ARIZONA EXTENSION AGENTS' USE OF COMMUNICATION TECHNOLOGIES

by

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STATEMENT BY AUTHOR

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ABSTRACT

Arizona Cooperative Extension strives to address community issues and needs through a research based educational process. The specific foci of the Extension agent gradually changed over time. Today's Arizona Extension agents should have good communication skills as they work to identify community resources, form community partnerships, and develop educational materials, among other things.

The study sought to describe how Arizona Extension agents utilize nine communication technologies: cell phones, Smartphones, tablet computers, wikis, blogs, podcasts, YouTube, Facebook, and Twitter. Greater than half of the participants utilized each mobile device included in the study (cell phones, Smartphones, and tablet computers). Facebook was a widely used social media tool.

The researcher suggests that funding and professional development may play key roles in Arizona Extension agent technology adoption. Communication technology use should be considered within Cooperative Extension work in order to help agents better serve the clientele.
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CHAPTER 1: INTRODUCTION

Background of Cooperative Extension

The Smith-Lever Act was signed by President Woodrow Wilson on May 8, 1914, establishing the Cooperative Extension System (Rasmussen, 1989). The purpose 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, 1914, section 1).

The title Cooperative Extension reveals the system's design. The term Cooperative refers to the system's unique partnership with county agents, state land-grant universities, and the United States Department of Agriculture (USDA) (Rasmussen, 1989). Extension stems from the idea that the system would serve as an extension of the university by giving instruction and practical demonstrations to persons not attending land-grant colleges, by taking information to the communities (Smith-Lever, 1914). The Arizona Board of Regents (2012) stated Cooperative Extension's mission "is to help people improve their lives through an educational process that uses scientific knowledge to address issues and needs" (section 1.01.01).

Throughout the years, the Cooperative Extension system showed great flexibility while accomplishing its mission, even through hardships. The United States entered into World War I in 1917 (Rasmussen, 1989). Cooperative Extension responded with a campaign for increased food production. Extension agents promoted gardening, food preservation, and organized youth to work on farms to meet labor shortages. Throughout the Great Depression, Extension agents encouraged people to make the best use of their
resources by rationing and preserving food, sewing, and refurnishing furniture. Later, the Cooperative Extension system was threatened as the New Deal created relief programs, many directly serving farmers with similar actions and education as Extension work. The Cooperative Extension system adapted nevertheless, often partnering with the relief programs. Cooperative Extension adapted again with the rise of World War II. Extension agents encouraged increased farm production, gardening, and canning. Four-H clubs brought relief to their communities by making clothes, raising Victory gardens, and providing farm labor (Rasmussen, 1989).

The Cooperative Extension system survived various trials over the decades by remaining flexible. Rasmussen (1989) stated, "Extension will change to deal with change, but Extension must carry out change within the framework of helping people help themselves through research-based educational programs" (p. 241). Cooperative Extension continued to demonstrate the ability to adapt to change over the years, while maintaining the original organizational framework. Cooperative Extension serves a broader clientele today than the system did when established in 1914. As the number of farms declined and the size of commercial farms increased, individuals were more able to live and work away from the farm. The number of U.S. families increased from 45 million in 1960 to 64 million in 1986. As a result, Cooperative Extension began to work with a more urban audience (Rasmussen, 1989).

The issues and values of the new audience were different from those in previous years. Rasmussen (1989) stated, "Values were changing. Society witnessed a greater materialism, a shift away from ethical values, liberalized sexual mores, increased
mobility of families, changing roles of family members, and a rising rate of gainful employment among wives and mothers" (p. 156). The changed values were accompanied by a variety of issues. "Stress in families manifested itself in child abuse and family violence, juvenile delinquency, divorce, teenage pregnancy, drug and alcohol abuse, and bankruptcies" (Rasmussen, 1989, p. 156). Poverty and obesity rates increased while nutrition and health decreased. Youth faced many challenges as many were born into poverty, risked becoming a teen parent, had no health insurance, or risked dropping out of school (Rasmussen, 1989).

Cooperative Extension adapted to address several of the challenges. The Smith-Lever Act was amended several times, expanding Cooperative Extension program areas (Rasmussen, 1989). Today, Cooperative Extension's primary foci are rooted in the following program areas: Agriculture and Natural Resources; Community and Economic Development; Family, Consumer, and Health Sciences; and 4-H Youth Development (Seevers, Graham, Gamon, & Conklin, 2007; Arizona Cooperative Extension, 2012).

Extension agents are hired within each program area to "develop practical applications of research knowledge and give instruction and practical demonstrations of existing or improved practices or technologies" (Smith-Lever, 2002, section 2). The Arizona Board of Regents (2012) identified common roles for Arizona Extension agents. In general, Extension agents develop, conduct, and evaluate programs that address needs related to their assigned program area. Specific tasks may include identifying resources such as grants or donations, preparing educational materials, and forming community partnerships. Extension agents should be experts in their field and should strive to
professionally represent the University of Arizona Cooperative Extension. Many of the duties require the Extension agent to actively engage in communication with others (Arizona Board of Regents, 2012). Rasmussen (1989) stated, "every agent must be a communication expert, providing the link between the university and the people" (p. 7).

**Social Impacts of Communication Technologies**

Ways in which people communicate changed over the years as communication innovations were developed. Since America's establishment, the nation has communicated through the postal system, telegraph, telephone, radio, television, mobile phone, and Internet, to name a few (Ensmenger, 2006; Dhir, 2004). Communication technologies have "allowed human communication to transcend time, space, and social distance barriers" (Rogers, 2002, p. 61).

Over the years, communication technologies have altered the image of the traditional workplace, community, and individual (Willson, 2006; Prensky, 2001). Communication technologies altered work practices by allowing work to be accomplished outside the traditional office environment (Willson, 2006). Atkin and Lau (2007) indicated that the number of workers who telecommuted, used communication technologies to work while away from the office environment, doubled between 1997 and 2003. Communication technologies also influenced workers' interaction and work flow. For example, email communication enables workers to control their pace of response, as opposed to telephone communication, which often expects an immediate reply (DiMaggio, Hargittai, Neuman, & Robinson, 2001).
Willson (2006) explained how communication technologies caused the definition of community to broaden into two forms, traditional and modern communities. Traditional communities are defined as the physical location where an individual resides. Face-to-face interaction is the most common form of communication in traditional communities. Modern communities are accessed using technology and can transcend time and space. Interaction within modern communities have a broad reach and allow individuals to become members within multiple communities simultaneously. Modern communities can be used to supplement traditional communities in order to enhance community member interactions (Willson, 2006).

Communication technologies can allow users to have instantaneous communication with others, and could provide the opportunity for users to relocate without completely disengaging from prior relationships (Willson, 2006). By contrast, potential communication barriers can arise when technology users and non-users interact (DiMaggio et al., 2001). Prensky (2001) identified people today as either digital natives or digital immigrants. Digital natives are those individuals who grew up surrounded by various technologies such as computers, videogames, cellular telephones, and other digital tools and toys. Digital natives are fluent speakers of the digital lingo and are accustomed users of digital technologies. Digital immigrants, on the other hand, were not born into the digital world, but rather "immigrated" into the digital society by adopting digital technologies at a later point in life. Digital immigrants, just like all immigrants, must learn the technical language and skill required to utilize digital technologies. Many digital immigrants maintain an "accent" of familiar, non-digital procedures (Prensky,
Communication between digital natives and digital immigrants could be challenging, as Prensky (2001) pointed out, "Digital Immigrant instructors, who speak an outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language" (p. 2).

Extension agents may see changes brought on by communication technologies within the workplace, community, and/or clientele (Willson, 2006; Prensky, 2001). While the Cooperative Extension System demonstrated the ability to adapt to change over the years, Extension agents need to be prepared for coming social changes brought on by communication technologies in order to remain a relevant resource (Rasmussen, 1989; Seevers et al., 2007).

**Statement of the Problem**

Cooperative Extension provided information and outreach to communities for decades. Technology created a means for people to easily acquire information from numerous other sources (King and Boehlje, 2000). Understanding how Arizona Extension agents currently utilize communication technologies can reveal how Cooperative Extension is adapting to serve the technologically changing society, such as the modern communities and digital natives (Willson, 2006; Prensky, 2001). Arizona Extension agents' use of communication technologies was largely unknown prior the study.

The problem statement is as follows: How do Arizona Extension agents use communication technologies?
Purpose Statement

The purpose of the study was to determine how Arizona Extension agents use communication technologies. The researcher was interested in explaining the population's use of the selected mobile devices (cell phones, Smartphones, tablet computers) and social media tools (wikis, blogs, podcasts, YouTube, Facebook, Twitter).

Demographic differences could exist within the population. Castells et al. (2007) noted that women tend to be more reluctant to use mobile technologies than are men. Reports from the National Telecommunications and Information Administration (NTIA) revealed that the elderly and rural dwellers reported less Internet access than their opposite (Blank & Strickling, 2011).

Further, the researcher was interested to understand how quickly Arizona Extension agents adopted each communication technology by determining the rate of adoption based on Roger's (2003) diffusion of innovations theory. Using the rate of adoption, the researcher categorized Extension agents into Roger's (2003) adopter categories in order to better understand the character of the participants. Rate of adoption and adopter categories are explained in Chapter 2.

Research Objectives

The following objectives were identified to guide the study.

1. Describe the demographic variables of program area, age, sex, and number of years of Extension experience of Arizona Extension agents who participated in the study.
2. Describe the population's use of each communication technology (cell phones, Smartphones, tablet computers, wikis, blogs, podcasts, YouTube, Facebook, Twitter).

3. Compare the population's use of each communication technology to each demographic variable.

4. Determine the relative rate of adoption for each communication technology.

5. Classify Arizona Extension agents into adopter categories, based on the relative rate of adoption, for each communication technology.

**Significance of the Study**

Many Extension agents utilize the Journal of Extension (JOE) as a resource for reliable Extension related information. "JOE is a rigorous, peer-reviewed journal that brings the scholarship of university outreach and engagement to educators and practitioners around the world" (Journal of Extension, 2013, para 2). A recent search within the JOE database brought up hundreds of results for articles related to Cooperative Extension and communication technologies. The numerous related articles indicate that many people within the national Extension community have a shared interest to understand how communication technologies are used within Cooperative Extension work. Some of the related articles are explained further in Chapter 2.

From a broader examination, American President Barak Obama recognized that technology played a key role in economic growth and job creation. In September, 2011, Obama stated, "We should be making it easier and faster to turn new ideas into new jobs and new businesses. And we should knock down any barriers that stand in the way."
Because if we're going to create jobs now and in the future, we're going to have to out-build and out-educate and out-innovate every other country on Earth" (White House, 2012, para 1). The Presidential Administration developed many programs and policies to encourage and expand technology use. The National Wireless Initiative and Recovery Act outlined two main goals which relate to the study (White House, 2012).

First, in June 2010, President Obama signed the National Wireless Initiative. The plan was to make 500 megahertz of wireless spectrum available for fixed and mobile wireless broadband within ten years. Wireless technologies rely on information traveling through a series of airways. As more people adopt technologies and as faster, higher powered devices are adopted, the vast amount of information threatens to overload the airways creating a "spectrum crunch." In order to increase spectrum space, the plan calls to repurpose identified spectrum bands used for both Federal and Non-Federal purposes (Locke & Strickling, 2010). The National Wireless Initiative intends to provide 98% of Americans with high-speed, 4G wireless Internet access. The White House (2012) stated, "The availability of new wireless broadband services will allow more Americans to use the Internet to learn, work and play—regardless of where they live" (para 15).

A second target was to increase broadband Internet access across America, as part of the Recovery Act. The vision began in 2004 when President George W. Bush established a national goal of universal broadband Internet access (Cooper & Gallagher, 2004). President Obama's Administration planned to increase broadband Internet access by conquering barriers contributing to the digital divide. In recent years, some demographic inequalities of the digital divide have lessened and overall broadband
Internet access has increased. Sixty-eight percent of American households used broadband Internet service in 2010, an increase from sixty-four percent the previous year (Blank & Strickling, 2011). Technology use is expected to increase as barriers from the digital divide and spectrum crunch are overcome, and as society becomes more accustomed to technology (White House, 2012; Parasuraman & Colby, 2001).

**Implications**

Available funding and professional development may influence Arizona Extension agents' use of communication technologies, as well as influence the rate of adoption and adopter categorization for the study.

**Application**

Understanding how Arizona Extension agents utilize communication technologies could impact funding, hiring decisions, professional development, and research at the University of Arizona.

