

USABILITY ANALYSIS OF THE USDA-ARS OGALLALA

INITIATIVE WEB SITE

by

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ABSTRACT

This study tested the usability of the USDA-ARS Ogallala Initiative Web site to determine the external user preferences. Although testing Web sites for usability is still in the developmental stages, Nielsen (2000) says “usability rules the Web” (p. 9).

A stratified purposeful sample ($n = 49$) of county extension agents, agricultural producers, communication professionals, and the general public was tested. A stratified purposeful sample was taken, because Nielsen (2000) and Krug (2000) state how important it is to test the target audience of a site.

A usability survey instrument was developed for agricultural and natural resources Web sites by the researcher, based on standards set by Web site usability experts, Nielsen and Krug. The instrument included demographics, as well as 4-point Likert questions pertaining to these categories: general appearance, navigation, efficiency, and content of the site.

More than 85% of the participants reported they were satisfied with the USDA-ARS Ogallala Initiative Web site. However, they did indicate a need for contact information and more content. There were no differences among audience responses. Each audience category indicated their needs were being met.

The survey instrument yielded a Cronbach’s Alpha of 0.923. The researchers recommend adding the following variables to the survey instrument: age of participants, years in profession, and if participants have Internet in their home or business.

The researchers suggest revising and adding content based on reported results for the Ogallala Initiative Web site. Then the site needs to be retested several times over.

Future tests should be conducted with live audiences, allowing researchers to observe participants in a natural navigation setting.

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CHAPTER I

INTRODUCTION

Background and Setting

The Ogallala Aquifer, which has long been the main water supply for the High Plains' population, is rapidly depleting. This underground water reservoir covers approximately 174,000 square miles mainly in Nebraska, Kansas, Oklahoma, and Texas (also known as the High Plains). The aquifer also covers acreage in South Dakota, Wyoming, Colorado, and New Mexico (Opie, 2000).

Discovered after World War II, the aquifer has been the main source of water for agricultural, municipal, and industrial development in the High Plains (Opie, 2000). With the dust bowl in the 1930s, advancements in irrigation, and the occurrence of dry climates, which resulted in repeated droughts, the use of the aquifer has surpassed its ability to naturally recharge (Glantz, 1989). It has been estimated between 1960 and 1990, one billion acre-feet of Ogallala water was consumed by irrigation farms in southwest Kansas, the Oklahoma Panhandle, and West Texas (Opie, 2000).

Irrigation is a way of life in this area. Farmers' livelihoods depend on the ability to turn a valve or flip a switch to water crop fields. One advantage for the High Plains farmers is irrigation is 'intensely localized and small-scale' (Opie, 2000). Opie (2000) explains that irrigation water is initially free to High Plains' farmers since they are able to pump water directly from underneath their crop fields. Whereas in the majority of the world and other parts of the United States, irrigation water has to be transported hundreds of miles through canals or pipes, resulting in huge overhead costs (Opie, 2000). High

Plains' irrigation farmers only expense is the pumping of the water; the water itself is free.

Another advantage High Plains farmers have is the low population of the area; there are no major cities. According to Opie (2000), irrigation farmers in Arizona and California face the monetary competition of acreage, which for farmers who cannot profit would not allow them to continue. Plus, the amount of water required for one year of 1,280 acre wheat crop could supply 24 American families for a year (Opie, 2000).

Since ground water can only be replaced from the surface and much of the High Plains receives only inches of rainfall each year, the aquifer is unable to keep up because water is being pumped out by feet (Opie, 2000). *Figure 1.1* shows the High Plains area and the gray area indicates where the Ogallala Aquifer is located.



Figure 1.1 The Ogallala Aquifer and the High Plains (“Ogallala Aquifer: A General Geology, Stratigraphy, and Hydrology,” n.d.).

With the rapid depletion of the Ogallala Aquifer, the U.S. Congress passed legislation in 2003 authorizing the Agricultural Research Service (ARS) to research water conservation of the Ogallala Aquifer (Clark, Upchurch, & Howell, 2004). Researchers from ARS Conservation and Production Research Laboratory in Bushland, Texas, and the ARS Cropping Systems Laboratory in Lubbock, Texas, along with Kansas State Research and Extension, Kansas State University, Texas Agricultural Experiment Station, Texas Cooperative Extension, Texas Tech University, United States Department Agriculture (USDA), and West Texas A&M University have joined together, as the Ogallala Initiative, in an effort to preserve the aquifer (Clark et al., 2004).

The Ogallala Initiative was created to ensure the sustainability of agricultural industries and rural communities through innovative scientific research. This research is focused on irrigation and precipitation management, integrated crop/livestock systems, considering socioeconomic impacts and an assessment of all available water resources, and providing scientifically sound information for public policy decisions (R. N. Clark, D. R. Upchurch, & T. A. Howell, personal communication, May 11, 2005).

The Ogallala Initiative Web site will serve as the database for information pertaining to several audiences affected by the aquifer. Audiences included in this study are agricultural producers, communication professionals, and the general public. This Web site is updated regularly with current research being conducted and new information on ways to help preserve this invaluable water resource. Since several audiences reference the Initiative Web site, it is important the Web site meet their needs, since “usability rules the Web,” (Nielsen, 2000, p. 9). A site must be usable for Web goers to return.

Nielsen (2000) believes if Web goers cannot maneuver through a Web site quickly, they will leave the site in less than a minute. Design of a Web site is key for people to find information quickly. Nielsen (2000) suggests when selecting design, do not ask which design you like best, but ask which design allows users to obtain information the quickest.

Web site design ideas should be obtained from what the users like, find easy, and where they stumble (Nielsen, 2000). Some tips Nielsen (2000) recommends:

- Structure the site to mirror the users' task and their view of the space.
- Always make page designs for an "optimal user experience," that are under realistic circumstances.
- Shorten your writing, so users can quickly scan the text to obtain information.
- Include proper links to other valuable Web sites.

The Initiative Web site contains valuable information which agricultural producers, communication professionals, and the general public access. This Web site needs repeat users, thus making it important that usability meets the audiences' needs.

Statement of the Problem

As the aquifer continues to diminish, so does the High Plains water supply. It has been estimated between 1960 and 1990 one billion acre-feet of Ogallala water was consumed by irrigation farms in southwest Kansas, the Oklahoma Panhandle, and West Texas (Opie, 2000). Life on the High Plains is strongly dependant on this water resource, thus making it a dire need to conserve the water that is left.

Conservation information needs to be easily accessible for people in the High Plains in order to preserve the aquifer. The Initiative Web site is the link to disseminate information to the agricultural producers, communication professionals, and the general public. This new Web site is dedicated to the preservation of the Ogallala Aquifer. The Web site is a quick way to keep people informed on aquifer issues. It is through these audiences that information can be shared across the High Plains in an effort to preserve this valuable aquifer.

Purpose and Objectives

The purpose of this study was to determine the external user preferences of the USDA-ARS Ogallala Initiative Web site and to develop a baseline Web site usability instrument for future agricultural and natural resources Web sites. The following were objectives for this study:

- 1) Evaluate the overall usability of the Ogallala Initiative Web site by the identified consumers.
- 2) Determine if there was a difference in overall usability satisfaction among identified consumers of the Ogallala Initiative Web site.
- 3) Develop a usability survey instrument for agricultural and natural resources Web sites.

Definition of Terms

For the purpose of this study, the following terms were defined.

Agricultural Producers – Those agricultural producers affected by the aquifer. The Ogallala Aquifer covers a large agricultural production area.

ARS-USDA – Agricultural Research Service-United States Department of Agriculture, the USDA’s main in-house scientific research agency (USDA, 2005).

Communication Professionals – includes any form of agricultural communicators or media that reports information about the Ogallala Aquifer; may include television, radio, print, or Internet.

External – “relating to, existing on, or connected with the outside or an outer part; exterior” (Editors of the American Heritage[®] Dictionaries, 2000).

External users – Those people using the Web site, outside of the researchers. Includes agricultural producers, communication professionals, and the general public.

General Public – Anyone who is not a producer or involved with communication professionals.

Ogallala Initiative – The Ogallala Initiative is to ensure the sustainability of agricultural industries and rural communities, through innovative scientific research focused on irrigation and precipitation management and integrated crop/livestock systems, considering socioeconomic impacts an assessment of all available water resources, and providing scientifically sound information for public policy decisions (Clark et al., 2004). Those involved in the Initiative include the USDA-ARS, Kansas State University, Kansas State Research & Extension, Texas A&M University, Texas Agricultural Experiment

Station, Texas Cooperative Extension, Texas Tech University, and West Texas A&M University (Clark et al., 2004).

Preference – “the selecting of someone or something over another or others; the right or chance to so choose; someone or something so chosen; or the state of being preferred” (Editors of the American Heritage[®] Dictionaries, 2000).

Usability – “that can be used, or fit for use; convenient to use” (Editors of the American Heritage[®] Dictionaries, 2000); “the degree to which something, i.e. software, hardware or anything else, is easy to use and a good fit for the people who use it; a quality or characteristic of a product; it is whether a product is efficient, effective, and satisfying for those who use it” (Usability Professionals’ Association, 2005).

USDA – United States Department of Agriculture; the Ogallala Initiative is funded by the USDA.

User preferences – What the people, who use the Initiative Web site, want to see on the Web site, or how they prefer it to be set up, i.e. is the Web site user friendly or not.

