Information related competencies for Montana Extension Service professionals
by Jodee Lynn Kawasaki

A thesis submitted in partial fulfillment of the requirments for the degree of Master of Science in Agricultural Education
Montana State University

Abstract:
The purpose of the study was to determine the information-related competencies and training needed by Montana Extension Service professionals to acquire and disseminate information to clients electronically.

A descriptive study was planned based on a design described by Borg and Gall (1989). The intention was to perform a needs assessment that describes the current situation and to determine differences that answer the objectives of the study. The population was stratified by Montana Extension professionals and consisted of administrators, specialists, and agents.

An email survey, prepared in part using the Total Design Method (Dillman, 1978), was used as the data collection instrument. Thirty seven competencies were identified and set up as a needs assessment model (Borich, 1980). A pilot study was used to validate and test the instrument. Assurance of the needed sample size was provided through two follow-up email messages to non-respondents. The double dip technique was employed to assure non-respondents were no different than respondents.

Responses to questions were analyzed by a personal computer statistical package. T-tests or analysis of variances were run on the data at the 0.05 level of significance. The analyses of the data were used to determine any differences among selected demographic features and to rank order the competencies based upon the respondents perceived level of importance and knowledge. The study's results were also used to determine learning and training preferences related to information technologies.

The data from this study reveal several factors which are impacting the use of information technologies by agents and specialists. Competencies with a positive weighted discrepancy score need to be taught. Selected demographic factors and other characteristics showed no influence on the competencies because both of the stratums need further education in information-related competencies. Different training sessions need to be developed for each stratum because of the reported difference in the ranked competencies, preferred instructional method, and training preferences. A lack of equipment, the cost of long distance telephone calls, or the secretary given the responsibility to do email limits the efforts of MES professionals in using electronic information technologies.

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Date April 21, 1994

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ABSTRACT

The purpose of the study was to determine the information-related competencies and training needed by Montana Extension Service professionals to acquire and disseminate information to clients electronically.

A descriptive study was planned based on a design described by Borg and Gall (1989). The intention was to perform a needs assessment that describes the current situation and to determine differences that answer the objectives of the study. The population was stratified by Montana Extension professionals and consisted of administrators, specialists, and agents.

An email survey, prepared in part using the Total Design Method (Dillman, 1978), was used as the data collection instrument. Thirty seven competencies were identified and set up as a needs assessment model (Borich, 1980). A pilot study was used to validate and test the instrument. Assurance of the needed sample size was provided through two follow-up email messages to non-respondents. The double dip technique was employed to assure non-respondents were no different than respondents.

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CHAPTER 1

THE PROBLEM

Introduction

The decade of the 1980's was the start of a global economy. With the European Community beginning the only integrated market and the fall of Communism, in Eastern Europe and the Soviet Union in the late 1980's and early 1990's, the global economy was off and running. Advances in telecommunications have contributed to this start of a global economy. Telecommunication links allow the demands placed on a local market by a global economy, such as increased diversity and competition, to be dealt with immediately. What ties a global economy to the U.S. Extension Service (ES) is the impact this economy has on the mission and role of Extension. The role of ES must change with the world. The ES must keep up or it will become a part of United States history like the Pony Express. There will not only be an impact on agriculture, but on many other industries and markets as well. These changes will trickle down to both consumers and workers. ES is for the consumer and the worker, and therefore must adopt an ever-changing role to meet these new demands.

New technologies were coming into existence long before ES got its start with the Smith-Lever Act of 1914. The telegraph, printing press, automobile, telephone, and new and improved motors and machinery influenced the Cooperative Extension Service from the start. The organization has adopted many new technologies and goals

along the way. ES has brought research findings, new technologies and information for improving operations and lifestyles to its clients since 1914. Hybrid corn, tractors, fertilizers, pesticides and other chemicals, sewing machines, polyester cloth, and information on nutrition and new crops were a few of the technologies and types of information that ES has transferred to its clients. During these last decades, technologies and information which ES have transferred include such things as precision farming (using computers and satellites), biological weed control, ever-changing human nutrition and proper diets, and software programs for many different operations and businesses, to name a few.

Information literacy, defined as the ability to access and effectively evaluate information for a given need, is needed more than ever in order for global consumers to compete in the world today. Information literacy has been defined (Tessmer cited in Breivik, 1985) as:

> "1. An integrated set of skills (research strategy, evaluation) and knowledge of information tools and resources.
> 2. Attitudes of persistence, attention to detail, and caution in accepting printed word and single sources.
> 3. Time and labor intensive.
> 4. Need-driven (problem-solving activity).
> 5. Distinct but relevant to literacy and computer literacy.
> Information literacy is *not* only knowledge of resources, or library dependent as sole source, nor is only information finding but understanding and evaluating also" (p. 723).

There are databases and electronic networks throughout the United States that Extension professionals have access to via microcomputers. These networks and databases have helped Extension professionals to effectively organize and present information in the last decade. However, information literacy has yet to be achieved by

many professionals (Harriman and Daugherty, 1992). The question needs to be asked as to whether Extension professionals receive sufficient training in information access, retrieval, and dissemination? How are the databases and networks being used by Extension professionals, if at all?

Goode and Elliott (1992) conducted a study to identify the computer competencies Mississippi Extension professionals needed. These data show that Extension professionals were using computers on an average of six hours per week and that they had computer competencies. Smith and Kotrlik (1990) studied computer anxiety levels of Extension agents. The researchers found that Extension agents had computer anxiety, but not significantly higher than other professional groups. These two studies are related to this study in that computer technologies are involved in information gathering and transfer. This study will attempt to answer the question: "do Extension professionals have the necessary competencies to deal with the new information technologies?" There is no indication, after an extensive literature search, that other literature about information-related competencies needed by Extension professionals exists. Therefore, it is evident that there is a need for a comprehensive investigation of Extension professionals' competencies in the area of information literacy.

