support.

Who is your <u>main source</u> of technical support?

☐ friend or family member ☐ computer store or vendor ☐ paid computer consultant/service

☐ other (specify) _____

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have adequate support for problems that arise.	1	2	3	4	5
My technical support person responds **immediately** to my request for assistance	1	2	3	4	5
I have adequate **access** to technical support	1	2	3	4	5
My support person(s) shows me techniques for how to integrate technology into my life	1	2	3	4	5
I rarely need to seek technical support	1	2	3	4	5
I might use technology more if I had better support	1	2	3	4	5

PLEASE TELL US ABOUT YOURSELF

Gender: ☐ Male ☐ Female
Region: ☐ Upper Peninsula ☐ North ☐ Central ☐ South West ☐ South East

Highest degree earned: ☐ Bachelors ☐ Masters ☐ Doctorate

☐ Other (please specify) _____ Major for highest degree
_____

Program Area/Responsibility : (check all that apply)
☐ County Extension Director ☐ Community and Economic Development
☐ Agriculture and Natural Resources ☐ Sea Grant
☐ Children, Youth and Families ☐ 4-H Youth Educator
☐ Other (please specify) _____

Total years experience in Extension:
☐ 1 - 5 years ☐ 6 - 10 years ☐ 11 - 15 years ☐ 16 - 20 years ☐ 21 - 25 years ☐ Over 25 years

Your current age: ☐ under 25 ☐ 26 to 35 ☐ 36 to 45 ☐ 46 to 55 ☐ 55 and above

Please tell us anything you would like to add or share about your use of technology or about technology and Extension.

Thank you for taking the time to complete this survey. Your assistance is greatly appreciated.

A **limited** number of respondents will be selected to be interviewed about their perceptions and experience with technology and Extension. All responses will be kept confidential. If you are willing to be interviewed please indicate below and provide your contact information or you may contact the researcher directly at wellselz@msu.edu or by calling Elizabeth Wells at 616-846-8250.

☐ Yes I am willing to be interviewed about my experience and perceptions about technology and Extension. Contact me at:

_____

(name and phone)

☐ No, do not contact me for an interview

Informed Consent

Perceptions of MSUE
County Extension Directors and Extension Educators
Of the use of Information Technology in Their Work
a research project
by Elizabeth Wells

Your participation in this research is voluntary. The process will consist of a telephone interview that will last about 15 minutes.

The purpose of the interview is to learn about the perceptions of MSUE CEDs and Extension Educators of the use of information technology in their work. You will be sharing your personal and professional experiences in using technology. This interview will be recorded and later transcribed. The results will be written up using no descriptions that would identify you and an alias will be used. All recordings, transcripts, notes and drafts of the interview will be kept in a locked private office.

There is minimal risk to granting this interview but it is not possible to know all the risks in advance. You are free to stop the interview at any time or to choose to not answer any particular question. There will be no penalty for doing so. Your privacy will be protected to the full extent of the law.

You may call or write Elizabeth Wells if you have any questions of concerns about this research project. She can be reached at 616-844-4217 or by mail at 14506 Lincoln Street, Grand Haven, MI 49417. You may also call or contact the Director of the University Social Science, Behavioral and Education Institutional Review Board (SIRB), Dr. Peter Vasilenko at 517-355-2180 by e-mail at irbchair@ores.msu.edu or by mail at 202 Olds Hall, East Lansing, MI 48824.

Your signature below indicates your voluntary agreement to participate in this study.

_____
Printed Name

_____ _____
Signature Date

MSUE CED and Extension Educator Interview Protocol
By Elizabeth Wells

Interview Number _____ Survey Number _____

Date: _____ Location:_____

☐ Hello _____, Thank you for taking the time to answer my questions today. I anticipate this will take less than half an hour. I'm going to record the answers right onto my computer. Is that o.k.? ☐ Yes ☐ No

Informed Consent – signature ☐ **Yes** ☐ No

☐ Test Recording Function

☐ Begin Record

I have several questions to ask you, and will follow that up with additional questions to help me clarify my understanding. When we are done I would like you to share any additional thoughts you have about technology and Extension that we have not covered but which you think are important.

1. a) First of all please tell me about what technologies you use in your work and how you use them.

   Look for any technologies beyond e-mail, word processing, search engine or cell phone such as internet technologies and make note and probe for how they use it Then ask can you think of any others?
   Look for creative or unusual ways of using technologies and ask them to expand if found.

   b) Of the technologies you have talked about which one do you think is the most useful and why?

   c) Of these technologies which is the easiest to use? Why?

2. What ways do you think some of the new technologies available today might be able to be integrated into your work in Extension that you have **not** been able to do so far? Do you have any idea of how you might be able to do so if you could change things?

   If they can't think of any, suggest some technologies that they may have heard of and ask if any of those come to mind. I.E. On line learning and teaching, web sites and internet presence

3. Thinking back to a time when you started using a new technology can you tell me how you decided to use it? and how you learned to use it?

   Was it usefulness or ease of use? How do they learn and is it the preferred way of learning for them? If they can't think of one, suggest one from their list in question 1. Look for their thought process in making a decision to use.

4. What do you see as major barriers to your using technology in your work? What things prevent you from using new technologies that come along?

   If answers are time and/or access to technology, probe to find if they had time what would they do, or if access to technology what kind would it be and how would it help them? How would they use it?
   Web based applications are available to them, do they know that, can they use, how would they use?

5. How could someone help you with learning to use a new technology that you have heard about or seen? Can you describe how you learned about one in particular and what was helpful about how you learned it?

   Are they self taught? If so what motivated them to learn something new? What needs to they have in terms of learning to use technology in their work?

6. So thinking about integrating technology into your work...how do you think you might use it in the future? Any ideas of how this will be accomplished?

   If no idea, ask them to consider web sites, on line learning etc.

7. Is there anything else I haven't asked you about that you think might be important or that you would want to share about technology and your work in Extension?

Thank you _____. What you have shared has been very helpful. I may need to get back with you to clarify some things after I have a chance to review the transcript of what we talked about today. Is that o.k.?

Again thank you for your help with this. I've learned a lot today.

Table A.1

Returns of Survey Instrument

Number	Total Returned	Cum Percent	Date
2	2	.01	10/24/2007
12	14	.04	10/25/2007
21	35	.11	10/26/2007
41	76	.25	10/27/2007
31	107	.36	10/29/2007
4	111	.38	10/30/2007
13	124	.42	10/31/2007
22	146	.49	11/1/2007
14	160	.54	11/2/3007
14	174	.59	11/3/2007
13	187	.63	11/5/2007
5	192	.65	11/6/2007
10	202	.68	11/7/2007
4	206	.70	11/8/2007
5	211	.71	11/9/2007
10	221	.75	11/10/2007
2	223	.76	11/13/2007
2	225	.76	11/14/2007
1	226	.76	11/15/2007
1	227	.77	11/23/2007
1	228	.77	11/27/2007
2	230	.78	11/28/2007
4	234	.79	11/29/2007
8	242	.82	11/30/2007
3	245	.83	12/3/2007
1	246	.83	12/4/2007
2	248	.84	12/5/2007
5	253	.86	12/7/2007
1	254	.86	12/11/2007
1	255	.86	12/13/2007
3	258	.87	12/26/2007
1	259	.88	1/4/2008
1	260	.89	1/9/2008
2	262	.90	1/10/2008
3	265	.90	1/14/2008
1	266	.91	1/15/2008
2	268	.92	1/16/2008
3	271	.93	1/18/2008
1	272	.94	1/19/2008

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