Utility – “quality or condition of being useful; usefulness,” (Editors of the American Heritage[®] Dictionaries, 2000).

Limitations to the Study

The following limitations of this study should be taken into consideration:

- 1) The purposeful sample of the agricultural producers may not be an accurate representation of Web consumers in the Ogallala Aquifer region.
- 2) The purposeful sample of the communication professionals may not be an accurate representation of Web consumers in the Ogallala Aquifer region.

- 3) The purposeful sample of general public may not be an accurate representation of Web consumers in the Ogallala Aquifer region.
- 4) Some responses made by participants may not truly represent usability; i.e., just because the user may like an aspect does not mean that it is an actual user preference.
- 5) The Ogallala Initiative Web site content and layout changed from the time the pilot test was conducted to the time the actual study was conducted. The change in the Web site was out of the researcher's control.

Assumptions

The following assumptions were made when conducting this study:

- 1) The identified consumers are an accurate representation of the Ogallala Aquifer population.
- 2) The purposeful sample of agricultural producers was an accurate representation of the Ogallala Aquifer population.
- 3) The purposeful sample of the communication professionals was an accurate representation of the Ogallala Aquifer population.
- 4) The purposeful sample of the general public was an accurate representation of the Ogallala Aquifer population.
- 5) The survey instrument measures user preferences.
- 6) User preferences are a factor in Web site usability.

Significance of the Study

The significance of this study was the dissemination of information on conserving the Ogallala Aquifer. With the aquifer rapidly depleting, valuable conservation information needs to be easily accessible to the audiences pertaining to the aquifer region. Water conservation is the only way to preserve the aquifer, which needs to become first priority to the High Plains people.

The Ogallala Initiative Web site is targeted at agricultural producers, communication professionals, and the general public. These three audiences are primary in the dissemination of information to the rest of the region about water conservation. Thus, the Web site needs to meet the needs of its audiences, so in turn conservation of the aquifer can go into affect.

Web goers need to be able to get though Web sites quick and if they can't within a minute or so, Nielsen (2000) believes they will leave the site in search of an easier one. Design of a Web site is key for people to find information quickly (Nielsen, 2000). Nielsen (2000) suggests when selecting design, do not ask which design you like best, but ask which design allows users to obtain information the quickest.

The three audiences targeted for this study have different characteristics and the Web site needs to meet all their needs. It is through these audiences that preservation of the aquifer can begin.

With literature being small in the area of Web site usability, there is a need for an actual instrument that can test agricultural and natural resources Web sites. According to Nielsen (2000), "usability rules the Web," (p. 9), therefore it is important to make sure

Web sites are usable. This study developed a survey instrument to test the usability of agricultural and natural resources Web sites.

CHAPTER II

REVIEW OF LITERATURE

Introduction

As the Ogallala Aquifer continues to diminish, so does the High Plains water supply. It has been estimated between 1960 and 1990, one billion acre-feet of Ogallala water was consumed by irrigation farms in southwest Kansas, the Oklahoma Panhandle, and West Texas (Opie, 2000). Life on the High Plains is strongly dependant on this water resource, thus making a dire need to conserve the water that is left.

Conservation information needs to be easily accessible for people in the High Plains in order to increase preservation of the aquifer. The Ogallala Initiative Web site is that link to disseminating information to the agricultural producers, communication professionals, and the general public. The Web site is a quick way to keep people informed on aquifer issues. It is through these audiences that information can be shared across the High Plains in an effort to preserve this valuable aquifer.

The purpose of this study was to determine the external user preferences of the USDA-ARS Ogallala Initiative Web site and to develop a baseline Web site usability instrument for future agricultural and natural resources Web sites.

This literature consists of the following topics: Web site usability, usability in agriculture, usability in the communication professionals, usability in the general public, and the development of a usability survey instrument for agricultural and natural resources Web sites. Research was gathered from computer aided research techniques using the following terms: Web site usability, agriculture Web site usability,

communication professionals Web site usability, agriculture and the Internet, rural communities and the Internet, and Web site usability instruments.

Jakob Nielsen is quoted many times throughout this literature review, because he is considered an expert on Web site usability. He has been called “the reigning guru of Web usability,” by Fortune magazine, and “perhaps the best-known design and usability guru on the Internet,” by Financial Times, (“Nielsen: It’s Time for Redesign,” 2004, p. 1).

The Internet became public more than a decade ago, and since has rapidly grown (Ng, Parette, & Sterrett, 2003). It has been estimated that in 2005 there will be 50 billion Web sites, which results in many added users (Ng et al., 2003).

Theoretical Framework

The purpose of this study was to determine the external user preferences of the USDA-ARS Ogallala Initiative Web site and to develop a baseline Web site usability instrument for future agricultural and natural resources Web sites.

The Web site acts as a tool for the dissemination of information to its several audiences. The uses and gratifications theory best describes this study.

The uses and gratifications approach theory “attempts to explain the uses and functions of the media for individuals, groups, and society in general,” (“Uses and Gratifications Approach,” n.d., p. 1). In other words it is “how people use media to gratify their needs,” (North, 2000, p. 1). This theory explains what people do with the media; how they use it or don’t use it (North, 2000). Three objectives of this approach:

- 1) how people use mass communications to meet their needs,

- 2) discover what are other reasons for individuals' use of the media,
- 3) to determine individual consequences of media use, whether negative or positive
("Uses and Gratifications Approach," n.d.).

"Uses and gratifications research studies the motivations for media exposure, how media are used and the rewards derived from that use; it focuses on the receiver or user of a medium and his or her purpose(s) for using it. Such a framework offers an approach or model at best and is not very theoretical" (Garrison, 2003, p. 2).

"However, applications of the Web and Internet in news organizations remain widely under-studied and weak in theory, but a first generation of literature about Internet and Web use in general, as well as Internet and Web use by journalists, has appeared" (Garrison, 2003, p. 2).

The uses and gratifications theory best fits the following literature review and the objectives of this study. As you will find, literature is weak in the areas of Web site usability. Although the Internet has been around for a few years, it has only been until recent that usability of Web sites has been tested. As you will read throughout this review, experts have differing opinions of what makes a Web site usable.

Figure 2.1 lays out the framework in which this study will be analyzed. The Initiative Web site will be evaluated on efficiency, satisfaction of the users, utility, reliability of the site, and user accessibility. As shown in the diagram, these all relate to each audience, content of the site, navigation, page layout, how the information presented on the site is used, and if the site should be in more than one language. This literature review discusses some of the above topics, which experts highlight as important factors in evaluating Web site usability.

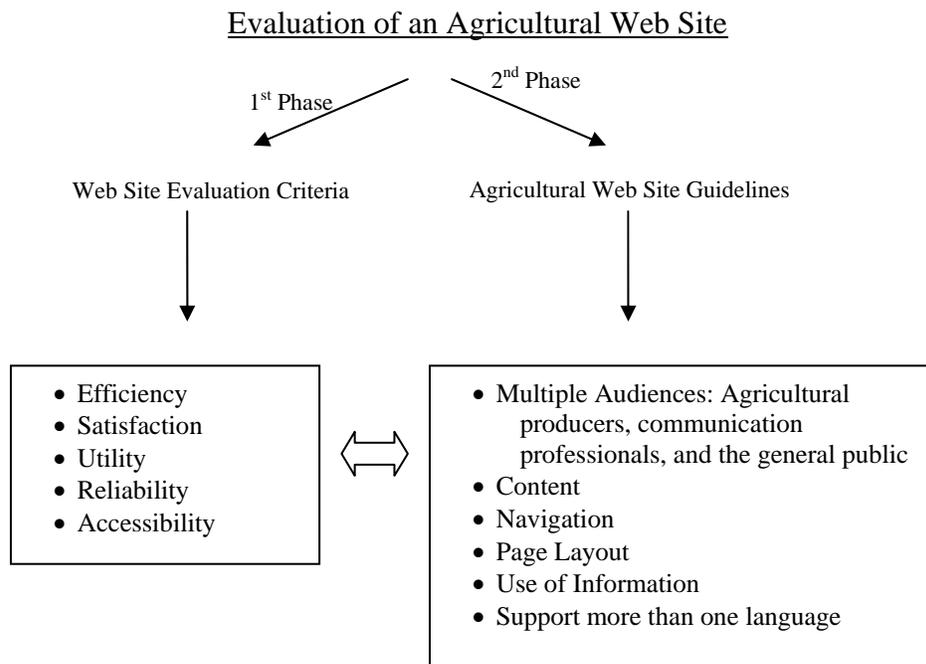


Figure 2.1 “Evaluation of an Agriculture Web Site” model adapted from Patsioura, Vlachopoulou, & Manthou’s study (n.d.).

Related Literature

Usability

According to Nielsen (2000), “usability rules the Web,” (p. 9). Usability is defined in the dictionary as something “that can be used, or fit for use; convenient to use” (Editors of the American Heritage® Dictionaries, 2000, p. 1). Usability Professionals’ Association (2005) define usability as “the degree to which something, i.e. software, hardware or anything else, is easy to use and a good fit for the people who use it; a quality or characteristic of a product; it is whether a product is efficient, effective, and satisfying for those who use it” (p. 1).

Web site usability is becoming a bigger issue as the Internet audience continues to increase in size. In a 2001 survey, the United States had more than 160 million people who had access to the Internet, and of those, about 100 million accessed it weekly (Webster & Lin, 2002).