Statement of Purpose

The purpose of the study was to determine perceived level of importance and knowledge of selected information-related competencies and training needed by Montana Extension Service (MES) professionals for electronically acquiring and disseminating information.

Need for Study

According to Patton (1985), Extension has always been in the business of getting people to apply new knowledge and make use of information. However, the Future Application of Communication Technology report (ES-USDA and ECOP, 1992) states there is a need to increase staff knowledge and skills in communication and information technologies. Computers are here to stay; they will become an important tool to help the ES assimilate as well as disseminate knowledge. Shill (1992) noted that:

> "The agriculture information dissemination infrastructure is in a state of significant transition. Traditional institutions, such as the state agricultural extension services, have been forced to adapt to the emergence of electronic dissemination channels while still making active use of print and face-to-face communication mechanisms" (p. 313).

The basic model of the United States Extension Service has County Extension agents going to Extension specialists for information and publications. Specialists have some expertise to interpret, as well as the close proximity to find, information which agents do not have readily available. Due to the large amount of information produced during this Information Age, specialists should be well equipped to acquire and disseminate information electronically.

The Journal of Extension has an irregular column called "futures," devoted to the future of Extension, in which writers project what Extension needs to do to be successful in the 21st Century. "With less than two percent of the nation's population engaged in production agriculture, Extension must be seen as an organization staffed to meet the needs of a broader, more diverse population" (Harriman and Daugherty, 1992,

p. 26). These authors provided ideas for changing the staffing patterns of Extension. Chesney (1992) writes that the extension delivery system must be updated to operate in our changing environment. Chesney concluded that Extension will be unable to maintain its competitive edge in delivering research-based agricultural and natural resources knowledge and practices if there is not an adequate human resource base, increase in training and technical support, and increase of skills in high technology. Graf (1993) stated that:

> "Shrinking resources haven't convinced state and federal Extension leaders to devote adequate resources to marketing, media, and technology. Extension must realize these are the basic tools necessary for Extension to support and deliver programs in this technological age" (p.30).

Dik and Travieso (1986) in their article in the Yearbook of Agriculture hypothesized what a typical workday using a variety of communication and information technologies would be like for an Extension agent in 1990. By 1990 some agents were using all the technologies mentioned by Dik and Travieso, yet others were using only a small portion of the technology available to them during a typical workday. That year has come and gone; even then they were emphasizing computers and information playing major roles.

Extension professionals need many skills. Most prevalent now are the skills needed to actively seek and transfer information electronically. Competencies that are essential to successful Extension professionals are not described in the literature. However, there is a need to know what competencies are important and how to best achieve them. Future Extension professionals and the Extension Service's future hiring practices could benefit from knowing which specific competencies are important.

Position descriptions and job advertisements could be adjusted according to the study's findings.

The information from this study should impact on other areas as well. Future training sessions for Extension professionals may be modified according to the study's conclusions. Also, the results may be used for justifying the allocations of money to training sessions and impact on the curriculum and/or content of courses in university extension education programs.

Objectives

To fulfill the purpose of this study, the following objectives were identified. Extension professionals were surveyed to determine the:

(1) Perceived level of importance of selected information-related competencies needed for electronically acquiring and disseminating information;

(2) Perceived level of knowledge of selected information-related competencies needed for electronically acquiring and disseminating information;

(3) Priority for training of information-related competencies based on the weighted discrepancy score;

(4) Preference of instructional method used for information-related competencies; and

(5) Differences within selected demographic factors influenced by the mean weighted discrepancy score.

Definitions

(1) Information literacy---the ability to acquire and effectively evaluate information for a given need (Tessmer cited in Breivik, 1985).

(2) Information technologies---delivery systems for digitized information, such as the Internet, CD-ROM, expert system, satellite and interactive video.

(3) Transfer information---a "packet" of information to be transmitted through electronic channels to an agent, client, or other specialist.

(4) Network---a group of computers connected together so they can transmit information to one another. There are two kinds of network: local networks and remote networks (ES-USDA and ECOP, 1992).

(5) Internet---a global connection of interconnected local, mid-level, or wide area networks (ES-USDA and ECOP, 1992); the Internet includes such networks as NREN and NSFNet.

(6) Electronic mail---the transmission of messages over a communication network. Electronic mail, or email, is a computer-to-computer (or terminal-to-terminal) version of interoffice mail or the postal service (Woodcock and Microsoft Press, 1991).

7) Computer-administered surveys---surveys produced and administered in electronic format, also known as electronic surveys. The survey can be administered on a single computer terminal or over a network.

(8) Extension professionals---personnel employed by the Montana Extension Service (MES): agents, specialists, regional directors, and administrators.

(9) Discrepancy score---the difference between the level of importance and the level of knowledge given to a competency (Borich, 1980).

(10) Weighted discrepancy score---multiplication of the average importance score by each discrepancy score of each competency; also known as WD, competency ordering, competency ranking, or priority score (Barrick and Doerfert, 1989).

Assumptions

(1) MES professionals need training in gathering and transferring information through electronic dissemination channels.

(2) MES professionals are utilizing electronic channels to find information.

Limitations

(1) The use of an email survey for data collection limits the population because of the compatibility of computer systems.

(2) The survey was sent to MES professionals employed by Montana Extension Service at the time the study was conducted.

CHAPTER 2

REVIEW OF LITERATURE

The literature review covered four sections: (1) introduction, (2) future roles and skills, (3) technologies in use, and (4) computer-administered surveys. The first three sections laid the basis of the study, supporting the need for the study. The computer-administered survey section gave credence to the methodology.

Introduction

As the third millennium approaches and nations merge into a global economy information has become increasingly important to businesses and individuals. Kong and Goodfellow (1988) wrote that:

> "Information is now viewed as a strategic resource, by both corporations and individuals. Participants in the global economy seek the most current and relevant information to make the most timely and cost-effective decisions. Increased access to information has paralleled an increase in demand for information. However, consumers must now learn to cope with two major obstacles of the information age: information overload and information complexity. The key problem that information consumers face is organizing and sifting through information to find what is usable and relevant. Uncontrolled and unorganized information is no longer a resource" (p. 207).