**Assumptions**

The following basic assumptions were made for the study. These assumptions were speculated and therefore were not tested as part of the study. It was assumed:

- The participants were honest in providing responses to the questionnaire.
- The participants were able to provide accurate responses to the questionnaire.

**Limitations**

The following limitations were considered and impacted the research in the study:

- The results from the study were generalized only to the target population.
• If a respondent completed less than 50% of the questionnaire, the responses were not used.

• If a respondent did not complete the questionnaire within the designated time frame, the responses were not used.

**Definition of Terms**

For the purpose of adding clarity to the study, the following definitions are based on the study and should be viewed as such.

**Adopter category:** classification of individuals on a continuum, based on their readiness to adopt new innovations; includes five categories: innovators, early adopters, early majority, late majority, and laggards; can be calculated by determining the relative rate of adoption (Rogers, 2003).

**Adoption:** a decision to make full use of an innovation (Rogers, 2003).

**Communication Technologies:** The study categorized communication technologies as mobile devices and social media tools, in order to add clarity to the study.

**Mobile Devices:** For the purpose of the study, mobile devices included cell phones, Smartphones, and tablet computers. Though mobile devices only included three devices, the capabilities of each are vast. The selected mobile devices include functions such as gaming, playing music, reading, taking photos and video, texting, and calling, to name a few (Castells, Fernández-Ardévol, Qiu, & Sey, 2007). In order to limit the scope of the capabilities to a manageable range, the study centered around communication related capabilities of the selected mobile devices.
**Cell Phones:** The cell phone was introduced into the American market in 1983 (Rogers, 2003). Cell phones allow for communication to occur via radio waves rather than a fixed, wire connection. While early cell phones only allowed for verbal two-way communication with other phones, modern cell phones have numerous capabilities. For example, many cell phones allow the user to store contact information, make task lists, schedule appointments, play games, capture photo or video footage, and store and play music. Using cell phones for voice calling became the dominant form of wireless communication, and sending and receiving short text messages became one of the fastest growing uses for cell phones (Dhir, 2004). The study investigated the population's use of voice calling and text message communication with cell phones.

**Smartphones:** Smartphones combine the functions of a cell phone, pager, and PDA (personal digital assistant) into a single, compact device. In addition to the capabilities of a cell phone, a Smartphone can access the Internet and send and receive email transmissions. Smartphones have been around since about 1996 and have recently become popular in America (Dhir, 2004). Along with voice and text message communication, the study investigated the population's use of Smartphones to send and receive email and access the Internet to utilize social media tools.

**Tablet Computers:** Dhir (2004) described tablet computers as being "essentially full-fledged PCs [personal computers] with touch screens, wireless Internet connections, and speech and handwriting input" (p. 299). Tablet computers are approximately the length and width of a legal-size pad of paper and are roughly 1.5 inches thick. Reading electronic books (eBooks), playing games, accessing the Internet, and word processing
are a few of the many uses for a tablet computer (Dhir, 2004). The study investigated the population's use of tablet computers to communicate via email and access the Internet to utilize social media tools.

**Social Media Tools:** Kinsey (2010) indicated that Extension educators should seek new means to reach their learners. Kinsey (2010) identified wikis, blogs, podcasts, YouTube, and Facebook as five social media tools to help Extension agents reach their clientele. Seger (2011) also encouraged Extension agents to utilize social media tools in order to serve as a catalyst for technology adoption. Seger (2011) mentioned tools such as Wikipedia, blogs, Facebook, and Twitter. The Arizona Cooperative Extension website displayed a tab labeled "social media." When accessed, the tab provided linked websites to Arizona Cooperative Extension Facebook and Twitter accounts, and blogs and videos (Arizona Cooperative Extension, 2012). Due to the popularity and interest among Extension personnel of the following social media tools, the study investigated the population's use of wikis, blogs, podcasts, YouTube, Facebook, and Twitter.

**Wikis:** Wikipedia had over five million users who edited, added, and deleted content to "wikis" daily (Seger, 2011). Wikis could be used to share information, create documents, and provide a link to resources. Wikis allow for several users to collaborate on a project, which can then be shared with a selected audience or publicly via the Internet (Kinsey, 2010).

**Blogs:** Blogs allow users to share expertise and information with a blogging community. Seger (2011) reported that 77 percent of active Internet users read blogs. "Consumers use reliable blog sites for product review and commentary" (Kinsey, 2010,
The public blogging community encourages interactivity by allowing readers to comment on a blog post (Kinsey, 2010).

**Podcasts:** Podcasts are brief audio or video messages created to share educational information or announcements. Podcasts may include music, pictures, or other forms of animation. Podcasts are easy to share and can be useful for Extension agents to communicate with the clientele.

**YouTube:** YouTube is a venue often used to broadcast video podcasts. Kinsey (2010) stated, "YouTube is a popular video-sharing venue online that attracts millions of users daily" (para. 10). A link to a video on YouTube can be shared with others via email, and the video could be broadcast to a global audience (Kinsey, 2010).

**Facebook:** Facebook provides users with a forum to connect with others and share information, photos, videos, and messages. Extension educators may use Facebook to communicate upcoming events and share educational information (Kinsey, 2010). At the end of March 2012, Facebook was available in over 70 languages and had 901 million monthly active users (Facebook, 2012). In 2011, Facebook was the most visited website in the United States (O'Neill, Zumwalt, & Bechman, 2011).

**Twitter:** Twitter allows users to receive current information, ideas, and news from various sources. Twitter users create an account and then locate other accounts of interest to "follow" the conversations. Information is shared in short bursts called "tweets." Each tweet can be up to 140 characters in length. Tweets may be sent and received on either a computer or mobile device (Twitter, 2012).
Cooperative Extension: a non-formal educational system that links resources from the USDA, land-grant universities, and county offices in order to assist citizens by utilizing research based knowledge and programs (Seevers et al., 2007).

Extension agent: employee of a land-grant institution who utilizes University, USDA, and local resources to assist and educate citizens on topics within a program area (Seevers et al., 2007).

Rate of adoption: "the relative speed with which an innovation is adopted by members of a social system" (Rogers, 2003, p. 221)
CHAPTER 2: REVIEW OF LITERATURE

Introduction

The Cooperative Extension System demonstrated great flexibility throughout the years as Extension agents adapted along with society to address community issues and needs (Rasmussen, 1989). In recent years, communication technologies have impacted society by allowing users to have instantaneous communication with others (Willson, 2006). Communication technology use is expected to increase as barriers from the digital divide and spectrum crunch are overcome, and as society becomes more accustomed to technology (White House, 2012; Parasuraman & Colby, 2001). The researcher is interested in describing how Arizona Extension agents use some common communication technologies in order to better understand ways in which the Cooperative Extension System could be adapting to the meet the needs of a technologically changing society.

Purpose Statement

The purpose of the study was to determine how Arizona Extension agents use communication technologies.

Research Objectives

The following objectives were identified to guide the study.

1. Describe the demographic variables of program area, age, sex, and number of years of Extension experience of Arizona Extension agents who participated in the study.
2. Describe the population's use of each communication technology (cell phones, Smartphones, tablet computers, wikis, blogs, podcasts, YouTube, Facebook, Twitter).

3. Compare the population's use of each communication technology to each demographic variable.

4. Determine the relative rate of adoption for each communication technology.

5. Classify Arizona Extension agents into adopter categories, based on the relative rate of adoption, for each communication technology.

Theoretical Foundation

The theoretical foundation for the study was based on Rogers' (2003) diffusion of innovations work. Rogers (2003) defined diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 5). Professionals called change agents are employed to carry out the diffusion process. Extension agents are often referred to as change agents due to their efforts to encourage the clientele to adopt new innovations (Seevers et al., 2007; Rogers, 2003).

Extension's change agents powerfully influenced numerous agricultural practices over the years by encouraging farmers to adopt new ideas. Extension agents are credited with influencing farmers' decisions to adopt the tractor throughout the 1920s. Approximately 246,000 American farms owned a tractor in 1920; that number increased almost 375% to roughly 920,000 by 1930 (Rasmussen, 1989). Similarly, when researchers realized farmers were reluctant to try out experimental agricultural practices,
efforts focused on youth. Corn growing contests that awarded the best corn yield attracted boys while flower growing and home gardening competitions attracted girls to new agricultural practices. The idea of awarding premiums for agricultural projects became popular at county and state fairs. The youth competitions eventually led to the first 4-H programs (Seevers et al., 2007).

Change agents use various communication channels to share information about innovations with their clientele. Mass media channels that can quickly and efficiently inform a broad audience of the innovation can include radio, television, and newspapers. However, interpersonal channels are typically more effective in persuading the adoption of an innovation. An interpersonal channel involves a two-way communication effort in which the change agent and client work together (Rogers, 2003). While interpersonal communications were historically face-to-face, technologies such as email have created a similar degree of interpersonal communication by allowing opportunities for personalized communication (Lin & Atkin, 2002; Rogers, 2003).

When a change agent introduces, or diffuses, an innovation into society, individuals decide to adopt or reject the innovation. Rogers (2003) referred to the decision making process as the innovation-decision process. The amount of time the innovation-decision process takes varies with each individual or society. Some innovations will be adopted quickly while others may take several years to be adopted. For example, the Internet became widely used after a twenty year delay and the fax machine was created 125 years before it became popular (Rogers, 2003).
**Rate of Adoption**

The usual diffusion study takes place after the innovation has widely diffused and asks respondents to look backward in time. Unfortunately, asking respondents to recall data is a weakness of diffusion research as a respondent's retrospection may be inaccurate. The researcher can better understand the relative speed at which the participants began using each communication technology by asking individuals to recall the number of years each technology has been used (Rogers, 2003).

In general, when the cumulative frequency of adoption over time is plotted, the distribution will result in a S-shaped curve. The curve begins to climb as more individuals adopt. Eventually, the rate of adoption will level off as fewer individuals remain who have yet to adopt. Some innovations diffuse rapidly, creating a steep S-shaped curve; other innovations are adopted slowly, creating a lazy S-shaped curve (Rogers, 2003). See Figure 1 for an illustration of the S-shaped curve.

**Adopter Categories**

The rate of adoption may be analyzed to determine an individual's willingness to adopt an innovation. Rogers (2003) illustrated an individual's readiness to adopt new innovations on a continuum of five categories: (a) innovators, (b) early adopters, (c) early majority, (d) late majority, and (e) laggards. The innovators are those individuals who are quick to adopt the innovation, while the laggards are more stubborn and may quickly reject the innovation for fear of change. Each category of adopters has defining characteristics (Rogers, 2003).
Figure 1. Sample S-shaped Curve


Innovators often have a high degree of media exposure and actively seek information about new ideas. Innovators are considered venturesome and are able to cope with a high degree of uncertainty and risk. Early adopters are respected by other members of the social system who desire advice and information on the innovation. Many people consider the early adopter to be "the individual to check with before adopting" (Rogers, 2003, p. 283). The early majority frequently interact with their peers, but may deliberate for a time before deciding whether or not to adopt an innovation. The late majority are skeptical and cautious of new innovations; the decision to adopt does not occur until many have already adopted and the social system shows favor for the
innovation. Laggards are the last group of individuals to adopt an innovation. Laggards prefer to follow traditions and are often suspicious of innovations which will alter customs (Rogers, 2003).

Adopter categories may be plotted on a normal distribution. Using statistics, the mean (\( \bar{x} \)) number of years of use and standard deviation are used to divide a normal distribution into the five adopter categories. The innovators are found two standard deviations to the left of the mean and include the first 2.5 percent of the adopters. The early adopters occupy the area between "the mean minus one standard deviation and the mean minus two standard deviations" (Rogers, 2003, p. 280). The early adopters account for 13.5 percent of the total adopters. The next 34 percent of adopters are the early majority, included in the area between the mean and the mean minus one standard deviation. Late majority adopters are the next 34 percent of adopters between the mean and one standard deviation to the right of the mean. The final 16 percent of adopters are the laggards (Rogers, 2003). See Figure 2 for an illustration of the distribution.

The study utilized Roger's rate of adoption and adopter categories to better explain Arizona Extension agents' use of communication technologies. Participants were asked to look back in time and record when they began using each communication technology. The responses were used to calculate the relative rate of adoption. As described above, the rate of adoption was then used to classify Arizona Extension agents into adopter categories. Several past studies share commonalities with the current research.
**Related Studies**

In a study by O'Neill, Zumwalt, & Bechman (2011), researchers sought to determine how Cooperative Extension Family Economics Educators utilized social media. A link to a questionnaire was sent to over 300 Extension specialists and county agents who taught personal finance. Questions asked the participants how frequently they used various social media sites and which devices were used to access the sites (O'Neill et al., 2011).