Krug (2000) points out there is no such thing as an ‘average user.’ Each person viewing a Web site is going to like or dislike something different from each other; it basically comes down to a matter of personal preference (Krug, 2000). However, usability is taken into account with what the majority of users likes and dislikes (Krug, 2000). Because of this, questions should not ask what do they prefer, but ask if the menu on *this* page is more effective than *that* page (Krug, 2000).

Users go to Web sites for several different purposes. Some surf the Web for entertainment, information, or simply to pass time. The Ogallala Initiative Web site is dedicated to disseminating information to its audiences in an effort to preserve the aquifer.

Users should be able to leave a site satisfied that they were able to obtain the information they were searching. According to Krug (2000), a Web site is usable if it doesn’t make you think. Krug (2000) says when he evaluates Web sites, if he has to think, then the site is not easy to use. To Krug (2000) a Web page should be “self-evident, obvious, and self-explanatory” (p. 11). For example, a user should not spend even a millisecond of thought wondering if something on a site is clickable (Krug, 2000).

General appearance.

Nielsen (2000) believes site design is the most important when dealing with Web site usability. However, remember that content is the main reason users go to a Web site, it is not to see the design or layout so keep design to a minimum (Nielsen, 2000). Spool, Scanlon, Snyder, Schroeder, and DeAngelo (1999) found that graphic design of a Web site does not aide in the user finding information. On the flip side, experts agree graphics will appeal to return users. However, Spool et al. (1999) caution that if graphics are used, use only one or two and keep them the same throughout.

The home page should have a distinct look from the other pages of the site (Nielsen, 2000). All pages should have the same scheme, but the home page needs to stand out. One example of a home page being different is that it doesn't have a home button. "It is very annoying to click on a button that links right back to the current page" (Nielsen, 2000, p. 166).

When designing a Web site layout, Nielsen (2000) explains that whitespace can guide users through a page. "If you have the choice between separating two segments of content by a heavy line or by some whitespace, it will often look better to use the whitespace solution, which will typically also download faster" (Nielsen, 2000, p. 18). Keep the Web design simple; Nielsen (2000) suggests eliminating design elements one at a time and if the site still works then leave it off.

Navigation.

"Navigation is also a necessary evil," Nielsen (2000, p. 18) says, because Web sites must be easy to navigate. However, Nielsen (2000) warns designers should not lose

site of the information the Web site offers. Most users do not want to continuously click from page to page to find information. Many experts agree the 'three click rule' should always be taken into account when designing Web sites (Parlinska & Parlinski, 2003). The three click rule means all information should be no longer than three clicks away from the homepage (Parlinska & Parlinski, 2003).

Krug (2000) argues this point. He believes that many users will blame themselves for not finding what they are looking for or being unable to navigate the Web site. Krug (2000) says most users will have the state of mind of "I've waited this long, what's a little longer," (p. 19). However, designers do not want to leave their users with this thought. By making a Web site easy to navigate, hopefully it will prevent users from looking through several pages of a site to retrieve the information they are searching.

Krug (2000) also brings up an excellent point of the nontangible things that Web sites have. For example, he points out that on Web sites there is "no sense of scale," (p. 57); meaning that a user has no idea how many pages and how much information is on a site. Another example is there is "no sense of direction" (p. 57); there is no way for a user to know if they are moving forward, backward, up, or down. Finally, Krug (2000) explains there is also "no sense of location" (p. 57); in the physical world you can learn the shortcuts, but on the Web there is simply no way to tell where you are at.

Spool et al.'s (1999) study relates to Krug's theory. Spool et al. (1999) had predicted in their study that the structure of the Web site would play a role in the acceptability of the site to users. However, they discovered that structure of a site did not matter to users. According to Spool et al. (1999), users simply navigate from moment to moment; if they get lost, they kept going forward from where they were.

When designing a site, it has been discovered that navigation bars across the top or bottom of a Web site are better than navigation bars down the side of the site (Spool, et al., 1999). There is no concrete evidence to why this is, however Spool et al. (1999) predict it is because there are more scrolling problems with side navigation bars. The bar has the possibility of being scrolled off the screen, thus context can be lost (Spool et al., 1999).

Efficiency.

The dictionary defines efficiency as “the quality or degree of being efficient” (Woolf et al., 1973, p. 362). A Web site must be efficient by serving its purpose to the user, in order for them to return.

Studies have shown that users only stay focused on dialogue for approximately 10 seconds; this stays true for Web sites uploading (Nielsen, 2000). If a Web site is taking time to upload, more in likely a user will leave the site. Design should be kept at a minimum to increase upload speeds, which also will enable a wider range of computers to upload the site. For example, if a Web site contains several graphics and photographs, a dial-up modem probably could not handle all those graphics, which could result in losing users (Nielsen, 2000). Web sites need to be designed with all Internet connection speeds in mind (Nielsen, 2000).

Experts realize there is a need for larger files, but suggest putting them as optional downloads. Nielsen (2000) suggests having the file size next to its download link and if users have analog modems they need to be aware if the file is larger than 50 kilobytes.

He also says if images must be used on Web pages; try to use the same one, thus keeping download times shorter (Nielsen, 2000).

Content.

The Internet's most important role is communications; it has simply replaced newspapers (Parlinska & Parlinski, 2003). Millions of people each day depend on the Web for information, graphics, audio, and communication (Parlinska & Parlinski, 2003). According to Parlinska and Parlinski (2003), if a Web site is professionally designed, then it tells its users it is committed to providing them with quality information and service.

With most users obtaining information from a Web site, the information needs to be accurate and reliable. The Ogallala Initiative Web site is a reliable site which will be disseminating information to its audiences, who will in turn share it with other audiences. If the information is not reliable, then users will discontinue using the Initiative Web site as a source.

In Ng et al.'s (2003) study, "Evaluations of a graduate school Web-site," researchers focused on nine elements of a Web site, and content was found to be one of the most important. Content varies from Web site to Web site; depending on the purpose of the site determines the content that should be included (Ng et al., 2003).

Even though content is the main purpose of a Web site, designers must realize that users will only stay focused on dialogue for approximately 10 seconds; they expect a quick response time (Nielsen, 2000). Nielsen (2000) states 79% of Web users scan rather than read a Web page.

Too many times, Nielsen (2000) believes Web designers focus on the structure and navigation of the site, rather than putting information users want easily accessible. Spool et al. (1999) also agrees that the main point of a Web site should be information. Users do not go to a Web site to see the design or layout, they view the site for its content, so keep design to a minimum (Nielsen, 2000).

Headlines and summaries on Web sites are usually weak (“Nielsen: It’s Time for a Redesign,” 2004). This can be detrimental to a Web site, because summaries and headlines are all they have to go off of when searching the Web (“Nielsen: It’s Time for a Redesign,” 2004). Nielsen also points out that Web content should be clear; most of the time Web sites do not answer users questions directly (“Nielsen: It’s Time for a Redesign,” 2004).

According to Nielsen (2000) when writing for the Web, the following should be kept in mind:

- Convert 50% or less of a print article to a Web publication; do not put the entire article on the Web, because viewers will not want to read it all.
- Write short paragraphs, subheadings, and use bulleted lists; Web reading takes approximately 25% longer than print reading.
- Web articles should have two or more levels of headlines for easier reading.
- Hypertext should be used to split up multiple pages; most users will not scroll down (Nielsen, 2000).
- Conclusions should be listed first, (inverted pyramid, arranging information in the order from the most important to the least important (Brooks, Kennedy, Moen, & Ranly, 2005).

- Use spell check (Nielsen, 2000).
- Text should be left justified.
- Most Web users will want to print out information so have printable versions of information available.
- Use contrasting colors, such as a black background with white text or visa versa (Nielsen, 2000).
- Contact information should be available on the Web site. For some users, if they can contact an actual person, it is a comfort to them and can make a Web site more reliable (Parlinska & Parlinski, 2003).

Summary

Web site usability testing can be tested through the following categories: general appearance, navigation, efficiency, and content. A Web site is usable if it doesn't make users think while they are retrieving their information (Krug, 2000). The main purpose users go to a Web site is for the content it contains, however the site must be aesthetically pleasing as well as easy to navigate in order to keep return users. In addition, the site must quickly upload in the browser as well as download content, graphics, and photos quickly, or users will leave the site.

Testing

“Usability is a reality check,” (Nielsen, 2005, p. 2). A Web site usability test, according to Nielsen (2005), simply determines what humans can or can't work on a site. Through a usability test, conclusions and recommendations can be formed for changes

and alternations to a Web site (Nielsen, 2005). Like Nielsen, Krug (2000) too states that in order to have a great site, it must be tested. Krug says the only way to really determine if it works is to test it (2000). “Testing reminds you that not everyone thinks the way you do, knows what you know, or uses the Web the way you do,” (Krug, 2000).

Experts have varying views on how Web sites are to be tested for usability. Until recent, usability testing has been perceived as an expensive method, but as experts point out testing can be done cheap and effective (Nielsen, Coyne, & Tahir, 2001). Several usability testing methods can be done; designers need to find the one that works best for them. Designers simply need to keep in mind what they are testing and expect suggestions (Krug, 2000).