Rural information was discussed as a political issue by Christianson, Maurer, and Strang (1994) as being controlled by the political elite, which includes academe. Data and information has traditionally been applied to agriculture by the U.S. Extension Service (ES) acting as intermediary. Information is important in the U.S., yet drastic

changes in how it is handled have occurred in 60 years. The ES needs to continually meet this challenge of change, which is explained later in this chapter.

Extension Service, at the national level, acknowledges the need to manage information. ES, also, identifies the need for people to become 'information literate' (Greiner, Cain, and Hodges, 1992). Information literacy is the ability to access and effectively evaluate information for a given need (Tessmer cited in Breivik, 1985). Harriman and Daugherty (1992) saw the impact of the information age on Extension structure and staffing as:

> "The information explosion and accompanying communications technology have hit head-on with the way Extension has traditionally done business. The computer has transformed education as radically as the printing process once did. Extension publications may become an archaic method of delivering information. Satellite communications make it possible to bring national experts into local communities at little cost. Telecommunications networks have barely been tapped by Extension as tools for information dissemination" (p. 26).

A large-scale survey was conducted in 1988 by LaRose and Mettler to answer the question of who uses information technologies in rural America. Their findings suggested that "with the exception of cable television, rural residents are just as likely as non-rural residents to have a wide variety of telecommunications technologies in their homes" (p. 56). Rural residents are as familiar with computer technologies as non-rural residents, yet fewer rural residents use telephone technologies, e.g. answering machines.

Future Roles and Skills

The F-A-C-T Future Application of Communication Technology report (ES-USDA and ECOP, 1991) identified five emerging trends they expect to have

strong influence on the future ES. Networking, globalization, restructuring, pluralism and automation are trends emphasized by ES throughout the report. This report stated that these trends should be considered in any long-range communication, information, and technology strategic plan.

> "This report contends that if CES is to survive and thrive into the next century it must view itself as a sophisticated information processing system. To do that, it must examine how people within the organization currently acquire, interpret, generate, access, distribute, and store information. And, it must commit to Systemwide improvements in infrastructure, staffing, training, audience targeting, and support to operate in the new environment" (F-A-C-T, p. 1).

Changing Roles

Periodically, the Journal of Extension has a column "Futures," devoted, as the title would imply, to the future of Extension. Within this column, writers project what Extension needs to do to be successful in the 21st Century. Harriman and Daugherty (1992) suggested that with under two percent of the U.S. population engaged in production agriculture, Extension must be an organization staffed to meet the needs of a broader, more diverse population. Harriman and Daugherty provide ideas for changing the staff profile of Extension, not necessarily personnel, but changing how staff does business and what kind of expertise that staff should possess. These suggestions included information centers that provide immediate access via technologies to national databases to answer both common and uncommon questions. Harriman and Daugherty, also, pointed out staffing patterns to reflect client need for information or for education.

Extension professionals must have expertise in communication and computer technologies. Along with such high-tech skills, interpersonal and public relations will continue to be critical. Chesney (1992) wrote that the extension delivery system needs

to be updated to operate in our changing environment. Chesney concluded that Extension will be unable to maintain a competitive edge in delivering research-based agricultural and natural resources knowledge and practices if there is not an adequate human resource base, increase in training and technical support, and increase of skills in high technology. The seriousness of the situation is accentuated by Graf (1993) when he says that:

> "Shrinking resources haven't convinced state and federal Extension leaders to devote adequate resources to marketing, media, and technology. Extension must realize these are the basic tools necessary for Extension to support and deliver programs in this technological age" (p. 30).

Patton (1985) reinforced the mission of ES as one of getting its clients to apply knowledge and use information. The emerging global economy forces this mission to the forefront for Extension's clients. To be successful in any market, the client needs current, up-to-date information. Telecommunication links allow for this type of information to be available immediately. These clients must be able to apply new knowledge and technologies to stay competitive in a diverse global economy. ES can help clients retrieve and apply current, up-to-date information. The basic mission of ES may not change, but it must approach the mission using new technologies in order to be successful. ES-USDA and ECOP's F-A-C-T Future Application of Communication Technologies report (1991) said that the emerging trends of communication and information technologies have vital roles in ES.

Feller (1984) discovered in his research that the role of Extension Specialists had been changing with the times. During the early 1980s, Specialists became members of academic departments and more involved in research itself rather than just disseminating research findings. Harriman and Daugherty (1992) noted that throughout the years the ES has been an unbiased organization and a source of

impartial information and help. No matter to what role ES advances such impartiality needs to continue. Harriman and Daugherty, also, suggested that Extension professionals need to continue developing skills such as excellent communication, personal and public relations. This is vital for the 21st century, no matter what future roles these professionals play. The point is that "...extension services have been forced to adapt to the emergence of electronic dissemination channels while still making active use of print and face-to-face communication mechanisms" (Shill, 1992, p. 313). Greiner, Cain, and Hodges (1992) wrote "we in extension must continually remember our grass roots support as we develop new technology to assist us in our primary purpose--serving our clientele" (p. 472). ES must keep its integrity and its basic mission while adopting new methods of reaching their clientele.

Predictions

Significant predictions have been made by Long and Long (1984), Elliott (1985), and Dik and Travieso (1986). Long and Long (1984) gave direction in regard to the microcomputer,

> "we have a newer listening tool--the microcomputer. It can help us listen to researchers comprehensively, efficiently, purposefully. It can help us listen to clientele with more insight and with more power to integrate timely research with their goals and resources. It can help us listen to colleagues who have experimented and reported their experiences. Extension is not so old that it needs a hearing aid to amplify the signal! But it does face the challenge of using a newer tool to listen more sensitively to people's problems, research- and experience-based alternatives, and co-workers. We can extend our power to hear if through microcomputers we choose to extend our listening" (p. 25).