Respondents used Facebook most frequently. YouTube and blogs were reported as used "sometimes." When asked to indicate the devices used to access the social media tools, a computer was the most used device as 91% of respondents reported using a computer to access Facebook and YouTube. Further, 36% of respondents used a Smartphone to access Facebook. The study suggested that Extension agents utilize
Facebook, Twitter, and YouTube as social media tools because respondents were most familiar with the three tools (O'Neill et al., 2011).

Another related study by Hall, Dunkelberger, Ferreira, Prevatt, & Martin (2003), used Rogers (2003) diffusion of innovations model to analyze the use of personal computers and Internet technologies by beef and peanut farm operators in Alabama, Georgia, and Florida. The questionnaire for the study was designed to group respondents into Rogers (2003) adopter categories based on personal computer and Internet usage. The study further analyzed descriptive characteristics of the population such as age, education, and type of farmer. Finally, the researchers compared the adopter classifications to the descriptive characteristics of the participants (Hall et al., 2003).

The findings reported early adopters as the prominent group of farmers (28.6%), indicating they are likely to utilize a personal computer and Internet access in their farm business. Non-adopters, those without access to a personal computer, were the next largest group of participants (25.7%). The adopter categories were compared to the descriptive characteristics of the participants. The comparison revealed that age was a key factor in the adoption of the personal computer and Internet. Older farm leaders dominated the non-adopter, late majority, and early majority categories. The innovator and early adopter categories contained mostly farmers under age 45. Education level corresponded closely with age, and type of farmer did not impact the study (Hall et al., 2003).

A technology readiness study conducted by Oregon State University in 2009 serves as a foundation for the following related studies. The article entitled Assessing
county Extension programs' readiness to adopt technology; An OSU case study of two Oregon counties outlined the study. Two Oregon counties were selected to serve as a representative of Oregon's urban and rural communities. The study sought information from Extension agents about their clientele, how technology was currently being used in programming, and perceived barriers and needs related to technology (Diem, Gamble, Hino, Martin, & Meisenbach, 2009).

The findings identified time, money, and training as barriers that kept Extension faculty and staff from adopting new technology. The study also found that many Extension professionals really only knew their currently served audiences, who were identified as being very traditional. Many who responded believed technology was not valued by their clientele who desired face-to-face interaction (Diem et al., 2009).

Seger's (2011) article expressed a need for Extension agents to overcome the barriers of technology adoption outlined in the above study. While the respondents in the study described the extension profession as very traditional, Seger described agriculture extension clients as being "one of the fastest groups of technology adopters" (Seger, 2011). Further, Seger (2011) stated, "Extension's mission is to take the university to the people. To do so, we should go to where the people "are." Today we can find them online and on their PDAs, engaged in a variety of social media" (Seger, 2011).

The 2009 Oregon study was also followed with a 2011 article entitled Is Extension Ready to Adopt Technology for Delivering Programs and Reaching New Audiences? The article challenged Extension agents to find a balance between reaching new audiences and maintaining traditional audiences. Diem et al. (2011) stated: "The
current county-based delivery of Extension education is failing to serve a progressive and growing constituency that not only desires, but also expects to find, all forms of education and information online." The article explained that ignoring the needs of online audiences could threaten the future of the Cooperative Extension System. The article further suggested that Extension should lead the way in technology adoption and encourages Extension agents to engage in professional development opportunities to acquire technological skill (Diem, Hino, Martin, & Meisenbach, 2011).

**Conceptual Framework**

The researcher developed a conceptual framework based on information gained through the literature review (Figure 3). The large quantity of related studies found within Cooperative Extension literature revealed a need to explore how communication technologies are utilized by Extension agents. Rogers (2003) diffusion of innovations work provided a way to further analyze the results by calculating the relative rate of adoption and then classifying participants into adopter categories.

The researcher first administered a questionnaire that sought to determine how Arizona Extension agents use communication technologies. The rate of adoption was then calculated from the collected data. Participants were then categorized into adopter categories based on the relative rate of adoption. Figure 3 shows the flow of the process.

**Figure 3.** Conceptual Framework
Summary

Rogers (2003) diffusion of innovations theory provided insight into the process of adopting new technologies. First an innovation is introduced into a social system, often by a change agent. Then, individuals proceed through the innovation-decision process to decide whether or not to make use of the innovation (Rogers, 2003).

The speed at which an individual or society decides whether or not to adopt an innovation can be used to determine the relative rate of adoption for the innovation. Individuals can then be classified into categories as innovators, early adopters, early majority, late majority, or laggards, based on the readiness to adopt the innovation. The rate of adoption and adopter categories can provide a deeper look into characteristics of a selected population (Rogers, 2003).

Related studies sought to determine how Extension agents made use of new technologies and social media tools. Time, money, age, and training were identified as potential barriers to technology adoption in different studies (Hall et al., 2003; Diem et al., 2009).
CHAPTER 3: PROCEDURES

Purpose Statement

The purpose of the study was to determine how Arizona Extension agents use communication technologies.

Research Objectives

The following objectives were identified to guide the study.

1. Describe the demographic variables of program area, age, sex, and number of years of Extension experience of Arizona Extension agents who participated in the study.

2. Describe the population's use of each communication technology (cell phones, Smartphones, tablet computers, wikis, blogs, podcasts, YouTube, Facebook, Twitter).

3. Compare the population's use of each communication technology to each demographic variable.

4. Determine the relative rate of adoption for each communication technology.

5. Classify Arizona Extension agents into adopter categories, based on the relative rate of adoption, for each communication technology.

Research Design

The procedures used in the study were designed to acquire the necessary data to answer the research objectives. The study used objective measurement to gather numeric data, classifying it as quantitative research (Ary, Jacobs, & Sorensen, 2010). The study was non-experimental and had a descriptive research design. Descriptive research
gathers information from participants in order to measure and summarize characteristics of different groups (Ary et al., 2010). The end sought was to explain how Arizona Extension agents use communication technologies.

**Population**

The study was a cross-sectional census of Arizona Extension agents. A cross-sectional study occurs at a single point in time and a census targets the entire population (Ary et al., 2010). The researcher chose Arizona Extension agents based on proximity to the researcher and availability of participants. By using a census of Extension agents from Arizona, the researcher targeted 49 participants (N=49). The results of the study were not generalized beyond the target population.

The researcher obtained two directories in order to accurately identify the population. One directory was located through the Arizona Cooperative Extension website and listed all Arizona Cooperative Extension employees. The directory was last updated on 2 January 2013 (Arizona Cooperative Extension, 2013). The second directory was obtained from Arizona Cooperative Extension, Administrative Associate Patti Baciewicz. The directory was received on 6 February 2013 and listed all Arizona Extension agents along with their primary program area. The researcher compared the two directories and verified conflicting information in order to obtain an accurate frame for the study.

Arizona Extension agents are hired within Cooperative Extension's four broad program areas: Agriculture and Natural Resources; Community and Economic Development; Family, Consumer and Health Sciences; and 4-H Youth Development.
(Arizona Cooperative Extension, 2012). Some Arizona Extension agents work within multiple program areas, having a designed percentage of time allotted for each. Also, many counties hire a County Extension Director who serves in an administrative role to develop an effective overall Extension program. Most County Extension Directors also serve as Extension agents within one of the four program areas (Arizona Board of Regents, 2012).

Using the directories, the researcher identified 25 agents in Agriculture and Natural Resources; one agent in Community and Economic Development; 8 agents in Family, Consumer and Health Sciences; and 14 agents in the 4-H Youth Development program area. One agent serves in a fully administrative role as a County Extension Director.

**Sampling Error**

Sampling error is defined as "the difference between a sample statistic and a population parameter" (Ary et al., 2010, p. 158). If a sample were used, a non-probabilistic sample could introduce error. Sampling error is controlled for by making the sample probabilistic through random sampling (Ary et al., 2010). However, because a census was used, sampling did not occur and thus sampling error was avoided.

**Selection Error**

Selection error occurs when the same sampling units have a greater chance of being selected than others. Selection error can be corrected by purging the frame, or list of names, of duplicates (Ary et al., 2010). The researcher obtained two current, up-to-date
directories in order to accurately identify the population. The accurate frame did not contain any duplicates, so sampling error was avoided.

**Frame Error**

Frame error occurs when the frame, or list of names, is inaccurate or missing units. Frame error can be corrected by obtaining a current, up-to-date list of names (Ary et al., 2010). The researcher obtained and compared two up-to-date directories in order to obtain an accurate frame for the study. Therefore, frame error was avoided.

**Instrumentation**

The survey instrument was a questionnaire that was distributed to all Arizona extension agents via email. The email method was chosen due to the nature of Extension work. Extension agents frequently travel and may not be readily available at the county Extension office, but all agents are provided with an email address by the University of Arizona. Dillman (2007) found that email surveys have the advantage of prompter returns, more complete answers to open-ended questions, and lower cost to the researcher. Also, individuals who received prior notification about the study were more likely to respond, and emails addressed individually to a person had higher response rates (Ary et al., 2010).

Data was collected using the Illume research tool. Illume is provided at no cost to researchers at the University of Arizona. Questions asked participants to indicate their frequency of use for each communication technology, as well as identify with whom and in what ways they communicated using each communication technology. Three questions asked respondents to report the demographic data of age, sex, and number of
years of Extension experience. Program area was input into Illume as a hidden variable and was linked to each participant. Nineteen questions were forced choice, twelve multiple choice, and twenty were open-ended. Questions addressed the research objectives outlined in the study. See Appendix G for a copy of the questionnaire.

Validity

Validity refers to the accuracy in which an instrument measures what it claims to measure (Ary et al., 2010). Content and face validity were determined by a panel of experts within the University of Arizona and Cooperative Extension System. The selected panel assessed the questionnaire for appropriateness and clarity. The following individuals were contacted and asked to serve on the panel: Dan McDonald, Kurt Nolte, Cathy Martinez, Darcy Tessman, Dr. Ryan Foor and Dr. Robert Torres. These individuals were selected based on their knowledge and experience with research and/or Cooperative Extension.

Dan McDonald, Kurt Nolte, Cathy Martinez, and Darcy Tessman are experienced Arizona Extension agents from various Arizona communities and disciplines. Dr. Ryan Foor and Dr. Robert Torres have extensive research knowledge as faculty members in the Department of Agricultural Education at the University of Arizona. The panel of experts were contacted and asked to assist with the validity review on 14 September 2012. The expert panel received the questionnaire via Illume on 18 September 2012. Suggestions pertaining to the questionnaire were considered and a revised questionnaire was distributed to the panel of experts on 26 September 2012.
**Reliability**

The reliability of an instrument "is the degree of consistency with which it measures whatever it is measuring" (Ary et al, 2010, p. 236). A pilot study was used to determine the instrument's reliability. Colorado Extension agents were chosen to pilot test the questionnaire, because of similarities with the target population.

The researcher located two directories on the Colorado Cooperative Extension website (Colorado State University Extension, 2012). After comparing the two directories for accuracy, the researcher identified 103 (N=103) Colorado Extension agents to include in the pilot study. The researcher identified 29 agents in Agriculture and Natural Resources; one agent in Community and Economic Development; 13 agents in Family, Consumer and Health Sciences; and 27 agents in the 4-H Youth Development program area. Sixteen agents did not have an identified program area, 13 were recognized only as "County Director" and 3 only as "Extension Agent" (Colorado State University Extension, 2012).

An initial email was sent to each Colorado Extension agent's university email address on 3 October 2012, notifying the population of the pending pilot study. The initial email allowed the population to opt out of the pilot study by responding to the researcher. To those who do not opt out, a letter with an incentive of a half dollar was mailed to each Colorado Extension agent's office address on 5 October 2012.

The questionnaire was sent via Illume on 10 October 2012. Email reminders were sent on October 15th, 18th, and 23rd, 2012, to those who had not responded. The final day for pilot study responses was 24 October 2012.
Because the study lacked scale data, common reliability coefficients could not be used to determine the reliability of the instrument. Nevertheless, the researcher used the pilot study as a test of the questionnaire questions and the Illume research tool. The researcher benefited from feedback provided by Colorado Extension agents to enhance the questionnaire and research methods.

While specific data responses varied, a comparison of the pilot study data to the data from the main study showed similarities in responsiveness to the questionnaire questions. Eighty-three out of 103 participants (80.6%) responded to the questionnaire for the pilot study. The researcher determined the instrument to be a reliable measure for the study. The researcher also noted proportional similarities between the pilot study data and the main study data. See Table 1 for a comparison of communication technology use between pilot study and main study participants.