Krug (2000) describes usability testing as having friends in from out of town; they always see things in a different light and notice different things. Usability testing does not have to be a big deal, one new user testing the site is better than none (Krug, 2000). Usability tests should be done throughout the Web design process (Krug, 2000). A site should always be retested; test a site, then make suggested changes and retest. A usability test does not tell you if layout *a* is better than layout *b*, it simply provides you with more information to make a judgment call (Krug, 2000).

Testing should be done with the target audience according to experts. Krug (2000) states how important it is to test Web sites with people who will be using it. If more than one audience will be using the Web site, test people from each of the audiences (Krug, 2000). Nielsen et al. (2001) agree with Krug (2000); if a Web site is tested by people who are not going to use it, the site will not be able to meet users’ needs. A site should be tested by the target audience, so their needs are met. Also, Krug (2000) states that by

testing only five users can uncover 85% of a site's usability problems. He also says there is a serious case of diminishing returns for testing additional users (Krug, 2000).

Krug (2000) points out that when testing Web sites, the only time to use focus groups is during the predevelopment of a Web site. However, Krug (2000) warns to not mistake focus groups as a way to test usability; focus groups will tell what they want to see, not if they can use the site.

Nielsen (1997) agrees focus groups are a poor method to use for usability tests. He believes there is an opportunity for too much human interaction. For example, if there is a dominate member of the group, that person could possibly persuade others' opinions (Nielsen, 1997). A suggestion to eliminate this problem is to have individuals view the Web site individually, so they can draw their own conclusions and recommendations to improve the site (Nielsen, 1997).

Krug (2000) reiterates Nielsen's above point by defining a usability test as "one user at a time is shown something and asked to either figure out what it is, or try to use it to do a typical task" (p. 141). Usability testing should be done early in the developing of the Web site; it is easier to makes changes to the site before a lot of people are using it; because some people will resist change (Krug, 2000).

When testing usability Krug (2000) suggests staying focused on the big problems. After you test a site, fix the big problems first, then retest and begin fixing the little ones (Krug, 2000).

Nielsen (1997, 2001, 2005) reiterates throughout his articles and books that it is best to test usability in the early stages of the development of Web sites. It is easier to

make changes as the site is being created, but after it has been launched, it becomes more of a challenge to fix problems.

Ogallala Initiative Web site Audiences

Agricultural Producers

The majority of the Ogallala Aquifer is rural and one of the main target audiences of the Initiative Web site is agricultural producers. The Ogallala Aquifer region has a high concentration of agricultural producers, including farmers and ranchers. Farming and ranching is a way of life and the Ogallala Aquifer provides producers with a great natural resource - water.

The Internet is filling the gap of agriculture coverage in newspapers (Vogt, 1996). According to the Agriculture Census (2004), half of America's farms have access to the Internet and of those approximately 39% use a computer for their farm business.

The Pew Internet and American Life Project reported that only "52% of rural residents use the Internet" (Bell, Reddy, & Rainie, 2004, p. 2). Part of this could be due to Internet access being a challenge for most rural areas. Dial-up is the most common Internet connection speed; 80% of the rural population has dial-up compared to only 19% having a broadband connection of DSL, wireless, cable, or fiber optic (Bell et al., 2004).

In May 2004, U.S. Secretary of Agriculture Ann M. Veneman announced that 20 rural broadband and telecommunications loans had been approved by President Bush (Campbell, 2004). These loans totaled \$190 million and will advance technology in 10 states. According to Veneman, by 2007 President Bush intends to have every house in America equipped with broadband (Campbell, 2004).

Broadband is just one of the technologies these loans have provided to enhance telecommunications to farmers, rural residents, and businesses (Campbell, 2004). The 2002 Farm Bill allocated broadband to be put into rural communities, of 20,000 people or less (Brandon, 2005). Communities with DSL or cable can get Internet access easier than those communities who do not have cable access (Brandon, 2005). According to Brandon (2005), of rural communities with 1,000 or less people, less than 1% have cable access.

Even so, Internet access is slowly but surely being implemented into these rural communities. Brandon (2005) points out, that recently, in Texas the USDA gave a \$13 million loan to install high-speed wireless Internet into 100 rural communities.

Although efforts are being made to implement the Internet in rural communities, some factors still exist that inhibit agricultural producers from technology and Internet. These factors include low literacy rates, Internet providers are not available, and poor communication infrastructure (Gopinath, 2004). Other factors that need to be taken into consideration when designing a Web site targeted for rural areas: bandwidth and access to technical devices (Gopinath, 2004). Another factor, stated by Hipple (2003) is that agriculture ranked the lowest in use of computer and the Internet.

Communication Professionals

Communication professionals will be one of the key elements to further the dissemination of information about preserving the Ogallala Aquifer. Communication professionals include any form of agricultural communicators or media that reports information about the Ogallala Aquifer; may include television, radio, print, or Internet.

It is becoming more common for news media to utilize the Internet and World Wide Web as a way to obtain information for the news they share with their audiences (Garrison, 2003). It is estimated the United States has 3,600 newspapers online and there is a total of about 4,900 online newspapers worldwide (Garrison, 2003).

According to Garrison (2003) newspaper journalists expressed concerns of information verification, unreliable information, badly sourced information, incredible Web sites, download speed, and finding Web sites were also listed. When journalists search the Web, they are looking for “difficult-to-find” information, background information, and government information (Garrison, 2003).

Garrison’s (2003) study found that journalists did not prefer sites with inaccurate information, outdated links, lack of attribution and useless content. Download speed was not a concern (Garrison, 2003).

Communication professionals also have many audiences they target and reach as well. Experts say media professionals and media institutions develop images of their audiences from two kinds of organizational learning: single-loop and double-loop (Alasuutari, 1999). “Single-loop learning indicates that standards and organizational norms are unchanged, whereas double-loop learning is getting information from an outside source” (Alasuutari, 1999, p. 133). For example, double-loop learning is when journalists get information about their audiences from another company. One form of this would be a television meter panel. Single-loop learning is when an audience is perceived by the journalists (Alasuutari, 1999).

General Public

The general public for this study is going to be the rural population, which is not part of the communication professionals or an agricultural producer, within the Ogallala region. The biggest issue the general public faces with Web site usability is Internet access. Close to 30% of the rural population only has one Internet provider available to them (Bell et al., 2004).

However, the majority of the general public have accessibility to computers during work. Computers have become common in the workplace; but the extent to which people use them depends on age, sex, and education (Hipple, 2003). It has been proven that women are more likely to use a computer and the Internet, than men (Hipple, 2003). Hipple (2003) also reported that workers with higher educations were more apt to access the Internet and use a computer regularly.

Instrument Development

As you will find, literature is weak in the areas of Web site usability instrumentation. Although the Internet has been around for a few years, it has only been until recent that usability of Web sites has been tested. There is a need for an actual instrument that can test agricultural and natural resources Web sites. According to Nielsen (2000), “usability rules the Web,” (p. 9), therefore it is important to make sure Web sites are usable.

Web site usability testing does not have to be conducted by experts or be expensive. Testing can be done cheap and conducted by you (Krug, 2000). Nielsen et al. (2001) suggests that anyone can test usability through a few simple steps. First, determine

the goals of the Web site and decide what you need and want to learn from your population (Nielsen et al., 2001). Next, determine the Web site's target audience and select your population from that group. Nielsen et al. (2001) says to determine important characteristics of the population, such as occupation, Web experience and knowledge, and education.

After selecting your population, personal contact should be made. The test giver should make the population feel comfortable and explain the procedures to them (Nielsen et al., 2001). The population should be tested on an individual basis, as to eliminate persuasion from another member of the population. Finally, Nielsen et al. (2001) says to analyze the data. He warns to not make excuses for design and usability failures, but respect the responses and make changes, then repeat the test. Several, small usability tests should be ran throughout the development of a Web site (Krug, 2000).

Summary

The purpose of this study was to determine the external user preferences of the USDA-ARS Ogallala Initiative Web site and to develop a baseline Web site usability instrument for future agricultural and natural resources Web sites. The uses and gratifications approach best describes this study. It is "how people use media to gratify their needs," (North, 2000). With the main objective of the Ogallala Initiative Web site is to disseminate information, it is pertinent that user's needs be met.

Several factors are predicted to determine user preferences, which include age, gender, and education level, just to name a few. The site also needs to be usable, efficient, satisfactory to its audiences, users need to be able to and want to utilize the site,

and it needs to be reliable and accessible. Although variables have been listed throughout this literature review in which the Initiative Web site will be tested for, keep in mind that usability comes down to personal preference. Usability tests enable Web designers to make a more informative decision on how to create and what works best on their site.

With the Web site targeting different users, it is important to meet several needs in order to preserve the aquifer. Agricultural producers, communication professionals, and the general public are the links to this dissemination of information. The survey instrument developed by the researcher is the tool to test the usability of the Ogallala Initiative Web site. With a usable site, the target audience will then be able to disseminate information and thus the Initiative Web site will begin accomplishing its goal.

CHAPTER III

METHODOLOGY

The purpose of this study was to determine the external user preferences of the USDA-ARS Ogallala Initiative Web site and to develop a baseline Web site usability instrument for future agricultural and natural resources Web sites. The following were objectives for this research:

- 1) Evaluate the overall usability of the Ogallala Initiative Web site by the identified consumers.
- 2) Determine if there is a difference in overall usability satisfaction among identified consumers of the Ogallala Initiative Web site.
- 3) Develop a usability survey instrument for agricultural and natural resources Web sites.