Elliott predicted that all levels of ES would be networked by computers. In 1993 networked Extension offices were common. In their article titled "Agricultural

Agent of the Future," Dik and Travieso (1986) described a day at the office for an Extension Agent in the year 1990; included were many modern communication and information technologies such as portable computer, email, voice-mail, national network, teleconferencing, expert systems, mobile phone, and interactive videodisc. These new technologies are now in offices across the nation, yet most offices have only one or two of these technologies, not all of them as Dik and Travieso foresaw. Of course, no one can accurately predict the future, even though many try. Such predictions are helpful, however, in that they provide direction. Dik and Travieso (1986) in another article make a point that is relevant to future roles of ES: "...a new influence has come to the point of changing research and extension programs radically. This new force is information power" (p. 272). Their point reinforces the need for information in order to stay competitive in a global economy.

Mims, Novak, Simpson, and Davis (1992) suggested that "new communication technologies will allow for more information to be available to Extension and to its clientele than it has ever readily had before" (p. 622). "To access the information and become brokers of information, the Extension professional will need to know how to use appropriate information technology in finding the information" (p. 623). Extension can justify the adoption of these new processes as the need for current and relevant information is demanded by their clients.

Skills Needed

The assessment of need for certain skills is based on the anticipated role of Extension in the future. The role and skills of Extension professionals must go hand-in-hand in order for the profession to be successful. The ES must constantly train its

personnel in new information and communication technologies. Mims, Novak, Simpson, and Davis (1992) stated that:

> "training users on technology is a necessary component of technology adoption and should be included as part of the implementation process. To use new technology to its fullest, Extension professionals must understand why a particular technology is more useful than the more traditional information delivery methods" (p. 626).

ES-USDA's Future Application of Communication Technologies (FACT) committee (1992) found that there was a need to increase staff knowledge and skill in communication and information technology. The committee members believed that all states should include education/training as a component of their strategic communication, information, and technology plan. Another point made by Mims, Novak, Simpson, and Davis (1992) was that "easing the pain of adopting new technology is not easy, but careful attention to the users' needs will prevent adoption failure or sluggish adoption" (p. 627).

Summers (1993) found that out of 309 respondents to his survey of the 1992 readership of the Journal of Extension, "75 percent reported use of the computer for communication purposes including email and INTERNET, but only 39 percent reported use of the computer to access databases..." (p. 7-8). He also found "respondents indicated they generally are frequent users of email but only about one-third are frequent users of Internet or Almanac" (p. 8). Summers concluded that:

> "since a sizable number of Extension staff indicate a basic lack of knowledge or use of electronic communications and data base accessing, increased training will be needed to enable staff to develop requisite knowledge and skills in electronic communication..." (p. 12).

Information technologies can play a large role in the future of ES. Nevertheless, ES at all levels needs to be convinced to use these technologies even though its effectiveness has been demonstrated over and over again. The tools of

information technology are necessary for ES success. However, using them will not guarantee success. Information technologies only support or facilitate the efforts of ES to do its business of acquiring, evaluating, and disseminating information.

Technologies in Use

Through the efforts of the national ES, state level Extension personnel are adopting information and communication technologies as useful tools to satisfy client needs. Pennsylvania Extension agents and specialists have used PENpages as an information delivery tool for Extension staff since 1984, and for public access since 1985. The Alabama Cooperative Extension Service has implemented a statewide Extension computer network called ACENET. ACENET delivers "large quantities of timely information to staff and clientele alike in an efficient and easy to use manner" (Davis and Simpson, p. 514). Two Iowa State University Extension offices are using a fulltext information database for storage and retrieval of their publications and files (Greiner, Cain, and Hodges, 1992). Iowa Extension has a statewide computer network, EXNET. Trent and Kephart (1990) wrote on the benefits of electronic delivery of Extension publications to Idaho farmers. They list speed and ease of retrieval of information, reduction of publication costs and storage problems, and recreate slide images on the computer as benefits of the program. University of Wisconsin Extension Service has an almanac server available with the Journal of Extension back issues and current issues of the Journal of Extension are available through Virginia Tech's almanac server (Attention authors and readers, 1993, p. inside front cover). Other Extension Services are making Internet servers or computer networks accessible for practice or application.

A wide variety of sources included in the bibliography New Communications Technologies in Agriculture: a bibliography compiled by Hayes (1993) covered telecommunications, computers, and communication systems. This three volume set represented the importance published literature put on information technologies in the late 20th century.

Computer-Administered Surveys

Rosenfeld, Doherty, Vicino, Kantor, and Greaves (1989) have written that:

> "Computers have been used as a means of assessment on psychological instruments for over two decades. During the 1960s, clinicians began using computers to administer and score standardized psychological tests, such as the MMPI. .... The advantages of computerized psychological testing attractive to clinicians (e.g. ease of administration and scoring, increased accuracy and standardization, time savings) are also true of its applications to other areas. Only recently, however, have researchers within social, behavioral, and management sciences utilized computer technology to administer surveys and questionnaires" (p. 147).

Electronic surveys can be used to reveal behavior of people who use computers as a communication mode. Computer-administered survey, as a concept, covers many different types of computerized surveys. Most of the literature is about a survey programmed on one computer terminal that one person uses at a time. Sproull (1986) wrote a comprehensive article on using a computer-administered survey simultaneously sent by email to multiple computer users.

Sproull's email survey produced higher response rates at a lower cost than either paper questionnaires or one-on-one interviews. The average time for responses to electronic survey was half as long as conventional surveys. Sproull recommended sending hard paper copy of letters before the survey with a signature endorsement on

letterhead to improve status and legitimacy. Follow-ups were sent via email instead of the traditional mail postcards. One drawback Sproull encountered was that in an email survey, respondents must be motivated to respond. Kiesler and Sproull (1986) found that electronic surveys lacked social context information. Another drawback discovered by Sproull (1986), Kiesler and Sproull (1986), Rosenfeld, Booth-Kewley, and Edwards (1993), as well as Rosenfeld, Doherty, Vicino, Kantor, and Greaves (1989) was that computer-administered surveys are limited by organizational locations, computer equipment, and different networks. The respondents must be familiar with and have access to an electronic mail system.