**Table 1.** Pilot Study vs. Main Study Use

<table>
<thead>
<tr>
<th>Communication Technology</th>
<th>Pilot Study</th>
<th>Main Study</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Cell Phone</td>
<td>82</td>
<td>98.8</td>
</tr>
<tr>
<td>Smartphone</td>
<td>58</td>
<td>69.9</td>
</tr>
<tr>
<td>Tablet Computer</td>
<td>50</td>
<td>60.2</td>
</tr>
<tr>
<td>Wiki</td>
<td>17</td>
<td>20.5</td>
</tr>
<tr>
<td>Blog</td>
<td>36</td>
<td>43.4</td>
</tr>
<tr>
<td>Podcast</td>
<td>23</td>
<td>27.7</td>
</tr>
<tr>
<td>YouTube</td>
<td>41</td>
<td>49.4</td>
</tr>
<tr>
<td>Facebook</td>
<td>63</td>
<td>75.9</td>
</tr>
<tr>
<td>Twitter</td>
<td>9</td>
<td>10.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>83</td>
<td>100</td>
</tr>
</tbody>
</table>
Data Collection

The researcher used suggested techniques from Dillman's Tailored Design Method for mail and internet surveys to guide the data collection process. Dillman suggested contacting the population seven times (Dillman, 2007). An initial email was sent to each Arizona Extension agent's university email address on 12 February 2013, notifying the population of the pending study. The initial email allowed anyone within the population to opt out of the study by responding to the researcher. To those who did not opt out, a letter and an incentive of a $5 bill was mailed to each Arizona Extension agent's office address on 14 February 2013.

The questionnaire was sent to the target population on 19 February 2013 via Illume. Email reminders were sent to those who had not responded on February 21st, 27th, March 5th, and 7th. Data collection ceased on Friday, 8 March 2013. See Table 3 for the time table and Table 4 for the budget.

Non-response Error

Non-response error could have a large impact on the study because a census was used. The incentive and frequent email reminders were intended to encourage prompt participation in the study. Non-response error was calculated by comparing early to late respondents, as suggested by Miller and Smith (1983). Individuals who responded prior to the second email reminder were classified as early respondents. Individuals who responded after the second email reminder the was sent on 27 February 2013 were considered late respondents. Late respondents are often similar to non-respondents. Groups of early respondents can be statistically compared to groups of late respondents.
by analyzing characteristics of each group. "If no differences are found, then respondents are generalized to the sample. If differences are present, data are weighted proportionately for determining the statistics to describe the sample" (Miller and Smith, 1983, p. 4).

There were 44 total respondents (89.8%) for the study. Thirty-seven (84.1%) were early respondents and seven individuals (15.9%) were classified as late respondents. The researcher compared the responses for communication technology use in order to determine non-response error. The responses are found in Table 2.

**Table 2. Early vs. Late Respondents Use**

<table>
<thead>
<tr>
<th>Communication Technology</th>
<th>Early Respondents</th>
<th>Late Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Cell Phone</td>
<td>34</td>
<td>91.9</td>
</tr>
<tr>
<td>Smartphone</td>
<td>28</td>
<td>75.7</td>
</tr>
<tr>
<td>Tablet Computer</td>
<td>24</td>
<td>64.8</td>
</tr>
<tr>
<td>Wiki</td>
<td>6</td>
<td>16.2</td>
</tr>
<tr>
<td>Blog</td>
<td>10</td>
<td>27.0</td>
</tr>
<tr>
<td>Podcast</td>
<td>6</td>
<td>16.2</td>
</tr>
<tr>
<td>YouTube</td>
<td>18</td>
<td>48.6</td>
</tr>
<tr>
<td>Facebook</td>
<td>30</td>
<td>81.1</td>
</tr>
<tr>
<td>Twitter</td>
<td>10</td>
<td>27.0</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>84.1</td>
</tr>
</tbody>
</table>

When viewed proportionally, differences between early and late respondents lack substantial discrepancies. Further, the non-response calculation could be skewed because of the high response rate (89.8%) and large number of early respondents (84.1%). The researcher determined that non-response error did not impact the data. Therefore, non-response error was ignored and the findings were generalized to the target population.
Data Analysis

Data was analyzed using Illume, IBM SPSS Statistics, and Microsoft Excel. Descriptive statistics were used to describe the population, with regards to research objective one. Means, standard deviations, and percentages were used to describe the program area, age, sex, and number of years of Extension experience of Arizona Extension agents who participated in the study.

Objective two sought to determine the population's use of each communication technology. The researcher counted the number of users for each communication technology and means and percentages were calculated. The same calculations were performed to compare the population's use of each communication technology to each demographic variable, as outlined in objective three.

The researcher calculated means, frequencies, and cumulative frequencies in order to determine the relative rate of adoption, as described in objective four. Finally, the mean years of use and standard deviation for each communication technology was used to categorized participants into adopter categories, with regards to objective five. The findings are reported in Chapter 4.
**Table 3.** Time Table

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-28 September 2012</td>
<td>Panel of Expert Review</td>
</tr>
<tr>
<td>3 October 2012</td>
<td>Pilot: Initial Email</td>
</tr>
<tr>
<td>5 October 2012</td>
<td>Pilot: Mail Incentive</td>
</tr>
<tr>
<td>10 October 2012</td>
<td>Pilot: Questionnaire Email</td>
</tr>
<tr>
<td>15 October 2012</td>
<td>Pilot: Email Reminder</td>
</tr>
<tr>
<td>18 October 2012</td>
<td>Pilot: Email Reminder</td>
</tr>
<tr>
<td>23 October 2012</td>
<td>Pilot: Final Email Reminder</td>
</tr>
<tr>
<td>24 October 2012</td>
<td>Pilot: Last Day for Responses</td>
</tr>
<tr>
<td>12 February 2013</td>
<td>Initial Email</td>
</tr>
<tr>
<td>14 February 2013</td>
<td>Mail Incentive</td>
</tr>
<tr>
<td>19 February 2013</td>
<td>Questionnaire Email</td>
</tr>
<tr>
<td>21 February 2013</td>
<td>Email Reminder</td>
</tr>
<tr>
<td>27 February 2013</td>
<td>Email Reminder</td>
</tr>
<tr>
<td>5 March 2013</td>
<td>Email Reminder</td>
</tr>
<tr>
<td>7 March 2013</td>
<td>Final Email Reminder</td>
</tr>
<tr>
<td>8 March 2013</td>
<td>Last Day for Responses</td>
</tr>
<tr>
<td>10 April 2013</td>
<td>Thesis Defense</td>
</tr>
</tbody>
</table>
Table 4. Budget

### Pilot Study (N=103)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive: 1/2 dollar</td>
<td>$51.50</td>
</tr>
<tr>
<td>Printing: Incentive Letter</td>
<td>$10.30</td>
</tr>
<tr>
<td>Envelopes: Incentive Mailing</td>
<td>$14.00</td>
</tr>
<tr>
<td>Postage: Incentive Mailing</td>
<td>$46.35</td>
</tr>
<tr>
<td><strong>Pilot Study Total</strong></td>
<td><strong>$122.15</strong></td>
</tr>
</tbody>
</table>

### Population (N=49)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive: 5 dollar bill</td>
<td>$245.00</td>
</tr>
<tr>
<td>Printing: Incentive Letter</td>
<td>$5.20</td>
</tr>
<tr>
<td>Envelopes: Incentive Mailing</td>
<td>$6.00</td>
</tr>
<tr>
<td>Postage: Incentive Mailing</td>
<td>$22.54</td>
</tr>
<tr>
<td>Postcards</td>
<td>$32.00</td>
</tr>
<tr>
<td>Postage: Postcard Reminder</td>
<td>$16.64</td>
</tr>
<tr>
<td><strong>Study Total</strong></td>
<td><strong>$278.74</strong></td>
</tr>
</tbody>
</table>

**Grand Total**                        **$400.89**
CHAPTER 4: FINDINGS

There were 44 total respondents (89.8%) for the study. The researcher was selective to report only findings that related to the purpose and research objectives of the study.

**Purpose Statement**

The purpose of the study was to determine how Arizona Extension agents use communication technologies.

**Research Objectives**

The following objectives were identified to guide the study.

1. Describe the demographic variables of program area, age, sex, and number of years of Extension experience of Arizona Extension agents who participated in the study.

2. Describe the population's use of each communication technology (cell phones, Smartphones, tablet computers, wikis, blogs, podcasts, YouTube, Facebook, Twitter).

3. Compare the population's use of each communication technology to each demographic variable.

4. Determine the relative rate of adoption for each communication technology.

5. Classify Arizona Extension agents into adopter categories, based on the relative rate of adoption, for each communication technology.
Demographics

Objective 1 sought to describe the program area, age, sex, and number of years of Extension experience of Arizona Extension agents who participated in the study.

Program Area

Arizona Extension agents are hired within Cooperative Extension's four broad program areas: Agriculture and Natural Resources; Community and Economic Development; Family, Consumer and Health Sciences; and 4-H Youth Development (Arizona Cooperative Extension, 2012). The researcher identified each participant's program area with the help of Arizona Cooperative Extension Administrative Associate, Patti Baciewicz. Program area was assigned to each Extension agent and was assessed as a hidden variable in Illume.

Half of the participants (n=22) were in the Agriculture and Natural Resources program area and thirteen agents worked within 4-H Youth development. Table 5 shows the participants by program area.

Table 5. Agents by Program Area

<table>
<thead>
<tr>
<th>Program Area</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANR</td>
<td>22</td>
<td>50.0</td>
</tr>
<tr>
<td>4-H</td>
<td>13</td>
<td>29.5</td>
</tr>
<tr>
<td>FCHS</td>
<td>7</td>
<td>15.9</td>
</tr>
<tr>
<td>CED</td>
<td>1</td>
<td>2.3</td>
</tr>
<tr>
<td>Admin</td>
<td>1</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>44</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note. ANR=Agricultural and Natural Resources; 4-H=4-H Youth Development; FCHS=Family, Consumer, and Health Sciences; CED=Community and Economic Development; Admin=Fully Administration Extension Position
Age

The average age of participants was 51 years. The minimum age was 27 years and the maximum age was 68 years. The standard deviation was 9.7 years. The largest group of participants (n=13) were ages 51 through 56. Table 6 displays the participants by age.

Table 6. Agents by Age

<table>
<thead>
<tr>
<th>Age Range</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>27-32 yrs</td>
<td>2</td>
<td>4.6</td>
</tr>
<tr>
<td>33-38 yrs</td>
<td>3</td>
<td>6.8</td>
</tr>
<tr>
<td>39-44 yrs</td>
<td>5</td>
<td>11.4</td>
</tr>
<tr>
<td>45-50 yrs</td>
<td>6</td>
<td>13.6</td>
</tr>
<tr>
<td>51-56 yrs</td>
<td>13</td>
<td>29.6</td>
</tr>
<tr>
<td>57-62 yrs</td>
<td>9</td>
<td>20.4</td>
</tr>
<tr>
<td>63-68 yrs</td>
<td>6</td>
<td>13.6</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Sex

There were two more male participants than female. The researcher believed that both sexes were well represented in the study. Table 7 reports the sex of participants.

Table 7. Agents by Sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>23</td>
<td>52.3</td>
</tr>
<tr>
<td>Female</td>
<td>21</td>
<td>47.7</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Years of Extension Experience

Participants averaged 17 years of experience with Cooperative Extension. The minimum number of years experience was 2 years and the maximum was 40 years. The standard deviation was 10.3 years. Table 8 reports the years of experience of the agents included in the study.