Research Design

A survey research design was used for this study. Fraeknel and Waller (2006) state that survey research is simply to determine the opinions about a particular subject from a specific group of people. This study was used to determine the external user preferences of the Ogallala Initiative Web site and factors that affect the usability of this site.

Population and Sample

Three audiences were surveyed for this study: agricultural producers, communication professionals, and the general public. A stratified purposeful sample ($N = 116$) was taken because Krug (2000) stresses the importance of testing Web sites with actual users. If a Web site is tested by people who are not potential users, the site will not be able to meet users' needs. A site should be tested by the target audience, so their needs are met (Krug, 2000).

A stratified purposeful sample of agricultural producers from the Ogallala region in the states of Kansas and Texas were surveyed. The researcher contacted 10 county extension agents in Kansas by phone. They were then sent a personalized e-mail with the survey link and brief instructions. Kansas county agents were asked to forward the e-mail on to three producers ($n = 40$) within their respected counties who use the Internet as an information source. The researcher also contacted nine county extension agents in Texas by phone. They were then sent a personalized e-mail with the survey link and brief instructions. Texas county agents also were asked to forward the e-mail on to three producers ($n = 36$) within their respected counties who use the Internet as an information source.

Communication professionals, including television stations, radio, and agricultural publications from the Ogallala region in the states of Kansas and Texas were surveyed. A list of communication professionals were obtained from the National Association of Farm Broadcasters Web site (nafb.com). NAFB lists 12 members in the Kansas and Texas Ogallala region. Besides farm broadcasters, also included on the NAFB list is a cooperative, livestock association, and agricultural based company.

Because there was only one television station on the NAFB Web site listed for Kansas, three additional television news stations were contacted. The researcher contacted them by phone to see if they would participate in the study. Each communication professional was given a three digit number to enter on the survey to code responses. They were then sent a personalized e-mail with the survey link and brief instructions.

A stratified purposeful sample of the general public was obtained in the Ogallala region in the states of Kansas and Texas. The researcher contacted, by phone, five chambers of commerce in Kansas: Dodge City, Garden City, Liberal, Colby, and Wichita. In Texas, two chambers of commerce were contacted: Amarillo and Lubbock. The contacts were then sent a personalized e-mail with the survey link and brief instructions. These chamber contacts were asked to fill out the survey and have three other people within the chamber or their city ($n = 28$), who use the Internet as an information tool, to also fill out the survey.

Note that the entire population was personally contacted by phone and sent a personalized e-mail. Nielsen et al. (2001) say that after selecting your population, personal contact should be made. Audiences were purposely chosen, because experts say that testing should be done with the target audience. Krug (2000) states how important it is to test Web sites with people who will be using it. If more than one audience will be using the Web site, test people from each of the audiences (Krug, 2000). Nielsen et al. (2001) agrees with Krug; if a Web site is tested by people who are not going to use it, the site will not be able to meet users' needs. A site should be tested by the target audience, so their needs are met.

A total of 49 surveys were received. The response rate was broken down into audience categories: county extension agents, agricultural producers, communication professionals, and other, which includes chambers of commerce (general public) and agricultural industry. For extension, a response rate of 63.1% was achieved, with 12 of the 19 extension agents completing a survey. Because only 12 extension agents replied, the researcher assumed that the seven who did not respond also did not send the survey on to agricultural producers. Therefore the initial number of agricultural producers who should have received the survey was 36. Agricultural producers ended up with a response rate of 58.3%, because 21 completed a survey. The communication professionals sample did not have to forward the survey on to anyone. An initial sample of 12 was sent; the researcher received seven (58.3%) responses. The general public and chambers of commerce, which were categorized as 'other,' had the same reciprocal effect as the county extension agents to the agricultural producers. The researcher initially sent the survey to seven chambers; four (57.1%) responded. Therefore, 12 surveys should have been sent on by chamber contacts. Nine of those 12 responded for a response rate of 75%.

Instrumentation

For this study, the researcher developed a survey instrument. A survey instrument was used because it is a way to determine characteristics or needs of the population (Fraeknel & Waller, 2006). "Usability is a reality check," (Nielsen, 2005, p. 2). A Web site usability test, according to Nielsen (2005), simply is to determine what humans can or can't work on a site. Through a usability test, conclusions and recommendations can be formed for changes and alternations to a Web site (Nielsen, 2005). Like Nielsen, Krug

(2000) states that in order to have a great site, it must be tested. Krug (2000) says the only way to really determine if a site works is to test it. “Testing reminds you that not everyone thinks the way you do, knows what you know, or uses the Web the way you do,” (Krug, 2000, p. 141).

Categories, such as general appearance, navigation, efficiency, and content, were addressed on the instrument. Within these categories topics, such as layout, color scheme, links, download speed, researcher contact information, and graphics were included on the instrument. Questions were answered using a 4-point Likert scale of 1 to 4, 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree. Additional space was provided for participants to explain if the site met their professional needs and any additional recommendations or comments they wanted to make.

Other questions collected demographics data on gender, state in which participants reside, zip code, occupation, educational level, Internet connection or bandwidth speed, and time spent using the Internet per week for business and personal uses.

Questions developed for the survey instrument were based on literature from Nielsen (1997, 2001, 2005) and Krug (2000). Nielsen (2000) believes site design is the most important when dealing with usability. However, remember that content is the main reason users go to a Web site, it is not to see the design or layout so keep design to a minimum (Nielsen, 2000). This also allows for a wider range of computers to handle a Web site, because if a site has too many graphics or photographs to download each time a user tries to access it, some computers may not be equipped with the software or high-

speed Internet to handle those graphics. Also, an efficient Web site should meet the needs of its audience in a timely manner.

“Navigation is also a necessary evil,” Nielsen (2000, p. 18) says, because Web sites must be easy to navigate, but he warns designers should not lose sight of the information the Web site offers. Information provided on the Web site should be clear according to Nielsen. Most of the time Web sites do not answer users questions directly (“Nielsen: It’s Time for a Redesign,” 2004). If information is hard to understand and find, users will leave the site. The purpose of the Ogallala Initiative Web site is to disseminate information about preserving the aquifer. Therefore, graphics are not the main point of this Web site, content is (Nielsen, 2000).

A Web site also needs to satisfy its users. To Krug (2000) a Web page should be “self-evident, obvious, and self-explanatory,” (p. 11). For example, a user should not spend even a millisecond of thought wondering if something on a site is clickable (Krug, 2000).

Parlinska and Parlinski (2003) stress the importance of having a reliable Web site. Millions of people each day depend on the Web for information, graphics, audio, and communication (Parlinska & Parlinski, 2003). According to Parlinska and Parlinski (2003), if a Web site is professionally designed, then it tells its users it is committed to providing them with quality information and service. Parlinska and Parlinski (2003) say contact information for the Web site should be available. For some users, if they can contact an actual person, it is a comfort to them and can make a Web site more reliable.

The researcher pilot tested the instrument with a select group of graduate students at Texas Tech University in the department of agricultural education and

communications. The pilot test helped determine if the questions were easy to understand, and also tested for reliability and validity of the instrument. The reliability of the instrument was surveyed after data was collected with Cronbach's Alpha. The Cronbach's Alpha yielded a 0.68 for the pilot test. The posttest yielded a reliability of 0.923 and deemed acceptable for this study. After the pilot test was conducted, a few grammatical changes were made. There was such a great increase in pilot and post reliability, because of changes that were made to the Web site during this time period, which was out of the researcher's control. Changes included more content being added, layout was altered, and links were added.

Cronbach's Alpha was also conducted for each usability section of the instrument: general appearance yielded a 0.861, navigation yielded a 0.935, efficiency yielded a 0.896, and content yielded a 0.849.

The survey instrument was housed on zoomerang.com. Zoomerang is an online survey software company that allows the creation and distribution of surveys. Zoomerang tallies results from the survey.

Data Collection

All participants were contacted by phone on February 7, or February 8, 2006. The purpose of the phone call was to ask the participants if they would be willing to participate and make them aware that they would be receiving the survey later in the week. They were also made aware that if they had questions or problems at any time that they could contact the researcher. Participants received an e-mail Friday, February 10, 2006, with instructions and the link to the survey. From the link, participants could access

the Initiative Web site, and then answer the questions. Participants were informed that this was a confidential survey and their name would not be released to anyone. They also were informed of their right to withdraw at any time from the study without any repercussions from Texas Tech University or the department of agricultural education and communications.

An e-mail reminder was sent to those who had not completed the survey on February 15, 2006. The researcher sent a second e-mail reminder the morning of February 22, 2006. All participants who were asked to forward the survey on to others, where asked in the e-mail reminders to remind their recipients. Data collection ended February 22, 2006. The data was collected in a short time period due to a time restriction on an Initiative project report.

According to Fraenkel and Wallen (2006), major internal validity threats for surveys include mortality, location, instrumentation, and instrument decay. Mortality was not a threat, because the data collection does not take place over an extended period of time. There was a location threat, because the researcher has no control of the physical location of the computer the participants used to answer the survey. The researcher also did not know the connection speed or bandwidth of the participants' connection to the Internet.

Instrumentation was minimized as a threat because a pilot test was conducted. The pilot test helped determine if the questions were easy to understand, and also tested for reliability and validity of the instrument. Instrument decay was not considered a valid threat, because participants could take the survey at their own pace.