Sproull's findings have proven to be consistent with what others have discovered. Rosenfeld et al. (1993) followed Sproull's suggestions and obtained more relevant findings in support of computer-administered surveys. Rosenfeld et al. (1993) felt that if an organization was linked to an existing email system such as BITNET or the Internet, then it would be possible to conduct a low-cost electronic survey. Rosenfeld et al. (1993) suggested their "own experience recommends computer surveys as a preferred mode for sample sizes of 500 or less" (p. 495); level of response on surveys applied either by computer or paper were nearly identical, and internal consistency and reliability (coefficient alpha) of psychological and organizational scales were very similar.

Kiesler and Sproull (1986) came up with similar results corroborating that paper and electronic surveys show considerable similarity, as did Rosenfeld et al. (1993, p. 506). In fact, Booth-Kewley, Edwards, and Rosenfeld (1992) discovered that respondents found the computer format more interesting. Rosenfeld, Doherty, Vicino, Kantor, and Greaves (1989) studied three different microcomputer systems effects on an electronic survey. Rosenfeld et al. (1989) found that a computerized

survey "administered on virtually any type of computer in general use today can produce...responses at least as reliable and valid as would be obtained if paper and pencil were used" (p. 153).

The literature clearly supports the success of computer-administered surveys. Using this methodology to obtain data should not adversely affect the conduct of reliability of the study adversely. It will be monitored and the same steps that Sproull (1986) suggests and Rosenfeld et al. (1993) applied will be used.

CHAPTER 3

METHODOLOGY

The study was designed to determine the information-related competencies and training needed by Montana Extension Professionals when acquiring and disseminating information to clients electronically. The methods and procedures to be used in the study are described in this chapter. The methodology chapter was organized into five sections. These were (1) population description, (2) instrument design, (3) data collection, (4) data analysis, and (5) summary.

A descriptive study was planned based on a design described by Borg and Gall (1989). The intention was to perform a needs assessment that describes the current situation and to answer the objectives of the study.

Population Description

The researcher requested and received verbal permission and endorsement from the Associate Director of Montana Extension Service, Andrea Pagenkopf, to survey MES professionals. The population consisted of specialists, county agents, and administrators employed by the Montana Extension Service. County agents included agriculture agents, home economists, and 4-H agents. Paraprofessionals and secretarial staff were excluded from this study. Specialists were chosen by their formal Extension title, i.e., range specialists. Area Administrative personnel directly employed by the MES were included in the study. This study excluded county and university

department administrators. Names and addresses were obtained from a directory titled County Extension Agents, printed by the MES Office of the Director in September 1993; the directory has a comprehensive list of all staff and faculty involved with MES. Names from the directory were placed into the appropriate group for the study. All lists were compared and duplicated names removed to avoid selection error.

There were 36 Extension specialists, 80 County agents and 6 Extension administrators for a total population of 122. Since the population consisted of 122, a total census was taken.

Instrument Design

The basic design for the survey instrument followed Dillman's (1978) Total Design Method (TDM). Neither Dillman nor the researcher had any experience with computer-administered surveys, so trial surveys were sent by the researcher to members of the researcher's graduate committee. Based on these trial tests, it was concluded that specific directions would be needed depending on the email system available to the respondent.

Another trial test was conducted between the researcher and the researcher's colleagues. The colleagues all use email but there was a vast disparity of email skills among the group. The second trial test helped to determine format and layout of the instrument. Dillman highly recommended placing the response categories and numbers in a vertical format with the response space to the left of the category. The researcher found that this format can be used if specific directions are given to NOT use the return/enter key after placing the answer on the line. The directions told the respondent to use the arrow keys to move one line at a time. This strategy allowed the

respondent to answer a question and move down to the next question without adding numerous, blank lines to the survey instrument. The researcher, also, discovered that the layout of questions was not as crucial in email surveys as in paper (mailed) surveys. Unless the researcher knew that the respondents all had the same computer software and hardware to work with, the researcher could not control page breaks, fonts, and characters per line.

Sproull (1986) suggested that a researcher should send a cover letter in hard copy, because sending it electronically lost the effects that Dillman promoted. These effects include letterhead and a signature from someone with authority in the organization who would influence response rates. This researcher heeded Sproull's advice on sending a hard-copy cover letter. Along with the cover letter, a set of directions was sent that exactly matched the directions sent with the email survey. Sproull recommended this tactic for the infrequent user of email, and this was confirmed during one of the trial tests the researcher carried out. These recommendations were followed in an effort to control non-response error.

The survey was divided into three sections. The first section listed 37 competencies. The competencies were developed from competency items and other questions derived from the review of related literature and experience of the researcher. One tool that listed competencies developed by Nat Jaeggli (1993), MES Computer Applications Specialist, was used with his permission. The competencies taken from this source had been taught at least once to all agents in the survey population by Jaeggli. These competencies were further developed during the trial test runs conducted prior to the pilot test. Of the 37 competencies, 26 encompassed the information technologies used for transferring information and 11 competencies covered factors relevant to information in electronic format. The group of 26

competencies could have been grouped into more specific categories. The first four competencies covered telecommunication hardware and software packages. The next two, numbers 5 and 6, were email competencies. There were thirteen competencies encompassing the Internet protocols. Seven competencies covered a variety of information technologies and their uses.