Table 8. Agents by Number of Years Extension Experience

<table>
<thead>
<tr>
<th>Years Experience</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-7</td>
<td>10</td>
<td>22.7</td>
</tr>
<tr>
<td>8-13</td>
<td>8</td>
<td>18.2</td>
</tr>
<tr>
<td>14-19</td>
<td>10</td>
<td>22.7</td>
</tr>
<tr>
<td>20-25</td>
<td>5</td>
<td>11.4</td>
</tr>
<tr>
<td>26-31</td>
<td>6</td>
<td>13.6</td>
</tr>
<tr>
<td>32-36</td>
<td>3</td>
<td>6.8</td>
</tr>
<tr>
<td>37-40</td>
<td>2</td>
<td>4.6</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Communication Technology Use

Objective 2 sought to determine how Arizona Extension agents used the following communication technologies: cell phones, Smartphones, tablet computers, wikis, blogs, podcasts, YouTube, Facebook, and Twitter. Table 9 shows the number and percentage of users for each communication technology, separated as mobile devices and social media tools.
Table 9. Communication Technology Use

<table>
<thead>
<tr>
<th>Communication Technology</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mobile Devices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell Phone</td>
<td>41</td>
<td>93.2</td>
</tr>
<tr>
<td>Smartphone</td>
<td>35</td>
<td>79.5</td>
</tr>
<tr>
<td>Tablet Computer</td>
<td>26</td>
<td>59.1</td>
</tr>
<tr>
<td><strong>Social Media Tools</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facebook</td>
<td>36</td>
<td>81.8</td>
</tr>
<tr>
<td>YouTube</td>
<td>22</td>
<td>50.0</td>
</tr>
<tr>
<td>Blog</td>
<td>11</td>
<td>25.0</td>
</tr>
<tr>
<td>Twitter</td>
<td>11</td>
<td>25.0</td>
</tr>
<tr>
<td>Podcast</td>
<td>7</td>
<td>15.9</td>
</tr>
<tr>
<td>Wiki</td>
<td>7</td>
<td>15.9</td>
</tr>
</tbody>
</table>

**Cell Phones**

A cell phone was defined as a mobile device used for voice and text message communication. The majority of participants (72.7%) reported frequent cell phone use. Most cell phone users (97.6%) reported daily cell phone use. Daily users used a cell phone between two and forty times per day, with an average daily use of 13 times.

The researcher was particularly interested in understanding how participants utilized voice calling and text messaging capabilities of a cell phone. Forty participants (97.6%) used voice calling and 35 participants (85.4%) text messaged. Family members were most communicated with (97.6%), followed closely by colleagues (95.1%), then clients (90.2%).

**Smartphones**

A Smartphone was defined as a mobile device, similar to a cell phone, with advanced communication capabilities through email and Internet access (Dhir, 2004). All of the individuals who used a Smartphone reported using the Smartphone daily.
Participants used a Smartphone between two and 250 times per day, with an average daily use of 23 times.

The researcher was particularly interested in understanding how participants utilized voice calling, text messaging, email, Facebook, and Twitter on a Smartphone. All 35 Smartphone users used a Smartphone for voice calling and 97.14% for text messaging. Twenty-seven users (77.1%) used a Smartphone for email communication and eighteen (51.4%) accessed Facebook on a Smartphone. The majority of users (97.1%) communicated with colleagues using a Smartphone while clients and family members tied closely behind (91.4%).

**Tablet Computers**

A tablet computer was defined as a mobile device that can allow users to communicate via Internet access and email messaging (Dhir, 2004). Of the 26 individuals who used a tablet computer, half reported using a tablet computer daily. Daily users reported tablet computer usage between one and 20 times per day, with an average daily use of seven times.

The researcher was particularly interested in understanding how participants utilized email communication, web conferencing, and social media websites on a tablet computer. The majority (88.46%) used a tablet for email communication and seventeen (65.4%) accessed social media sites using a tablet computer. Colleagues (88.4%) and clients (76.9%) were most often communicated with using a tablet computer.
Wikis

A wiki is a social media tool used to share information, create documents, and provide a link to resources (Kinsey, 2010). The majority of participants (84.1%) never used wikis. Seven participants used wikis.

Blogs

A blog is a social media tool used to share expertise and information with a blogging community (Kinsey, 2010). The majority of participants (75%) never used blogs. Eleven participants used blogs.

Podcasts

A podcast is a brief audio or video message created to share educational information or announcements with others (Kinsey, 2010). The majority of participants (84.1%) never used podcasts. Seven participants reported to using podcasts.

YouTube

YouTube is an online venue used to broadcast video podcasts (Kinsey, 2010). Half of the participants used YouTube. When asked with whom the participants communicated with using YouTube, colleagues and clients received the most responses (71.4%).

Facebook

Facebook is a social media tool that provides users with a forum to connect with others and share information, photos, videos, and messages (Kinsey, 2010). Thirty-six participants used Facebook. Twelve individuals reported daily Facebook use. Daily
Facebook users ranged from using the site 1-100 times with a mean usage of 12 times. The majority (94.4%) of Facebook users utilized the site to communicate with friends.

**Twitter**

Twitter is a social media tool that allows users to receive current information, ideas, and news from various sources through short "tweets" (Twitter, 2012). The majority (75%) of the participants never used Twitter. Eleven participants were Twitter users.

**Communication Technology Use By Demographic Variable**

Objective 3 sought to compare the results for communication technology use with each demographic variable. The following tables demonstrate relationship between the number of users for each communication technology and the demographic variables of program area, age, sex, and number of years Extension experience.

**Program Area**

The majority of the participants in the study used both a cell phone and Smartphone. A large number of Agriculture and Natural Resources agents (95.4%) used a cell phone, while only 68.2% of the same agents utilized a Smartphone.

Agents in the 4-H Youth Development and "Other" program areas proportionally demonstrated more Facebook usage than agents from the Agriculture and Natural Resources and Family, Consumer, and Health Sciences programs.
Table 10. Users by Program Area

<table>
<thead>
<tr>
<th>Communication Technology</th>
<th>4-H</th>
<th></th>
<th>ANR</th>
<th></th>
<th>FCHS</th>
<th></th>
<th>Other</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Mobile Devices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell Phone</td>
<td>11</td>
<td>84.6</td>
<td>21</td>
<td>95.4</td>
<td>7</td>
<td>100.0</td>
<td>2</td>
<td>100.0</td>
</tr>
<tr>
<td>Smartphone</td>
<td>12</td>
<td>92.3</td>
<td>15</td>
<td>68.2</td>
<td>6</td>
<td>85.7</td>
<td>2</td>
<td>100.0</td>
</tr>
<tr>
<td>Tablet Computer</td>
<td>8</td>
<td>61.5</td>
<td>13</td>
<td>59.1</td>
<td>3</td>
<td>42.8</td>
<td>2</td>
<td>100.0</td>
</tr>
<tr>
<td>Social Media Tools</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facebook</td>
<td>12</td>
<td>92.3</td>
<td>17</td>
<td>77.2</td>
<td>5</td>
<td>71.4</td>
<td>2</td>
<td>100.0</td>
</tr>
<tr>
<td>YouTube</td>
<td>8</td>
<td>61.5</td>
<td>10</td>
<td>45.4</td>
<td>2</td>
<td>28.6</td>
<td>2</td>
<td>100.0</td>
</tr>
<tr>
<td>Blog</td>
<td>5</td>
<td>38.5</td>
<td>5</td>
<td>22.7</td>
<td>1</td>
<td>14.3</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Twitter</td>
<td>3</td>
<td>23.1</td>
<td>8</td>
<td>36.4</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Podcast</td>
<td>2</td>
<td>15.4</td>
<td>5</td>
<td>22.7</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Wiki</td>
<td>1</td>
<td>7.7</td>
<td>5</td>
<td>22.7</td>
<td>1</td>
<td>14.3</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>13</td>
<td>-</td>
<td>22</td>
<td>-</td>
<td>7</td>
<td>-</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. “Other” was used to increase confidentially of participants for program areas which only had one agent.
Age

The youngest users (age 27-32 years) reported using each mobile device and Facebook and YouTube, but the same group did not use wikis, blogs, podcasts, or Twitter. All participants up to 51 years of age used a Smartphone, while fewer agents 51 years and older utilized the device. Similarly, all agents up to 39 years of age used a tablet computer, and fewer older agents used a tablet computer. Most participants fell into the 51-56 year age range and demonstrated a strong propensity to use each communication technology.

Table 11. Users by Age

<table>
<thead>
<tr>
<th>Communication Technology</th>
<th>27-32 Yrs</th>
<th>33-38 Yrs</th>
<th>39-44 Yrs</th>
<th>45-50 Yrs</th>
<th>51-56 Yrs</th>
<th>57-62 Yrs</th>
<th>63-68 Yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td><strong>Mobile Devices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell Phone</td>
<td>2</td>
<td>100.0</td>
<td>5</td>
<td>100.0</td>
<td>13</td>
<td>100.0</td>
<td>8</td>
</tr>
<tr>
<td>Smartphone</td>
<td>2</td>
<td>100.0</td>
<td>5</td>
<td>100.0</td>
<td>10</td>
<td>76.9</td>
<td>5</td>
</tr>
<tr>
<td>Tablet Computer</td>
<td>2</td>
<td>100.0</td>
<td>3</td>
<td>100.0</td>
<td>3</td>
<td>50.0</td>
<td>9</td>
</tr>
<tr>
<td><strong>Social Media Tools</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facebook</td>
<td>2</td>
<td>100.0</td>
<td>4</td>
<td>80.0</td>
<td>13</td>
<td>100.0</td>
<td>6</td>
</tr>
<tr>
<td>YouTube</td>
<td>2</td>
<td>100.0</td>
<td>4</td>
<td>80.0</td>
<td>7</td>
<td>53.8</td>
<td>1</td>
</tr>
<tr>
<td>Blog</td>
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<td>0.0</td>
<td>1</td>
<td>20.0</td>
<td>4</td>
<td>66.7</td>
<td>1</td>
</tr>
<tr>
<td>Twitter</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td>40.0</td>
<td>4</td>
<td>30.8</td>
<td>1</td>
</tr>
<tr>
<td>Podcast</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>33.3</td>
<td>2</td>
<td>16.7</td>
<td>1</td>
</tr>
<tr>
<td>Wiki</td>
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<td>0.0</td>
<td>1</td>
<td>33.3</td>
<td>2</td>
<td>16.7</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2</td>
<td></td>
<td>3</td>
<td></td>
<td>5</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
Sex

There were slightly more male participants (n=23) than female (n=21). Males demonstrated more cell phone use than females, but females indicated more Smartphone use than males. Overall, females demonstrated more of willingness to use many of the social media tools. More females used Facebook, YouTube, blogs, Twitter, and podcasts, while more males used wikis.

**Table 12. Users by Sex**

<table>
<thead>
<tr>
<th>Communication Technology</th>
<th>Female</th>
<th></th>
<th>Male</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><strong>Mobile Devices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell Phone</td>
<td>19</td>
<td>90.5</td>
<td>22</td>
<td>95.7</td>
</tr>
<tr>
<td>Smartphone</td>
<td>18</td>
<td>85.7</td>
<td>17</td>
<td>73.9</td>
</tr>
<tr>
<td>Tablet Computer</td>
<td>12</td>
<td>57.1</td>
<td>14</td>
<td>60.9</td>
</tr>
<tr>
<td><strong>Social Media Tools</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facebook</td>
<td>19</td>
<td>90.5</td>
<td>17</td>
<td>73.9</td>
</tr>
<tr>
<td>YouTube</td>
<td>11</td>
<td>52.4</td>
<td>11</td>
<td>47.8</td>
</tr>
<tr>
<td>Blog</td>
<td>8</td>
<td>38.1</td>
<td>3</td>
<td>13.0</td>
</tr>
<tr>
<td>Twitter</td>
<td>6</td>
<td>28.6</td>
<td>5</td>
<td>21.7</td>
</tr>
<tr>
<td>Podcast</td>
<td>4</td>
<td>19.0</td>
<td>3</td>
<td>13.0</td>
</tr>
<tr>
<td>Wiki</td>
<td>2</td>
<td>9.5</td>
<td>5</td>
<td>21.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>21</td>
<td></td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>
Years Extension Experience

Participants averaged 17 years of experience with Cooperative Extension. All of the agents with less than fourteen years of experience used Facebook. Many of the same agents used several of the communication technologies included in the study. All of the agents with at least 32 years of experience used a cell phone and most used a Smartphone. None of the agents with the most number of years experience used Facebook, blogs, Twitter, podcasts, or wikis.