Another possible threat to this study was subject attitude; however the sample was purposely selected to decrease this threat.

External validity was not a problem, because generalizations were not made to other populations, since a stratified purposeful sample was taken. Table 3.1 gives a more detailed look at the internal validity threats and how each was controlled.

Table 3.1

Internal validity threats and how each was controlled.

Internal Validity	Control
<i>Subject Characteristics</i>	This was not a threat because subjects were not tested against each other. There was no right or wrong answer to the questions on the instrument.
<i>Mortality</i>	Because this study does not take place over an extended period of time, this was not a threat.
<i>Location</i>	The researcher has no control over where or under what connection speed subjects take the survey, so researcher designed the instrument as if all participants had a slow Internet connection speed to minimize this threat.
<i>Instrumentation</i>	This was not a threat, because a pilot test was conducted and data was analyzed using SPSS.
<i>Testing</i>	This is not a threat because this design does not use pre-test.
<i>History</i>	A small time frame was given for return of the surveys, so hopefully nothing tragic happened during that time frame.
<i>Maturation</i>	All three audiences were adults, so maturation is not a threat.
<i>Attitude of Subjects</i>	This was not a threat, because the sample will be purposely selected.
<i>Regression</i>	This was not a threat, because there was not a retest and the instrument did not have right or wrong answers.
<i>Implementation</i>	This was not a threat, because the instrument was administered through the Internet.

Data Analysis

Data was analyzed using SPSS[®] for Windows. Frequencies, percentages, means of central tendencies and variances were reported. Demographics are outlined and reported in Chapter IV. Correlation analysis was conducted to examine for potential associations, but no significant findings were reported. Analysis of variance (ANOVA) also was used to determine if user preferences differed across user groups. An alpha level of .05 was used for all statistical tests.

CHAPTER IV

RESULTS AND FINDINGS

The purpose of this study was to determine the external user preferences of the USDA-ARS Ogallala Initiative Web site. The following were objectives for this research:

- 1) Evaluate the overall usability of the Ogallala Initiative Web site by identified consumers.
- 2) Determine if there is a difference in overall usability satisfaction among identified consumers of the Ogallala Initiative Web site.
- 3) Develop a usability survey instrument for agricultural and natural resources Web sites.

The findings for each objective of this study are described in this chapter. The results are explained with the information and data found from the research conducted.

Descriptive Analysis Results

Descriptive data were collected and included on the following demographic variables: gender, state and zip code in which participants reside, occupation, educational level, Internet connection bandwidth, and time spent on the Internet each week for personal and business purposes.

Of the 49 participants, 33 (67.3%) were male and 16 (32.7%) were female. There were 27 (55.1%) from Texas and 22 (44.9%) from Kansas.

Participants also were asked to list their occupation from choices provided: farming, ranching, extension, communication professionals, and other. Participants were

instructed to select all occupations that applied. The ‘other’ category had the highest response of 19 (39%). Listed results for ‘other’ included eight (42.1%) professional agricultural industry, six (31.6%) chamber of commerce affiliation, three (15.8%) did not specify, one (5%) education, and one (5%) non profit. Farming and extension both had 12 (24.5%) responses, ranching had nine (18.4%), and communication professionals made up six (12.2%). There were five responses of a combination of farming/ranching. Other combinations of occupations included two farming/extension, one ranching/communication professionals, and one farming/education. *Figure 4.1* gives a more detailed look at the gender and state of residence for each occupation category.

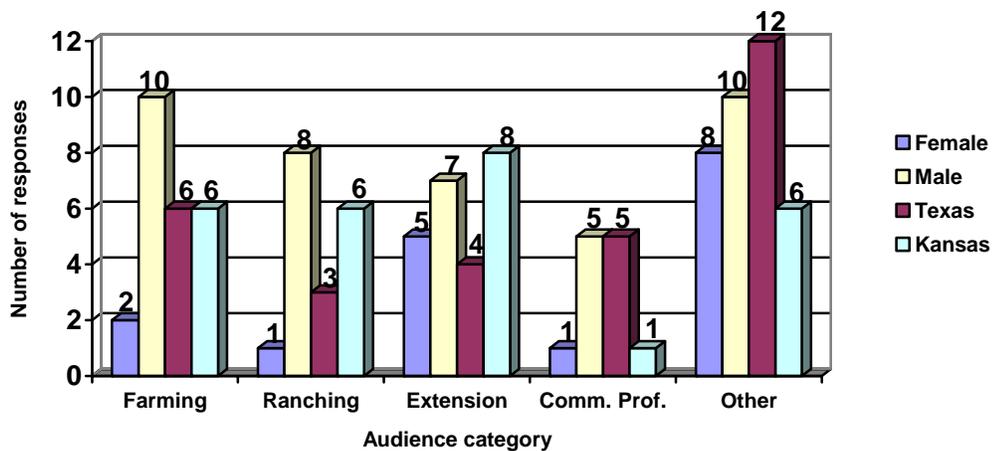


Figure 4.1. Responses for gender and state of residence for each occupation category ($N = 49$).

The educational level of the participants varied from a high school diploma or GED ($n = 4$, 8.1%) to a master’s degree ($n = 12$, 24.5%), with the majority having a bachelor’s ($n = 27$, 55.1%), four (8.2%) had some college education, and only two (4.1%) had a technical degree. *Figure 4.2* displays the educational level of the participants within each audience category.

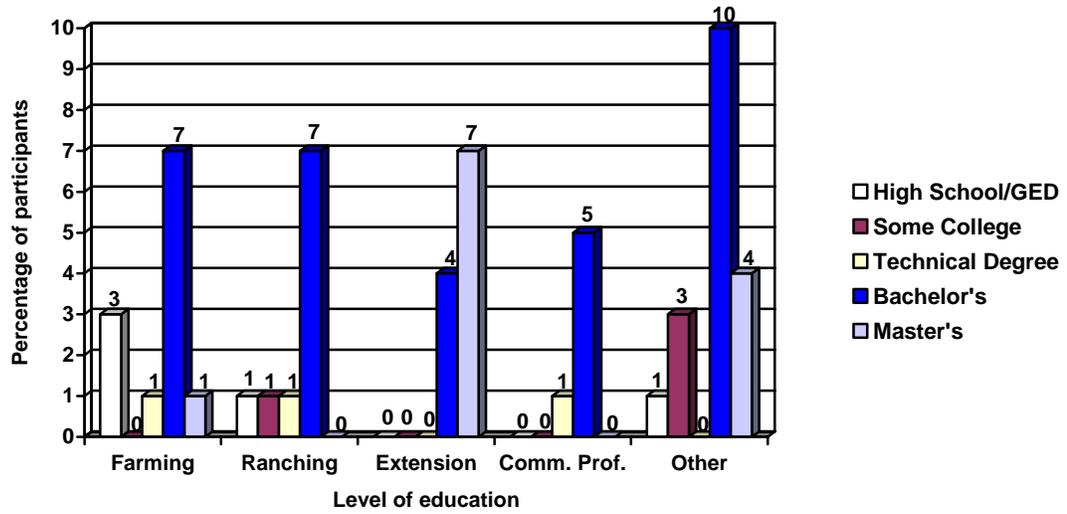


Figure 4.2. Education level of participants (N = 49).

A majority ($n = 45$, 91.8%) of the participants had a high-speed Internet connection whether it was DSL, broadband, satellite, wireless, or cable. Only four (8.2%) are using a dial-up Internet connection. Figure 4.3 displays participants' Internet connection speed.

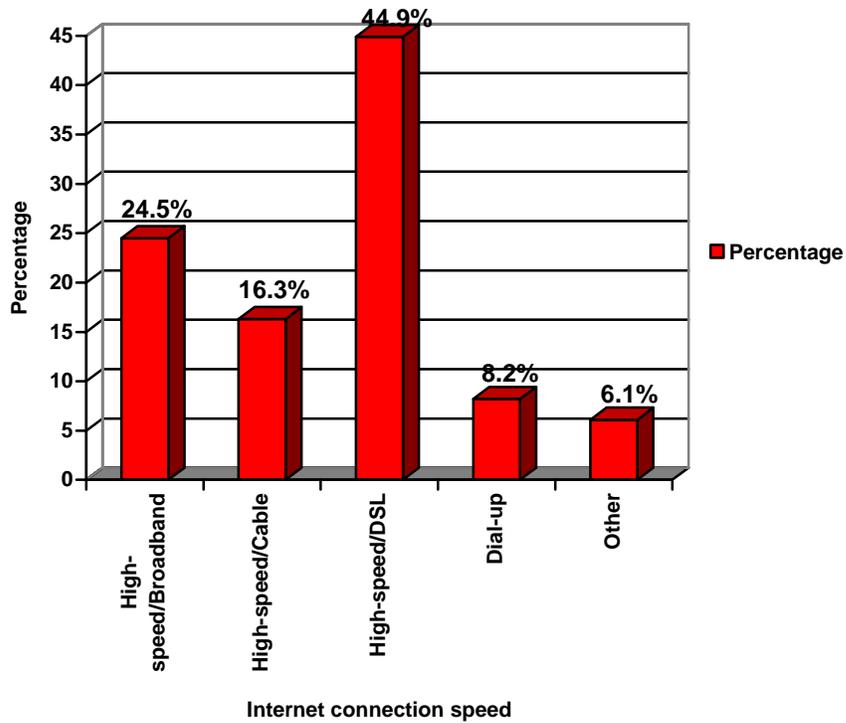


Figure 4.3. Participants' Internet connection speed ($N = 49$).