The respondents were asked to rate the 37 competencies' importance on the left side and rate their knowledge of the competency on the right hand side using a five point (one through five) Likert-type scale. The scales were weighted so that the numbers represented the following: one = not important; two = less important; three = somewhat important; four = more important; and five = very important. For knowledge of the competencies, the ratings were: one = no knowledge; two = little knowledge; three = somewhat knowledgeable; four = more knowledgeable; and five = very knowledgeable. This structure was based on Borich's (1980) needs assessment model. Importance ratings minus knowledge ratings yields a discrepancy score for each competency from each respondent. The discrepancy scores are then weighted by multiplying the average level of importance by the discrepancy score of each competency. The weighted discrepancy scores (WD) allowed for a low discrepancy-scored competency with a high-level of importance to rank higher than a high discrepancy-scored competency with a low-level of importance. Any WD above zero could mean that more training on the competency would be appropriate. The higher the positive WD of a competency, the higher the priority of training should be given that competency. This score can be contributed to the effectiveness, or lack thereof of prior training, lack of training, or respondent's familiarity with the information technology competency through another source, i.e., professional organizations. The weighted discrepancy score can be used in planning future training of competencies.

The second section covered questions on preferences of instructional method and training. Six questions encompassed instructional method preferences, taken from Ballard's (1989) study. The presentation style or format of training sessions could be constructed or modified based on the responses to this series of questions. Four questions covered previous training received by respondents and how they would prefer future training sessions, i.e., length and frequency. These responses can, also, influence the nature of future training sessions.

Five demographic questions (with parts) comprised the last section. These related to gender, age, position, education level, years in the profession, years in current position, and membership in organizations. Data on the respondents membership in organizations was gathered to determine if belonging to state or national-level organizations correlated to responses.

The last two questions asked respondents if they wanted a copy of the results of this survey, and what their comfort level was in answering an email survey. This last question was added as a result of the pilot study. The final questionnaire (Appendix C) contained 53 questions, and required about 20-25 minutes to answer. The length of time was an average obtained from pilot test respondents. A point made by a pilot test respondent was that the person who is less familiar or comfortable with email would take longer to fill out the survey.

The instrument was pilot tested on 14 participants, 13 randomly selected people from the population; one was an administrator, four were specialists, and eight were agents. The fourteenth person was the Director of Evaluation Studies, under the Extension Service in another state. On December 2, 1993, a cover letter and copy of the directions were sent to the 14 selected participants. The cover letter was signed jointly by Andrea Pagenkopf, Director of Montana Extension and the researcher on

departmental letterhead. The survey and a second set of directions were sent via email on December 8, 1993. The pilot respondents were asked to return the completed survey with any comments via email by December 22, 1993. Two email follow-ups were sent; the first one on December 14, 1993, and the second on December 20, 1993. The second follow-up included a copy of the survey and directions. This strategy was followed because the researcher found it was possible for respondents to delete an email message and not realize it was the survey. The first follow-up increased the response rate from 35.7 percent to 57 percent. The second follow-up brought the pilot response rate up to 92.8 percent.

Sproull (1986) had reported that response turn-around time can be less when using an electronic survey. Two weeks were given for the survey to be returned. The response rate was 92.8 percent, confirming Sproull's findings. In all other aspects, Dillman's TDM worked well for this computer-administered survey.

Of the 14 pilot surveys sent, 13 were returned for a response rate of 92.8 percent. Even though respondents were asked to do the survey electronically and return it that way, six came back via postal mail for a 46 percent postal mail return rate. The researcher's address was neither given in the cover letter nor in the email survey or follow-ups, so as not to promote surveys being returned by regular mail. The postal surveys arrived with a variety of addresses, yet they all managed to reach the researcher. There were seven pilot responses returned by email for a 54 percent electronic mail return rate. The one non-respondent did send an email message stating computer problems were preventing the completion of the survey.

Reviewers were asked to evaluate the instrument for editorial or appearance changes, and to review the directions and questions for ease of response, clarity, or ambiguity. No major changes were suggested. Respondents felt the time of 20-25

minutes was accurate for completing the survey. The directions were determined to be useful and easily understood. One question from the pilot test was added to the final survey asking about the respondents comfort level on answering an email survey.

Data Collection

For the pilot test, 13 professionals from this census were queried. They were not duplicated in the census population study done in January of 1994. On January 5, 1994, the cover letter (Appendix A) and directions (Appendix B) were sent on Agriculture and Technology Education Department letterhead bearing the signatures of Andrea Pagenkopf, Director of Extension and the researcher. The email survey and directions were sent January 10, 1994, three working days after the cover letter was sent. This delay allowed time for the letter announcing the survey to arrive. Two email follow-ups were sent seven working days apart, the first one (Appendix D) on January 26, 1994. The second follow-up including the survey (Appendix E) was sent four days before the deadline. Both follow-ups generated more returns. By sending follow-ups on email, the researcher could use a shorter turn around time and send the last one closer to the deadline than would have been possible with mailed postcards.

The return rate on the census survey was 78.9 percent; 86 of the 109 surveyed responded. These figures do not include the surveys returned during the pilot test. From the agent stratum, 59 of 72 responded for 81.9 percent return rate. Twenty-six of the 32 specialists responded, an 81.3 percent return rate for the stratum. The administrator stratum had such a low response rate that group was discarded from the study. One administrator out of the five responded. Another administrator gave the survey to someone else for response, which made that return unusable This response

rate is not representative of the population, so the researcher elected to discard the administrator stratum from the results. This change in population altered the overall response rate from 78.9 percent to 81.7 percent; 85 of the 104 responded. The individual stratums were not affected. Further reporting of the statistics did not include the administrator's stratum. Of the 85 returned, 47 came in via email (55.3 percent) and 38 came through the postal mail (44.7 percent). As in the pilot test, the address of the researcher was not given, but the surveys nevertheless arrived with a variety of addresses.

A random sample of non-respondents was taken after the February 11, 1994 deadline. Of the non-respondents, 10 percent were pooled, which came to three people. As in the pilot test, this was divided up among the three stratums, agents, specialists, and administrators. Two non-respondents were contacted by telephone and the completed survey was sent back to the researcher. The agent sent the survey via email and the specialist sent the survey through postal mail. The third, an administrator, was contacted by telephone, then a copy of the survey was sent via email to this person. The administrator sent an email message back saying that time was too precious to be used on an email survey. The lack of response by the administrator here, also, contributed to the elimination of the stratum from the survey results.