Table 13. Users by Years of Extension Experience

<table>
<thead>
<tr>
<th>Communication Technology</th>
<th>2-7 Yrs</th>
<th>8-13 Yrs</th>
<th>14-19 Yrs</th>
<th>20-25 Yrs</th>
<th>26-31 Yrs</th>
<th>32-36 Yrs</th>
<th>37-40 Yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td><strong>Mobile Devices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell Phone</td>
<td>10</td>
<td>100.0</td>
<td>7</td>
<td>87.5</td>
<td>10</td>
<td>100.0</td>
<td>3</td>
</tr>
<tr>
<td>Smartphone</td>
<td>9</td>
<td>90.0</td>
<td>8</td>
<td>100.0</td>
<td>7</td>
<td>70.0</td>
<td>4</td>
</tr>
<tr>
<td>Tablet Computer</td>
<td>6</td>
<td>60.0</td>
<td>7</td>
<td>87.5</td>
<td>5</td>
<td>50.0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Social Media Tools</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facebook</td>
<td>10</td>
<td>100.0</td>
<td>8</td>
<td>100.0</td>
<td>8</td>
<td>80.0</td>
<td>4</td>
</tr>
<tr>
<td>YouTube</td>
<td>7</td>
<td>70.0</td>
<td>6</td>
<td>75.0</td>
<td>3</td>
<td>30.0</td>
<td>1</td>
</tr>
<tr>
<td>Blog</td>
<td>1</td>
<td>10.0</td>
<td>3</td>
<td>37.5</td>
<td>3</td>
<td>30.0</td>
<td>3</td>
</tr>
<tr>
<td>Twitter</td>
<td>2</td>
<td>20.0</td>
<td>4</td>
<td>50.0</td>
<td>3</td>
<td>30.0</td>
<td>0</td>
</tr>
<tr>
<td>Podcast</td>
<td>2</td>
<td>20.0</td>
<td>1</td>
<td>12.5</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
</tr>
<tr>
<td>Wiki</td>
<td>1</td>
<td>10.0</td>
<td>2</td>
<td>25.0</td>
<td>1</td>
<td>10.0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>5</td>
</tr>
</tbody>
</table>
Rate of Adoption

Objective 4 used Rogers diffusion of innovations theory to calculate the rate of adoption for each communication technology. "Rate of adoption is the relative speed with which an innovation is adopted by members of a social system" (Rogers, 2003, p. 221). In general, when the cumulative frequency of adoption over time is plotted, the distribution will result in a S-shaped curve (Rogers, 2003). The following tables and figures show the rate of adoption for each communication technology.

Cell Phones

Respondents averaged 12 years of cell phone use, with 5 years being the minimum and 25 years being the maximum. The largest number of adopters (n=13) began using a cell phone ten years ago.

Table 14. Number of Years of Cell Phone Use

<table>
<thead>
<tr>
<th>Years Cell Phone Use</th>
<th>f</th>
<th>Cumulative f</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>13</td>
<td>33</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>37</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>38</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>41</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>
The relative rate of adoption for cell phones began slowly 25 years ago. About 15 years ago, a rapid increase in adopters \( (n=6) \) caused the curve to quickly rise. The curve continued to steeply rise as a larger number of adopters \( (n=13) \) began using cell phones ten years ago. The curve showed a slower increase in adopters within the past ten years. No one indicated cell phone adoption within the past five years; however, there may still be Arizona Extension agents who have not yet made the decision to adopt.

**Figure 4.** Cell Phone Rate of Adoption

---

**Smartphones**

Respondents averaged 4 years of Smartphone use, with 0 years being the minimum and 12 years being the maximum. Out of 44 participants, 79.5\% \( (n=35) \) had adopted a Smartphone.
Table 15. Number of Years of Smartphone Use

<table>
<thead>
<tr>
<th>Years Smartphone Use</th>
<th>f</th>
<th>Cumulative f</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>23</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>29</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

Smartphone adoption began twelve years ago and slowly increased until about six years ago. Then the curve made a more rapid growth before adoption briefly slowed three years ago. The rate of adoption quickly increased again, two years ago. There may still be Arizona Extension agents who have not yet made the decision to adopt.

Figure 5. Smartphone Rate of Adoption
Tablet Computers

Respondents averaged 3 years of tablet use, with 0 years being the minimum and 15 years being the maximum. Out of 44 participants, 59.1% (n=26) had adopted a tablet computer.

Table 16. Number of Years of Tablet Computer Use

<table>
<thead>
<tr>
<th>Years Tablet Computer Use</th>
<th>f</th>
<th>Cumulative f</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>1</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

Tablet computer adoption began fifteen years ago and remained constant until about seven years ago. Then the curve grew slowly before showing very rapid growth in adoption beginning two years ago. The rate of adoption within the past year appears to have slowed; however, it is difficult to determine as there may still be Arizona Extension agents who have not yet made the decision to adopt.
Figure 6. Tablet Computer Rate of Adoption

Wiki users averaged 2 years of use, with 1 year being the minimum and 5 years being the maximum. The majority of participants (84.1%) did not use wikis.

Table 17. Number of Years of Wiki Use

<table>
<thead>
<tr>
<th>Years Wiki Use</th>
<th>f</th>
<th>Cumulative f</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>-</td>
</tr>
</tbody>
</table>
The rate of adoption for wikis is difficult to assess because only small number of participants (15.9%) used wikis. The S-shaped curve showed steady growth in wiki use over the past five years with a more sudden increase in users one year ago.

**Figure 7. Wiki Rate of Adoption**

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**Blogs**

Blog users averaged 3 years of use, with 1 year being the minimum and 15 years being the maximum. Most of the blog users (n=6) began using blogs one year ago.
Table 18. Number of Years of Blog Use

<table>
<thead>
<tr>
<th>Years Blog Use</th>
<th>f</th>
<th>Cumulative f</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

One respondent began using blogs fifteen years ago. There were no other blog adopters until five years ago. Then blog adoption gradually increased before quickly rising one year ago. There may still be Arizona Extension agents who have not yet made the decision to adopt blogs.

Figure 8. Blog Rate of Adoption
Podcasts

Podcast users averaged 3 years of use, with 1 year being the minimum and 7 years being the maximum. The majority of participants (84.1%) did not use podcasts.

Table 19. Number of Years of Podcast Use

<table>
<thead>
<tr>
<th>Years Podcast Use</th>
<th>$f$</th>
<th>Cumulative $f$</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7</strong></td>
<td><strong>-</strong></td>
</tr>
</tbody>
</table>

The rate of adoption for podcasts is difficult to assess because only small number of participants (15.9%) used podcasts. The S-shaped curve showed slow growth in wiki use over the past seven years with a more sudden increase in users approximately two years ago.

Figure 9. Podcast Rate of Adoption
**YouTube**

YouTube users averaged 4 years of use, with 1 year being the minimum and 15 years being the maximum. Half of the participants used YouTube. The largest number of users (n=7) began using YouTube four years ago.

**Table 20. Number of Years of YouTube Use**

<table>
<thead>
<tr>
<th>Years YouTube Use</th>
<th>f</th>
<th>Cumulative f</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22</strong></td>
<td></td>
</tr>
</tbody>
</table>

YouTube adoption began fifteen years ago and remained constant for a decade. More participants began adopting YouTube five years ago and the number of adopters suddenly increased four years ago. Then YouTube adoption slowed slightly but continued to grow steadily within the past three years. While none of the participants reported adopting YouTube within the past year, there may still be Arizona Extension agents who have not yet made the decision to adopt YouTube.
**Figure 10.** YouTube Rate of Adoption

Facebook

Facebook users averaged four years of use, with one year being the minimum and eight years being the maximum. The largest group of users (n=11) began using Facebook eleven years ago.

**Table 21.** Number of Years of Facebook Use

<table>
<thead>
<tr>
<th>Years Facebook Use</th>
<th>( f )</th>
<th>Cumulative ( f )</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>-</td>
</tr>
</tbody>
</table>
Respondents began adopting Facebook eight years ago. The adoption curve began to climb as more participants adopted. Four years ago, a larger number of participants (n=11) began using Facebook. Since then, the number of adopters continued to increase. Out of 44 participants, 36 (81.8%) had adopted Facebook. There may still be Arizona Extension agents who have not yet made the decision to adopt Facebook.

**Figure 11.** Facebook Rate of Adoption

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**Twitter**

Twitter users averaged two years of use, with one year being the minimum and four years being the maximum. The majority of Twitter users (n=6) began using Twitter one year ago.
Table 22. Number of Years of Twitter Use

<table>
<thead>
<tr>
<th>Years Twitter Use</th>
<th>f</th>
<th>Cumulative f</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>-</td>
</tr>
</tbody>
</table>

Twitter's relative rate of adoption began four years and slowly increased until two years ago. Then, a larger number of participants adopted Twitter and the majority (n=6) became Twitter users one year ago. Only 25% of participants reported using Twitter so there may still be Arizona Extension agents who have not yet made the decision to adopt.

Figure 12. Twitter Rate of Adoption
Adopter Categories

Objective 5 used Rogers (2003) diffusion of innovations theory to place participants into adopter categories for each communication technology. Using statistics, the mean number of years of use and standard deviation were used to divide a normal distribution into the five adopter categories (Rogers, 2003). Table 23 shows the mean number of years of use and standard deviation for each communication technology.

**Table 23. Mean Years and Standard Deviations**

<table>
<thead>
<tr>
<th>Communication Technologies</th>
<th>Mean Yrs</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mobile Devices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell Phone</td>
<td>12</td>
<td>4.4</td>
</tr>
<tr>
<td>Smartphone</td>
<td>4</td>
<td>3.2</td>
</tr>
<tr>
<td>Tablet Computer</td>
<td>3</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Social Media Tools</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facebook</td>
<td>4</td>
<td>1.6</td>
</tr>
<tr>
<td>YouTube</td>
<td>4</td>
<td>2.8</td>
</tr>
<tr>
<td>Blog</td>
<td>3</td>
<td>4.0</td>
</tr>
<tr>
<td>Podcast</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>Twitter</td>
<td>2</td>
<td>1.0</td>
</tr>
<tr>
<td>Wiki</td>
<td>2</td>
<td>1.5</td>
</tr>
</tbody>
</table>

The innovators are found two standard deviations to the left of the mean. The early adopters occupy the area between the mean minus one standard deviation and the mean minus two standard deviations. Next are the early majority, included in the area between the mean and the mean minus one standard deviation. Late majority adopters are next, between the mean and one standard deviation to the right of the mean. Finally, the laggards are found beyond one standard deviation to the right of the mean (Rogers, 2003). See Figure 2 on page 22 for an example of the distribution. Figures 13-21 display the adopter categorization for each communication technology included in the study.
Cell Phones

Most of the cell phone adopters (n=17) were categorized in the late majority. The late majority are typically skeptical and cautious of new innovations and the decision to adopt does not occur until many have already adopted and the social system shows favor for the innovation (Rogers, 2003). Many users (n=15) fell into the early majority category while there were an equal number of early adopters and laggards (n=4). One participant was classified as an innovator for cell phone adoption.

Figure 13. Cell Phone Adopter Categorization

Smartphones

Most of the Smartphone adopters (n=15) were categorized in the early majority. The early majority frequently interact with their peers, but may deliberate for a time before deciding whether or not to adopt an innovation (Rogers, 2003). Many Smartphone
users (n=13) fell into the late majority. Four participants were early adopters. Early adopters are respected by other members of the social system who desire advice and information on the innovation (Rogers, 2003). Two participants were innovators and one was classified as a laggard.

**Figure 14.** Smartphone Adopter Categorization

![Bar chart showing smartphone adopter categorization](chart)

**Tablet Computers**

Most tablet computer adopters (n=19) fell into the late majority. The same number of users (n=19) adopted the device within the past two years while tablet computer adoption began fifteen years ago.
Figure 15. Tablet Computer Adopter Categorization

Wikis

Only small number of participants (15.9%) used wikis. Of the seven wiki users, there was one innovator, one early adopter, two participants in the early majority, and two participants in the late majority.

Figure 16. Wiki Adopter Categorization
**Blogs**

Most blog adopters (n=8) were in the late majority. The same number of users (n=8) adopted blogs within the past two years while blog adoption began fifteen years ago.

**Figure 17. Blog Adopter Categorization**

![Bar chart showing distribution of blog adopters among innovators, early adopters, early majority, late majority, and laggards.](chart-image)

**Podcasts**

Only small number of participants (15.9%) used podcasts. Of the seven podcast users, there was one early adopter, and three participants in each the early majority and late majority categories.
**Figure 18. Podcast Adopter Categorization**

![Podcast Adopter Categorization](image1.png)

**YouTube**

Most YouTube adopters were categorized as either early or late majority. There were four laggards and one innovator of YouTube adoption.

**Figure 19. YouTube Adopter Categorization**

![YouTube Adopter Categorization](image2.png)
**Facebook**

A large number of Facebook users (n=15) were classified in the early majority. Several Facebook users (n=11) were classified as laggards. Laggards are the last group of individuals to adopt an innovation. Laggards prefer to follow traditions and are often suspicious of innovations which will alter customs (Rogers, 2003).