The number of hours per week spent on the Internet for business purposes reported by participants ranged from less than one hour to more than 10 hours. Twenty (40.8%) participants spend one to five hours, fourteen (28.6%) spend more than 10 hours on the Internet for business, eleven (22.4%) spend only six to 10 hours, and only three (6.1%) participants spend less than one hour on the Internet for business purposes. One participant (2%) did not respond to this question.

Numbers changed for time spent per week on the Internet for personal use. Twenty (40.8%) participants spend less than one hour and twenty (40.8%) participants spend one to five hours surfing the Internet for personal use. Only four (8.2%) spend more than 10 hours and five (10.2%) spend six to 10 hours on the Internet. These results indicated that more than 50% of producers spend only one to five hours a week on the

Internet for both personal and business purposes. The amount of time spent on the Internet for business and personal uses a week is further outlined in *Figure 4.4* and *Figure 4.5*.

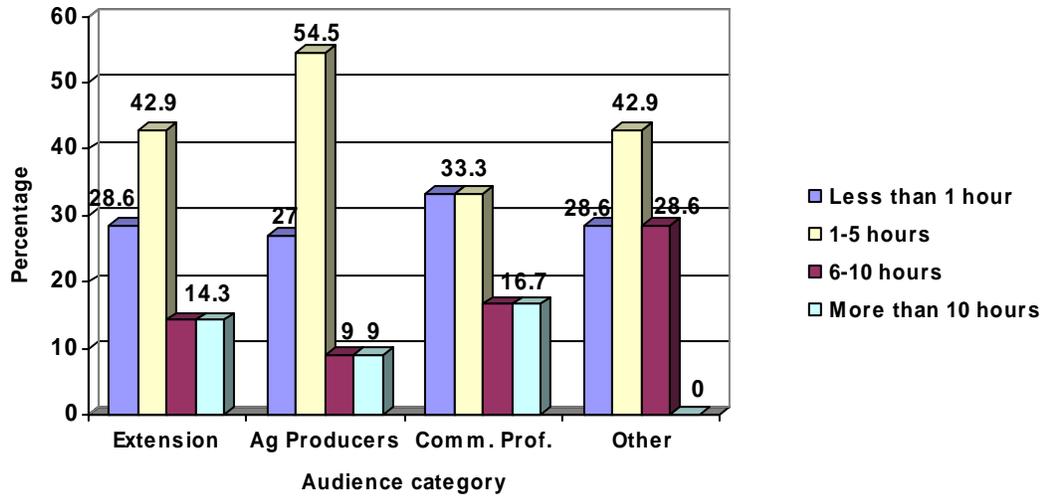


Figure 4.4. Business time spent on the Internet per week ($N = 49$).

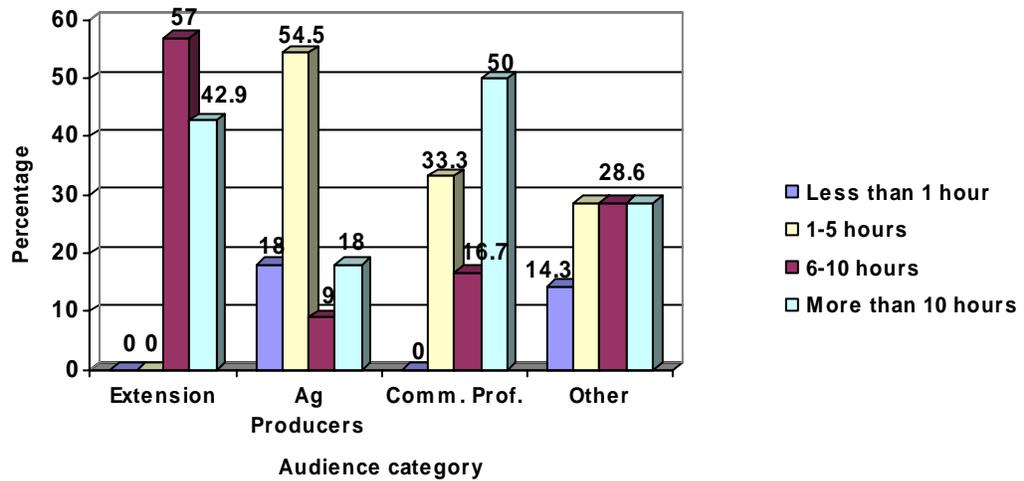


Figure 4.5. Personal time spent on the Internet per week ($N = 49$).

Participants also were asked if they had any Web design experience. This was answered on a yes or no basis only. Results indicated that nine (18.4%) did have Web design experience, and 40 (81.6%) did not have Web design experience. Occupations that had Web design experience included three communication professionals, two extension, two agricultural industry professionals, one farming/education combination, and one chamber of commerce.

Usability questions relating to general appearance, navigation, efficiency, and content of the Web site were answered on a 4-point Likert scale of 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree. The first section pertained to the general appearance of the Ogallala Initiative Web site. Thirty (61.2%) participants reported they agree the home page was aesthetically pleasing. Ten (20.4%) reported they strongly agree the home page was aesthetically pleasing, while three (6.1%) reported they disagree. No one responded with strongly disagree and six (12.2%) did not respond.

Statement two was 'the home page layout invites you to consume information placed on the site.' Thirty-one (63.3%) reported they agree, eight (16.3%) strongly agree, four (8.2%) disagree, and six (12.2%) did not respond.

For statement three, 'the home page is clearly designed,' 26 (53.1%) agreed. Nine (18.4%) strongly agreed, six (12.2%) disagreed, and eight (16.3%) did not respond.

The final statement in the home page category was 'other pages of the site are aesthetically pleasing and clearly designed.' Thirty-three (67.3%) responded with agree, five (10.2%) responded strongly agree, five (10.2%) responded disagree, and six (12.2%) did not respond to this statement. Table 4.1 gives a more detailed look at the responses for general appearance of the Web site.

Table 4.1

Responses to General Appearance Statements About the Ogallala Initiative Web Site.

Statement	<i>n</i>	<u>Strongly Disagree</u>		<u>Disagree</u>		<u>Agree</u>		<u>Strongly Agree</u>	
		<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>
The home page is aesthetically pleasing.	43	0	0.0	3	7.0	30	69.8	10	23.3
The home page layout invites you to consumer information placed on the site.	43	0	0.0	4	9.3	31	72.1	8	18.6
The home page is clearly designed.	41	0	0.0	6	14.6	26	63.4	9	22.0
Other pages of the site are aesthetically pleasing and clearly designed.	43	0	0.0	5	11.6	33	76.7	5	11.6

The extension ($m = 3.24$) and other audiences ($m = 3.22$) were both above the overall mean ($M = 3.08$), while producers ($m = 3.03$) and communications professionals ($m = 2.93$) were below. However, there was not a significant difference. Table 4.2 gives a more detailed look at the means and standard deviations for each audience category for general appearance responses.

Table 4.2

*General Appearance Statements' Means and Standard Deviations by Respondent**Categories.*

Statement	<u>Extension</u>		<u>Producers</u>		<u>Comm.</u> <u>Prof.</u>		<u>Other</u>		<u>Overall</u>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
The home page is aesthetically pleasing.	3.44	.73	3.18	.64	2.86	.38	3.15	.38	3.16	.53
The home page layout invites you to consume information placed on the site.	3.22	.67	2.90	.62	3.00	.00	3.31	.48	3.09	.53
The home page is clearly designed.	3.22	.67	3.14	.55	3.00	.58	3.25	.45	3.07	.61
Other pages of the site are aesthetically pleasing and clearly designed.	3.11	.60	2.90	.62	2.86	.38	3.15	.38	3.00	.49
<i>M</i>	3.24		3.03		2.93		3.22		3.08	

Note. Responses are based on 4-point Likert scale of 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree ($N = 43$).

The second category of Likert response statements dealt with navigation of the Web site. The first statement was 'I can immediately tell where I am on the Web site;' of responses reported, 29 (59.2%) said they agree, nine (18.4%) strongly agree, four (8.2%) disagree, one (2%) strongly disagree, and six (12.2%) did not respond.

The statement 'I am able to move from page to page without getting lost,' reported that 32 (65.3%) agree, eight (16.3%) strongly agree, and three (6.1%) disagree. Six (12.2%) did not respond.

Statement three asked if the links were clearly recognized and 24 (49%) agreed. Other responses included 14 (28.6%) strongly agreed, five (10.2%) disagreed, and six (12.2%) did not respond.

Statement four, 'I am aware of where I am on the Web site at all times,' resulted in 33 (67.3%) agreed, five (10.2%) strongly agreed, four (8.2%) disagreed, one (2%) strongly disagreed, and six (12.2%) did not respond.

More than half, 51% ($n = 25$) said they agreed with the statement 'it is easy to identify downloadable documents.' Other responses included 12 (24.5%) strongly agree, five (10.2%) disagree, one (2%) strongly disagree, and six (12.2%) did not respond.

Thirty (61.2%) participants said they agreed with statement six, 'the Web site menu assists navigation.' Seven (14.3%) said they strongly agreed, five (10.2%) disagreed, one (2%) strongly disagreed, and six (12.2%) did not respond.