Data Analysis

Responses from the survey were entered into a dbase file using DBASE III. The personal computer version of the Statistical Package for the Social Sciences (SPSS/PC+) was used for analyses (Norusis, M.J. & SPSS, Inc., 1988). Using

SPSS/PC+, the data were "cleaned" by running the procedures FREQUENCIES and LIST to identify variables outside appropriate ranges.

Reliability coefficients, using the data set from the 37 competencies, were computed. Cronbach's alpha coefficient, calculated as part of the One-Way ANOVA procedure by SPSS/PC+, was used as an indication of the reliability of the competencies. Thirty seven competencies and 90 responses (less than the total due to missing values) computed an alpha of 0.9451. The alpha (0.9451) showed a high correlation, therefore the competencies were considered to be sufficiently reliable for the study.

Frequencies, means, and standard deviation for each question was run for the entire population. Frequencies were run for the six questions pertaining to instructional method style preferences and future training preferences by each stratum, agents and specialists. The administrator stratum was not included in these data analysis. Data analyses were done on the 37 competencies. First, discrepancy scores for each competency were calculated by subtracting the knowledge rating from the importance rating for each competency from each response, followed by the computation of the weighted discrepancy scores. Weighted discrepancy scores (WD) were calculated by multiplying the discrepancy score of each competency from each response by the average importance score for each competency. Frequencies, means, and standard deviations were run for importance, knowledge, and WD of each competency for each stratum.

T-tests or analysis of variances, using the significant difference level of 0.05, were run for each WD against different demographics. Demographics by years in the profession, years in current position, degree held, or organization memberships showed no statistical significance. The analyses were run against age, email versus regular

postal mail return method, comfort level in answering an email survey, by agents by method of returning the survey, and by specialists by method of returning the survey.

Respondents were classified as early, middle, or late respondents. The data of Table 1 reveal the characteristics that 41 (43%) of the respondents returned the survey before the first follow-up email was sent. Thirty (31%) of the returns were received between the first and second follow-up. Any survey received after the second follow-up was a late return. Of the responses received, 25 (26%) were in this late category and included the responses from the double dip.

Table 1. Return rate by date of return. (N = 96)

Date returned	N	%
Early return	41	43
Middle return	30	31
Late return	25	26

Analysis of variance was computed on these three sub-population groups. The analysis revealed a very small number (one question) of significantly different means between the groups. Once again, the low numbers are attributed to expectation of random significance, rather than actual significant difference in the data.

Summary

This was a descriptive study of information technologies used by Montana Extension professionals. The population was stratified by Montana Extension professionals and consisted of administrators, specialists, and agents.

An email survey, prepared in part using the Total Design Method (Dillman, 1978), was used as the data collection instrument. Thirty seven competencies were identified and set up as a needs assessment model (Borich, 1980). A pilot study was used to validate and test the instrument. Assurance of the needed sample size was provided through two follow-up email messages to non-respondents. The double dip technique was employed to assure non-respondents were no different than other respondents.

Responses to questions were analyzed by a personal computer statistical package. Reliability coefficients were computed using Cronbach's alpha. The computed alpha was 0.9451 of the thirty-seven competencies. Frequencies, means and standard deviation was calculated on each question in the survey. Weighted discrepancy scores were computed for the 37 competencies. The data were tested by t-test and analysis of variance at the 0.05 significant level. The data were used to determine any differences among selected demographic features and rank ordered the competencies based upon the respondents perceived level of importance and knowledge. The data were, also, used to determine instructional method and training preferences related to information technologies.

CHAPTER 4

RESULTS OF THE STUDY

The study was designed to determine the information-related competencies and training needed by Montana Extension Service professionals to acquire and disseminate information to clients electronically. The results of this study are presented in 6 sections: (1) demographic data, (2) perceived level of importance, (3) perceived level of knowledge, (4) priority for training based on mean weighted discrepancy scores, (5) differences within selected demographic factors, (6) preference of instructional methods, (7) comments provided by the respondents, and (8) summary.

Some respondent's surveys were improperly completed, so the total number for each data analysis was not always equal to 96, i.e. six respondents did not indicate their age (N = 90).

Demographic Data

The data arranged in Table 2 show that the electronic mail survey was sent to 122 Extension professionals. The return rates for agents, specialists, and administrators can be found in Table 2.

Table 2. Return rates for respondents.

Response Group	Number Sent	Number Returned	Percent Returned
Agents	80	66	82.5
Specialists	36	30	83.3
Administrators	6	2	33.3
TOTAL	122	98	80.3

The date in Table 2 indicate that of the 122 surveys sent, 98 (80.3%) were returned. Of the 80 agents polled, 66 (82.5%) returned the survey. Two agents did call the researcher indicating there would not be a response from them because of time constraints. Surveys were returned by 30 of the 36 specialists, for an 83.3% return rate. An administrative assistant, who works for three specialists, notified the researcher that she took care of all the email and the specialists had nothing to do with email. She filled out the survey for the three specialists, which made the completed survey unusable. One other specialist sent an email message saying other commitments would not allow them to respond to the survey.

In the Administrator stratum only two (28.6%) of the seven returned surveys were usable. One administrator gave the survey to another person who did complete the survey. This person noted that the administrator had given them the survey to answer. For the double dip technique, the administrator could not commit the time to answering a survey. Due to the number of usable returns (n = 2), the Administrator stratum is not included in the result's data.

The returns were divided by gender and on this basis, 34 (35%) responses were from females and 62 (65%) returns were from males.

The data in Table 3 reveal the method by which agents and specialists returned the survey. The agent stratum had 40 (41.7%) respondents return the survey via email

and 26 (27.1%) through regular postal mail. The specialists returned 13 (13.5%) of the surveys via email. Seventeen (17.7%) of the specialists returned the survey by regular mail. Of the 96 returns, 53 (55.2%) were returned via email and 43 (44.8%) came back through the regular mail.

Table 3. Method respondents used to return the survey.