**Figure 20.** Facebook Adopter Categorization

![Bar chart showing Facebook adopter categorization](chart.png)

**Twitter**

Most Twitter users (n=6) fell in the late majority category. Three were classified as early majority, and there was one innovator and one early adopter.
Figure 21. Twitter Adopter Categorization
CHAPTER 5: CONCLUSIONS/IMPLICATIONS/RECOMMENDATIONS

The purpose of Chapter 5 was to report the conclusions, implications, and recommendations of the current study. First, the researcher provided a brief review of the research procedures utilized for the study. Then, the conclusions, implications, and recommendations were related to each research objective.

Purpose Statement

The purpose of the study was to determine how Arizona Extension agents use communication technologies.

Research Objectives

The following objectives were identified to guide the study.

1. Describe the demographic variables of program area, age, sex, and number of years of Extension experience of Arizona Extension agents who participated in the study.

2. Describe the population's use of each communication technology (cell phones, Smartphones, tablet computers, wikis, blogs, podcasts, YouTube, Facebook, Twitter).

3. Compare the population's use of each communication technology to each demographic variable.

4. Determine the relative rate of adoption for each communication technology.

5. Classify Arizona Extension agents into adopter categories, based on the relative rate of adoption, for each communication technology.
Summary of Research Procedures

The study was non-experimental and had a descriptive research design. The end sought was to explain how Arizona Extension agents use communication technologies. The study was a cross-sectional census of Arizona Extension agents, so sampling error was avoided. Selection and frame error were controlled for by using an accurate, up-to-date frame for the study.

There were 44 total respondents (89.8%) for the study. Thirty-seven (84.1%) were early respondents and seven individuals (15.9%) were classified as late respondents. The researcher compared the responses for communication technology use in order to determine non-response error. The non-response calculation could be skewed because of the high response rate (89.8%) and large number of early respondents (84.1%). The researcher determined that non-response error did not impact the data.

The researcher developed an electronic questionnaire using the Illume research tool to collect data. Questions addressed the research objectives outlined in the study. A panel of experts assessed the questionnaire for appropriateness and clarity and determined it to be a valid instrument for the study. A pilot study with Colorado Extension agents allowed the researcher to test the questionnaire and the Illume research tool. Because the study lacked scale data, common reliability coefficients could not be used to determine the reliability of the instrument; however, the pilot study proved valuable to the researcher and the questionnaire was deemed reliable. An initial email, an incentive, the questionnaire, and frequent email reminders were sent to the target population of Arizona Extension agents in February and March 2013.
Data was analyzed using Illume, IBM SPSS Statistics, and Microsoft Excel. Descriptive statistics were used to describe the population, with regards to research objective one. The researcher counted the number of users for each communication technology and means and percentages were calculated for both objectives two and three. The researcher calculated means, frequencies, and cumulative frequencies in order to determine the relative rate of adoption, as described in objective four. Finally, the mean years of use and standard deviation for each communication technology was used to categorized participants into adopter categories, with regards to objective five.

**Objective 1: Conclusions/Implications/Recommendations**

Objective one: Describe the demographic variables of program area, age, sex, and number of years of Extension experience of Arizona Extension agents who participated in the study.

**Conclusions**

Demographically, the Arizona Extension agents included in the study had many years of experience within Cooperative Extension, averaging 17 years (SD=10.3 yrs). There were slightly more males than females and the average age of participants was 51 years (SD=9.3 yrs). Over half (n=28, 63.3%) of the participants were age 51 or older.

**Implications**

Because the study's population largely consisted of an audience aged 51 or older, many participants may choose to retire within a decade. The findings in the study would then become dated.
Recommendations

Should the population of Arizona Extension agents substantially change within the decade, the study should be repeated with the new population of Arizona Extension agents in approximately ten years.

Objective 2: Conclusions/Implications/Recommendations

Objective two: Describe the population's use of each communication technology (cell phones, Smartphones, tablet computers, wikis, blogs, podcasts, YouTube, Facebook, Twitter).

Conclusions

Greater than half of the participants utilized each mobile device included in the study (cell phones, Smartphones, and tablet computers). Facebook was a widely used social media tool and YouTube was used by half of the participants. The remaining social media tools (wikis, blogs, podcasts, and Twitter) were used by only a small number of participants. The researcher concluded that colleagues and clients were the individuals most often communicated with using a Smartphone, tablet computer, and YouTube.

Implications

Based on the fact that Arizona Extension agents communicate most with colleagues and clients using Smartphones and tablet computers, Arizona Cooperative Extension administration should consider how the mobile devices are supplied to agents for the work-related communication.
Recommendations

Because only a small number of participants used wikis, blogs, podcasts, and Twitter, the researcher recommends further research on the effectiveness of wikis, blogs, podcasts, and Twitter to help Extension agents reach their clientele. Kinsey (2010) identified wikis, blogs, and podcasts as helpful social media tools. Seger (2011) also encouraged Extension agents to utilize social media tools in order to serve as a catalyst for technology adoption.

Based on the fact that Arizona Extension agents communicate most with colleagues and clients using Smartphones and tablet computers, Arizona Cooperative Extension administration should supply Smartphones and tablet computers to Extension agents for work-related communication.

Objective 3: Conclusions/Implications/Recommendations

Objective three: Compare the population's use of each communication technology to each demographic variable.

Conclusions

Focusing primarily on cell phone and Smartphone use, a large number of Agriculture and Natural Resources agents (95.4%) used a cell phone, while only 68.2% of the same agents utilized a Smartphone. All participants up to 51 years of age used a Smartphone, while fewer agents 51 years and older utilized the device. Males demonstrated more cell phone use than females, but females indicated more Smartphone use than males. All of the agents with at least 32 years of experience used a cell phone and most used a Smartphone.
Agents in the 4-H Youth Development and "Other" program areas proportionally demonstrated more Facebook usage than agents from the Agriculture and Natural Resources and Family, Consumer, and Health Sciences programs. The researcher concluded that professional development may have had a role in the increased number of users within the 4-H Youth Development and Other program areas.

**Implications**

The Arizona Cooperative Extension website displayed a tab labeled "social media." When accessed, the tab provided linked websites to Arizona Cooperative Extension Facebook and Twitter accounts, and blogs and videos (Arizona Cooperative Extension, 2012). Only 25% of participants reported using Twitter and blogs in the study. If Facebook, Twitter, blogs, and videos are important to the Arizona Cooperative Extension administration, professional development opportunities should be considered to encourage Extension agents to utilized the designated social media tools.

**Recommendations**

Professional development should be further analyzed as a potential cause for variations in communication technology use by program area. Further, Arizona Cooperative Extension administration should encourage Extension agents to utilize Facebook, Twitter, blogs, and videos by providing incentives and training opportunities.

**Objective 4: Conclusions/Implications/Recommendations**

Objective four: Determine the relative rate of adoption for each communication technology.


**Conclusions**

Overall, the rate of adoption calculations supported Roger's theory that the distribution would result in a S-shaped curve. Some curves grew quickly while others were showed slower rates of adoption. Cell phone adoption appeared to rapidly increase approximately ten years ago while Smartphone adoption showed a steadier incline over the past decade. Tablet computers gained popularity among the participants within the past two years. Many participants began using YouTube and Facebook roughly four years ago.

**Implications**

The cost and popularity of the communication technologies may have influenced the rate of adoption. Also, the rate of adoption may have spiked during periods of professional development or increased funding.

**Recommendations**

Administration should consider which communication technologies are of high importance to the purposes of Arizona Cooperative Extension. Appropriate funding and training opportunities should provide Extension agents access and knowledge to effectively utilize the technologies.

**Objective 5: Conclusions/Implications/Recommendations**

Objective five: Classify Arizona Extension agents into adopter categories, based on the relative rate of adoption, for each communication technology.
Conclusions

Overall, the majority of participants fell into the late majority adopter category. Typically, the late majority are skeptical and cautious of new innovations; the decision to adopt does not occur until many have already adopted and the social system shows favor for the innovation (Rogers, 2003). The early majority category also included a large portion of the participants. The early majority frequently interacts with their peers, but may deliberate for a time before deciding whether or not to adopt an innovation (Rogers, 2003).

Implications

Extension agents are often referred to as change agents due to their efforts to encourage the clientele to adopt new innovations (Seevers et al., 2007; Rogers, 2003). Ideally, change agents should be the innovators or early adopters when considering they are to be reaching their clientele with the innovations. However, the study frequently found the participants in the early or late majority adopter categories.

Recommendations

Technology adoption should be taken into consideration when making future hiring decisions. Extension administration should consider which communication technologies are important to the purposes of Arizona Cooperative Extension and candidates skilled with the technologies should be sought. Funding and professional development should also be provided to help agents stay up-to-date with new technologies.
Summary

Arizona Cooperative Extension strives to address community issues and needs through a research based educational process. The specific foci of the Extension agent gradually changed over time. Today's Arizona Extension agents should have good communication skills as they work to identify community resources, form community partnerships, and develop educational materials, among other things.

The study sought to describe how Arizona Extension agents utilize nine communication technologies: cell phones, Smartphones, tablet computers, wikis, blogs, podcasts, YouTube, Facebook, and Twitter. Greater than half of the participants utilized each mobile device included in the study (cell phones, Smartphones, and tablet computers). Facebook was a widely used social media tool.

The researcher suggests that funding and professional development may play key roles in Arizona Extension agent technology adoption. Communication technology use should be considered within Cooperative Extension work in order to help agents better serve the clientele.
REFERENCES


http://www.ext.colostate.edu.


APPENDIX A: PILOT STUDY INITIAL CONTACT EMAIL
3 October 2012

Good Morning {FIRST NAME},

I hope you are doing well. I am writing to ask for your help in a study of technology adoption that is being conducted at the University of Arizona. Communication technologies such as mobile phones and the Internet have become commonly used tools in American culture. I am interested in understanding Extension agents use of selected communication technologies.

Part of the research process involves pilot testing the questionnaire to ensure it a reliable instrument for the study. I have selected Colorado Extension agents for the pilot test. Because of your role as a Colorado Extension professional, you have been identified as a key individual to participate in the pilot study. Next week, you will receive a questionnaire administered via Illume. The questionnaire will be sent to this email address. I am writing in advance because many people like to know ahead of time that they will be receiving a survey questionnaire.

The study is an important one that will help professionals better understand how Extension agents utilize communication technologies. Thank you for your time and consideration. Meaningful research only happens with the generous support from people like you.

P.S. I will mail a small token of appreciation within the next few days as a way of saying thank you.

Sincerely,

Sarah Hopkins

Graduate Student

Department of Agricultural Education

University of Arizona
APPENDIX B: PILOT STUDY INCENTIVE LETTER
5 October 2012

Dear {FIRST NAME},

You should have received an email notifying you of a pending study on technology adoption that is being conducted at the University of Arizona. If you did not receive the email, please contact me at the email address or phone number below.

If you have not already, you can expect to receive a questionnaire sent to your University email address, via Illume, within the next few days. Enclosed is a half dollar as a way of saying thank you for your participation in the pilot study.

Enjoy,

Sarah Hopkins
Graduate Student
Department of Agricultural Education
University of Arizona
Phone: 304-206-8568
Email: sarahchopkins@email.arizona.edu
Greetings {FIRST NAME},

You should have received an email notifying you of a pending study on technology adoption that is being conducted at the University of Arizona. My graduate committee and I have developed a questionnaire to help us in understanding Extension agents use of selected communication technologies. When you are ready to begin the questionnaire, please [CLICK HERE LINK].

Part of the research process involves pilot testing the questionnaire to ensure it a reliable instrument for the study. I have selected Colorado Extension agents for the pilot test. Because of your role as a Colorado Extension professional, you have been identified as a key individual to participate in the pilot study.

Your participation in the study is voluntary. If you decide to stop participating in the study, there will be no penalty to you. Your decision will not affect your future relationship with the University of Arizona. There are no known risks or direct benefits associated with the study. The only cost to you will be a few minutes of your time. Collected data will be stored electronically using Illume. Illume maintains a security infrastructure to make sure data is safe and secure; it will privately and confidentially collect the data.

The study is an important one that will help professionals better understand how Extension agents utilize communication technologies. Please complete the questionnaire at your earliest convenience. Thank you for your time and consideration.

On October 5th, a half dollar was put in the mail to arrive at your office address, as a way of saying thank you. If you have not yet received it, please note that it is on the way! For questions, concerns, or complaints about the study please contact me at the email address or phone number below.

Sincerely,
Sarah Hopkins
Graduate Student
Department of Agricultural Education
University of Arizona
Phone: 304-206-8568
Email: sarahchopkins@email.arizona.edu
APPENDIX D: INITIAL CONTACT EMAIL
12 February 2013

Good Morning {FIRST NAME},

I hope you are doing well. I am writing to ask for your help in a study of technology adoption that is being conducted at the University of Arizona. Communication technologies such as mobile phones and the Internet have become commonly used tools in American culture. I am interested in understanding Extension agents use of selected communication technologies.

I have selected Arizona Extension agents for the study. Because of your role as an Arizona Extension professional, you have been identified as a key individual to participate in the study. Next week, you will receive a questionnaire administered via Illume. The questionnaire will be sent to this email address. I am writing in advance because many people like to know ahead of time that they will be receiving a survey questionnaire.

The study is an important one that will help professionals better understand how Extension agents utilize communication technologies. Thank you for your time and consideration. Meaningful research only happens with the generous support from people like you.

P.S. I will mail a token of appreciation within the next few days as a way of saying thank you.

Sincerely,

Sarah Hopkins
Graduate Student
Department of Agricultural Education
University of Arizona
APPENDIX E: INCENTIVE LETTER
14 February 2013

Greetings {FIRST NAME},

You should have received an email notifying you of a pending study on technology adoption that is being conducted at the University of Arizona. If you did not receive the email, please contact me at the email address or phone number below.

If you have not already, you can expect to receive a questionnaire sent to your University email address, via Illume, within the next few days. Enclosed is a five dollar bill as a way of saying thank you for your participation in the study.

Enjoy,

Sarah Hopkins
Graduate Student
Department of Agricultural Education
University of Arizona
Phone: 304-206-8568
Email: sarahchopkins@email.arizona.edu
APPENDIX F: INITIAL QUESTIONNAIRE EMAIL
19 February 2013

Greetings { FIRST NAME},

You should have received an email notifying you of a pending study on technology adoption that is being conducted at the University of Arizona. My graduate committee and I have developed a questionnaire to help us in understanding Extension agents use of selected communication technologies. When you are ready to begin the questionnaire, please {CLICK HERE LINK}.

Your participation in the study is voluntary. If you decide to stop participating in the study, there will be no penalty to you. Your decision will not affect your future relationship with the University of Arizona. There are no known risks or direct benefits associated with the study. The only cost to you will be a few minutes of your time. Collected data will be stored electronically using Illume. Illume maintains a security infrastructure to make sure data is safe and secure; it will privately and confidentially collect the data.

The study is an important one that will help professionals better understand how Extension agents utilize communication technologies. Please complete the questionnaire at your earliest convenience. Thank you for your time and consideration.

On February 14th, a five dollar bill was put in the mail to arrive at your office address, as a way of saying thank you. If you have not yet received it, please note that it is on the way! For questions, concerns, or complaints about the study please contact me at the email address or phone number below.

Sincerely,

Sarah Hopkins

Graduate Student

Department of Agricultural Education

University of Arizona

Phone: 304-206-8568

Email: sarahchopkins@email.arizona.edu
APPENDIX G: QUESTIONNAIRE
What tools do you use for communication?

Welcome to the questionnaire!
It will only take a few minutes of your time.

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A cell phone is a mobile device that allows for communication to occur via radio waves rather than a fixed, wire connection. While early cell phones only allowed for verbal communication, modern cell phones have many more capabilities. For the purpose of this study, "cell phone" refers to a mobile device that can be used for voice and/or text message communication.

1. How often do you use a cell phone to communicate with others?
   - Never
   - Rarely
   - Occasionally
   - Usually
   - Frequently
2. Select the answer below that best completes the following sentence to better describe your frequency of cell phone use. I use a cell phone at least once each ______.

- [ ] Day
- [ ] Week
- [ ] Month
- [ ] Year

3. On average, how many times each {DAY/ WEEK/ MONTH/ YEAR} do you use a cell phone?

   [ ] times

4. How do you communicate using a cell phone? Select all that apply.
   - [ ] Voice calling
   - [ ] Text messaging

5. With whom do you communicate using a cell phone? Select all that apply.
   - [ ] Family members
   - [ ] Friends
   - [ ] Colleagues
   - [ ] Clients
   - [ ] Others. Please specify. __________________________________________

6. How long have you used a cell phone?

   [ ] years

A Smartphone is a mobile device similar to a cell phone. A Smartphone can send and receive voice and text messages, and a Smartphone can access the Internet and send and receive email transmissions. For the purpose of this study, "Smartphone" refers to a mobile device that can be used for voice and/or text message communication, AND can be used to access the Internet and/or send and receive email messages.
7. How often do you use a Smartphone to communicate with others?

- Never
- Rarely
- Occasionally
- Usually
- Frequently

8. Select the answer below that best completes the following sentence to better describe your frequency of Smartphone use. I use a Smartphone at least once each __________.

- Day
- Week
- Month
- Year

9. On average, how many times each {DAY/ WEEK/ MONTH/ YEAR} do you use a Smartphone?

- times

10. How do you communicate using a Smartphone? Select all that apply.

- Voice calling
- Text messaging
- Email
- Facebook
- Twitter
- Other. Please specify._____________________

11. With whom do you communicate using a Smartphone? Select all that apply.

- Family members
- Friends
- Colleagues
- Clients
- Others. Please specify._____________________

12. How long have you used a Smartphone?

- years
Tablet computers are mobile devices approximately the length and width of a legal-size pad of paper and roughly 1.5 inches thick. Tablet computers have touch screens and wireless Internet connections. Tablet computers have capabilities similar to that of a larger personal computer. For the purpose of this study, "tablet computer" refers to a mobile device, with characteristics similar to the description above, that can be used to access the Internet and/or for email communication.

13. How often do you use a tablet computer to communicate with others?
   - Never
   - Rarely
   - Occasionally
   - Usually
   - Frequently

14. Select the answer below that best completes the following sentence to better describe your frequency of tablet computer usage. I use a tablet computer at least once each ___________.
   - Day
   - Week
   - Month
   - Year

15. On average, how many times each {DAY/ WEEK/ MONTH/ YEAR} do you use a tablet computer?
   ______ times

16. How do you communicate using a tablet computer? Select all that apply.
   - [ ] Email
   - [ ] Web conferencing
   - [ ] Social media websites
   - [ ] Other. Please specify. ________________________________
17. With whom do you communicate using a tablet computer? Select all that apply.

- [ ] Family members
- [ ] Friends
- [ ] Colleagues
- [ ] Clients
- [ ] Others. Please specify. 

18. How long have you used a tablet computer?

[ ] ________ years

Wikipedia provides an online forum where users can add, edit, or delete information through their website. The content that is created is referred to as a "wiki." Wikis could be used to share information, create documents, and provide a link to resources.

19. How often do you use a wiki to communicate with others?

- [ ] Never
- [ ] Rarely
- [ ] Occasionally
- [ ] Usually
- [ ] Frequently

20. Select the answer below that best completes the following sentence to better describe your frequency of wiki use. I use a wiki at least once each ________.

- [ ] Day
- [ ] Week
- [ ] Month
- [ ] Year

21. On average, how many times each {DAY/ WEEK/ MONTH/ YEAR} do you use a wiki?

[ ] ________ times
22. With whom do you communicate through wikis? Select all that apply.
- Family members
- Friends
- Colleagues
- Clients
- Others. Please specify.

23. How long have you used wikis?

24. How often do you use a blog to communicate with others?
- Never
- Rarely
- Occasionally
- Usually
- Frequently

25. Select the answer below that best completes the following sentence to better describe your frequency of blog use. I use a blog at least once each _____________.
- Day
- Week
- Month
- Year

26. On average, how many times each {DAY/ WEEK/ MONTH/ YEAR} do you use a blog?

A "blog" is an online forum where users can share expertise and information with a blogging community.
27. With whom do you communicate using a blog? Select all that apply.

- Family members
- Friends
- Colleagues
- Clients
- Others. Please specify.

28. How long have you used a blog?

[ ] years

A "podcast" is a brief audio or video message created to share educational information or announcements. Podcasts may include music, pictures, or other forms of animation.

29. How often do you use a podcast to communicate with others?

- Never
- Rarely
- Occasionally
- Usually
- Frequently

30. Select the answer below that best completes the following sentence to better describe your frequency of podcast use. I use a podcast at least once each _____________.

- Day
- Week
- Month
- Year

31. On average, how many times each {DAY/WEEK/MONTH/YEAR} do you use a podcast?

[ ] times
32. With whom do you communicate through podcasts? Select all that apply.
   - Family members
   - Friends
   - Colleagues
   - Clients
   - Others. Please specify.

33. How long have you used podcasts?
   [ ] years

34. How often do you use YouTube to communicate with others?
   - Never
   - Rarely
   - Occasionally
   - Usually
   - Frequently

35. Select the answer below that best completes the following sentence to better describe your frequency of YouTube use. I use YouTube at least once each _________.
   - Day
   - Week
   - Month
   - Year

36. On average, how many times each {DAY/ WEEK/ MONTH/ YEAR} do you use YouTube?
   [ ] times
37. With whom do you communicate using YouTube? Select all that apply.

- [ ] Family members
- [ ] Friends
- [ ] Colleagues
- [ ] Clients
- [ ] Others. Please specify:

38. How long have you used YouTube?

[ ] years

Facebook is a social media website that provides users with a forum to connect with others and share information, photos, videos, and messages.

39. How often do you use Facebook to communicate with others?

- [ ] Never
- [ ] Rarely
- [ ] Occasionally
- [ ] Usually
- [ ] Frequently

40. Select the answer below that best completes the following sentence to better describe your frequency of Facebook use. I use Facebook at least once each _____________.

- [ ] Day
- [ ] Week
- [ ] Month
- [ ] Year

41. On average, how many times each {DAY/ WEEK/ MONTH/ YEAR} do you use Facebook?

[ ] times
42. With whom do you communicate using Facebook? Select all that apply.

☐ Family members
☐ Friends
☐ Colleagues
☐ Clients
☐ Others. Please specify. ________________

43. How long have you used Facebook?

________________ years

Twitter allows users to receive current information, ideas, and news from various sources. Twitter users create an account and then locate other accounts of interest to "follow" the conversations. Information is shared in short bursts called "tweets." Tweets may be sent and received on either a computer or a mobile device.

44. How often do you use Twitter to communicate with others?

☐ Never
☐ Rarely
☐ Occasionally
☐ Usually
☐ Frequently

45. Select the answer below that best completes the following sentence to better describe your frequency of Twitter use. I use Twitter at least once each ________________.

☐ Day
☐ Week
☐ Month
☐ Year

46. On average, how many times each {DAY/ WEEK/ MONTH/ YEAR} do you use Twitter?

________________ times
47. With whom do you communicate using Twitter? Select all that apply.
   - Family members
   - Friends
   - Colleagues
   - Clients
   - Others. Please specify. 

48. How long have you used Twitter?
   ______ years

The below demographic questions will be compared with the responses to previous questions. Your answers are important in order to obtain accurate data.

49. What is your age?
   ______ years

50. What is your sex?
   - [ ] Female
   - [ ] Male

51. How long have you been employed with Cooperative Extension?
   ______ years
APPENDIX H: EMAIL REMINDERS
27 February 2013

Dear {FIRST NAME},

You should have received an email with a link to a questionnaire asking about your use of certain communication technologies. To the best of my knowledge, the questionnaire has not yet been completed. To begin the questionnaire, please {CLICK HERE LINK}.

I am writing again because your responses are important to help us obtain accurate results for the study. This email is to remind you to please complete the questionnaire at your earliest convenience.

Please note that **Friday, March 8th is the last day to respond to the questionnaire.** Thank you for your time and consideration.

Respectfully,

Sarah Hopkins

Graduate Student

Department of Agricultural Education

University of Arizona
APPENDIX I: FINAL REMINDER EMAIL
7 March 2013

Greetings {FIRST NAME},

In the past weeks, you should have received several emails regarding a study on communication technology adoption that is being conducted at the University of Arizona. To the best of my knowledge, your questionnaire has not yet been submitted. To begin the questionnaire, please {CLICK HERE LINK}.

This is the final notice you will receive regarding the study. Please note that **TOMORROW, Friday, March 8th is the last day to submit the questionnaire.** Your responses are important to help us obtain accurate results for the study. Thank you for your time and consideration.

If you have questions, concerns, complaints, or need assistance completing the questionnaire, please contact me at the email address or phone number below.

Respectfully,

Sarah Hopkins

Graduate Student

Department of Agricultural Education

University of Arizona

Cell: 304-206-8568

Email: sarahchopkins@email.arizona.edu