	Agents		Specialists		Total	
Method of return	n=66	%	n=30	%	N=96	%
Email	40	41.7	13	13.5	53	55.2
Regular mail	26	27.1	17	17.7	43	44.8

As revealed by data in Table 4 the Masters degree group had the most respondents, 42 (44%). The respondents with a bachelor degree were the second highest group, 31 (32%). Twenty-three (24%) respondents hold a doctorate degree.

Table 4. Distribution of degree held by the respondents. (N = 96)

Degree held	n	%
Doctorate	23	24
Masters	42	44
Bachelors	31	32

Data arranged in Table 5 show the distribution of respondents by age. Of the 96 returns, 31 (32.3%) fall into the 36-45 years of age grouping. The highest return rate was in the 46-55 age category, thirty-three (34.4%) resondents. Six (6.3%) respondents did not divulge their age for this survey.

Table 5. Distribution of age of the respondents. (N = 96)

Age	n	%
24-35	16	16.6
36-45	31	32.3
46-55	33	34.4
56 and older	10	10.4
Missing	6	6.3

The data in Table 6 indicate respondents' returns by years in the Extension profession. Twenty-five percent (n = 24) of the respondents have been in the Extension profession from 1 to 5 years. Both categories of 21 to 25 years and 26 or more years in the profession each had 12 (12.5%) respondents. A total of three respondents did not indicate the years of experience.

Table 6. Distribution by years of service in the Extension profession of the respondents. (N = 96)

Years in the profession	n	%
1-5	24	25.0
6-10	15	15.6
11-15	16	16.7
16-20	14	14.6
21-25	12	12.5
26 or more	12	12.5
Missing responses	3	3.1

The data represented in Table 7 are the return rates by years of service in the current position. The respondents who fit the first category, 1-5 years in the current position, returned 43.7 percent (n = 42) of the surveys. Of the 96 Extension professionals surveyed, seven (7.3%) have 16-20 years in the current position and eight (8.3%) respondents had 21 years or more years in their current position.

Table 7. Distribution by years of service in the current position of the respondents. (N = 96)

Years in current position	n	%
1-5	42	43.7
6-10	14	14.6
11-15	21	21.9
16-20	7	7.3
21 and over	8	8.3
Missing responses	4	4.2

The data in Table 8 cover information about respondent's memberships in organization. The membership information was obtained to compare if belonging to an organization made any difference of respondent's experience or knowledge of information technologies. Five categories were listed on the survey ranging from local or county organizations to International organizations.

Table 8. Respondent's memberships in different organization levels. (N = 96)

	Local/ County		State		Regional		National		Inter-national	
Belong to	N	%	N	%	N	%	N	%	N	%
1-2	29	30	58	60	24	25	59	69	11	11
3-4	14	15	20	21	3	3	18	18	0	
5 or more	5	5	1	1	1	1	1	1	0	
None	48	50	17	18	68	71	18	19	85	89
Mean	1.18		1.64		0.47		1.54		0.16	

The numbers presented in Table 8 indicate the number of organizations respondents belong to for any given level. The data in Table 8 indicate that 50 percent (n = 48) of the respondents do not belong to a local or county organization. Thirty percent (n = 29) belong to one or two local or county organizations. Local or county organization membership has a mean of 1.18. Membership in state level organizations

has the highest mean, 1.64. Only 17 (18%) respondents do not belong to a state organization. The category of belonging to three to four state organizations had 20 (21%) of the respondents. Sixty percent (n = 58) of the respondents belong to 1 or 2 state organizations. Sixty-eight (71%) of the respondents did not belong to a regional level organization, while 24 (25%) belong to 1 or 2 regional organizations. The regional organization membership mean was 0.47. National level organizations had the highest memberships, 59 (69%) of the respondents, in one or two organizations. The mean for membership in national organizations was 1.54. International organizations had the smallest membership of Montana Extension professionals, which had a membership mean of 0.16. Eighty-nine (n = 85) percent of the respondents did not belong to an international organization, while 11 (11%) of the respondents belong to one or two international organizations.

Table 9. Respondent's level of comfort in answering an email survey. (N =96)

Comfort level	n*	%
Not comfortable	32	33.3
Less comfortable	11	11.4
Somewhat comfortable	19	19.8
More comfortable	11	11.4
Very comfortable	23	24.1

* Mean = 2.81.

The last table of data, Table 9, in the demographic section describes the comfort level of respondents to answer an email survey. One-third (n = 32)of the respondents were not comfortable responding to an electronic survey. Eleven (11.4%) of the respondents were less comfortable, while 19 (19.8%) were somewhat comfortable in answering an electronic survey. Eleven (11.4%) of the respondents reported being

more comfortable. When replying to the electronic survey, twenty-four (n = 23) percent of the respondents felt very comfortable. The mean of respondent's comfort level was 2.81, which indicates more respondents are less comfortable using email than more comfortable.

Perceived Level of Importance

Table 10 and Table 11 represent data generated from ratings of importance. These data were calculated from each competency by the two stratums. Ratings of 1 through 5 were the choices, where 1 was not important and 5 was very important. Therefore, the higher the mean value, the more important the stratum was for that competency. The data were analyzed for mean and standard deviation (SD). All means and SDs were truncated at two decimal places. The competencies are put in rank order based on the mean importance rating. A comment (see Appendix F) from one survey makes a relevant point: "I'm not fimiliar with several of the terms and acronyms (gopher, ftp--my co-worker defined this one for me) you used in the survey. If I never heard of it, how can I evaluate its importance."

The data in Table 10 indicate that mean of importance ratings by agents range from 4.39 to 1.96. The highest competency was *follow instructions on the computer screen*, whereas the lowest importance mean was for the competency *describe gopher or veronica*. The standard deviation for the competencies vary anywhere from 1.25 to 0.82. The highest mean, 4.39, had the smallest standard deviation (SD)of 0.82. The competency with the lowest mean of 1.96 had a SD of 1.03. The twelve competencies which are describing or using the Internet protocols consistently have the lower means among the agents.