The seventh statement asked if the Web pages were clearly designed and 27 (55.1%) said they agreed. Eleven (22.4%) responded with strongly agree, five (10.2%) disagree, and six (12.2%) did not respond.

Close to 60% ($n = 29$, 59.2%) of the participants said they agreed that the information is clearly organized, eleven (22.4%) strongly agreed, three (6.1%) disagreed, and six (12.2%) did not respond.

The final statement dealing with navigation was 'the overall Web site is easy to navigate.' Twenty-four (49%) responded with agree, 14 (28.6%) strongly agree, five

(10.2%) disagree, and six (12.2%) did not respond to statement nine. Table 4.3 gives a more detailed look at the responses for navigation of the Web site.

Table 4.3

Responses to Navigation Statements About the Ogallala Initiative Web Site.

Statement	<i>n</i>	<u>Strongly Disagree</u>		<u>Disagree</u>		<u>Agree</u>		<u>Strongly Agree</u>	
		<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>
I can immediately tell where I am on the Web site.	43	1	2.3	4	9.3	29	67.4	9	20.9
I am able to move from page to page without getting lost.	43	0	0.0	3	7.0	32	74.4	8	18.6
The links are clearly recognized.	43	0	0.0	5	11.6	24	55.8	14	32.6
I am aware of where I am on the Web site at all times.	43	1	2.3	4	9.3	33	76.7	5	11.5
It is easy to identify downloadable documents.	43	1	2.3	5	11.6	25	58.1	12	27.9
The Web site menu assists navigation.	43	1	2.3	5	11.6	30	69.8	7	16.3
The Web pages are clearly organized.	43	0	0.0	5	11.6	27	62.8	11	25.6
Information on the pages are clearly organized.	43	0	0.0	3	7.0	29	67.4	11	25.6
The overall Web site is easy to navigate.	43	0	0.0	5	11.6	24	55.8	14	32.6

Both extension ($m = 3.36$) and other audiences ($m = 3.16$) were above the overall mean ($M = 3.12$). Producers ($m = 2.93$) and communication professionals ($m = 3.03$) were below. However, there was not a significant difference. Table 4.4 gives a more

detailed look at the means and standard deviations for each audience category for navigation responses.

Table 4.4

Navigation Statements' Means and Standard Deviations by Respondent Categories.

Statement	<u>Extension</u>		<u>Producers</u>		<u>Comm.</u> <u>Prof.</u>		<u>Other</u>		<u>Overall</u>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
I can immediately tell where I am on the Web site.	3.22	.97	2.98	.57	3.00	.58	3.00	.41	3.07	.63
I am able to move from page to page without getting lost.	3.22	.67	2.98	.46	2.86	.38	3.23	.44	3.12	.50
The links are clearly recognized.	3.56	.73	2.95	.69	3.14	.69	3.31	.48	3.21	.64
I am aware of where I am on the Web site at all times.	3.11	.93	2.83	.53	2.86	.38	3.08	.28	2.98	.56
It is easy to identify downloadable documents.	3.44	.73	2.95	.78	2.86	.90	3.23	.44	3.12	.70
The Web site menu assists navigation.	3.22	.97	2.73	.59	3.14	.38	3.08	.28	3.00	.62
The Web pages are clearly organized.	3.44	.73	2.88	.71	3.14	.69	3.15	.38	3.14	.60
Information on the pages are clearly organized.	3.44	.73	3.05	.57	3.00	.58	3.23	.44	3.19	.55
The overall Web site is easy to navigate.	3.56	.73	3.00	.74	3.29	.49	3.15	.55	3.21	.64
<i>M</i>	3.36		2.93		3.03		3.16		3.12	

Note. Responses are based on 4-point Likert scale of 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree ($N = 43$).

The third category in the Likert-type questions dealt with efficiency of the Web site. Twenty (40.8%) answered they agreed that Web pages load quickly in their browser; 16 (32.7%) strongly agreed, six (12.2%) disagreed, one (2%) strongly disagreed, and six (12.2%) did not respond.

Statement two was 'the photos download quickly,' and 22 (44.9%) agreed, 14 (28.6%) strongly agreed, five (10.2%) disagreed, two (4.1%) strongly disagreed, and six (12.2%) did not respond.

When asked if Adobe PDF files downloaded quickly, 25 (51%) responded with agree, nine (18.4%) strongly agree, eight (16.3%) disagree, one (2%) strongly disagree, and six (12.2%) did not respond. Table 4.5 gives a more detailed look at the responses for efficiency of the Web site.

Table 4.5

Responses to Efficiency Statements About the Ogallala Initiative Web Site.

Statement	<i>n</i>	<u>Strongly Disagree</u>		<u>Disagree</u>		<u>Agree</u>		<u>Strongly Agree</u>	
		<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>
The Web pages load quickly in my browser.	43	1	2.3	6	14.0	20	46.5	16	37.2
The photos download quickly.	43	2	4.7	5	11.6	22	51.2	14	32.6
The Adobe PDF files download quickly.	43	1	2.3	8	18.6	25	58.1	9	20.9

Both extension ($m = 3.56$) and the other ($m = 3.31$) audiences were above the overall mean ($M = 3.10$), while producers ($m = 2.70$) and communication professionals ($m = 2.86$) were below. However, there was not a significant difference. Table 4.6 gives a more detailed look at the means and standard deviations for each audience category for efficiency responses.

Table 4.6

Efficiency Statements' Means and Standard Deviations by Respondent Categories.

Statement	<u>Extension</u>		<u>Producers</u>		<u>Comm.</u> <u>Prof.</u>		<u>Other</u>		<u>Overall</u>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
The Web pages load quickly in my browser.	3.56	.73	2.78	.77	3.00	.58	3.46	.52	3.19	.76
The photos download quickly.	3.67	.50	2.60	.87	3.00	.58	3.31	.48	3.12	.79
The Adobe PDF files download quickly.	3.44	.73	2.73	.66	2.57	.79	3.15	.38	2.98	.71
<i>M</i>	3.56		2.70		2.86		3.31		3.10	

Note. Responses are based on 4-point Likert scale of 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree ($N = 43$).

The fourth category answered with Likert-type responses pertained to the content on the Ogallala Initiative Web site. The first statement in this category was 'the site offers quality information,' and 24 (49%) agreed. Fourteen (28.6%) responded with strongly agree, five (10.2%) disagree and six (12.2%) did not respond.

Twenty-three (46.9%) responded that they agreed the site offers an adequate amount of information, while eight (16.3%) strongly agreed, 11 (22.4%) disagreed, one (2%) strongly disagreed, and six (12.2%) did not respond.

Twenty-five (51%) responded that they agreed with the statement ‘information on the site is easy to understand,’ 14 (28.6%) strongly agreed, three (6.1%) disagreed, one (2%) strongly disagreed, and six (12.2%) did not respond.

Statement four asked if the information was current and up-to-date; 21 (42.9%) agreed, 14 (28.6%) strongly agreed, seven (14.3%) disagreed, one (2%) strongly disagreed, and six (12.2%) did not respond.

The final statement in the content category was ‘contact information is provided.’ Nineteen (38.8%) agreed, 10 (20.4%) strongly disagreed, seven (14.3%) strongly agreed, six (12.2%) disagreed, and seven (14.3%) did not respond. Table 4.7 gives a more detailed look at the responses for content of the Web site.

Table 4.7

Responses to Content Statements About the Ogallala Initiative Web Site.

Statement	<i>n</i>	<u>Strongly Disagree</u>		<u>Disagree</u>		<u>Agree</u>		<u>Strongly Agree</u>	
		<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>	<i>f</i>	<i>P</i>
The site offers quality information.	43	0	0.0	5	11.6	24	55.8	14	32.6
The site offers an adequate amount of information.	43	1	2.3	11	25.6	23	53.5	8	18.6
The information is easy to understand.	43	1	2.3	3	7.0	25	58.1	14	32.6
The information is current and up-to-date.	43	1	2.3	7	16.3	21	48.8	14	32.6
Contact information is provided.	42	10	23.8	6	14.3	19	45.2	7	16.7

Both extension ($m = 3.18$) and the other ($m = 3.14$) audiences were above the overall mean ($M = 2.99$), while producers ($m = 2.89$) and communication professionals ($m = 2.66$) were below. However, there was not a significant difference. Table 4.8 gives a more detailed look at the means and standard deviations for each audience category for content responses.

Table 4.8

Content Statements' Means and Standard Deviations by Respondent Categories.

Statement	<u>Extension</u>		<u>Producers</u>		<u>Comm.</u> <u>Prof.</u>		<u>Other</u>		<u>Overall</u>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
The site offers quality information.	3.56	.73	3.10	.72	2.86	.38	3.23	.60	3.21	.64
The site offers an adequate amount of information.	3.11	.78	2.60	.96	2.86	.38	3.08	.49	2.88	.73
The information is easy to understand.	3.33	1.0	3.25	.67	2.86	.69	3.15	.38	3.21	.67
The information is current and up-to-date.	3.33	1.0	3.18	.92	2.86	.69	3.08	.49	3.12	.76
Contact information is provided.	2.56	1.33	2.32	1.16	1.86	.90	3.15	.38	2.55	1.04
<i>M</i>	3.18		2.89		2.66		3.14		2.99	

Note. Responses are based on 4-point Likert scale of 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree ($N = 43$).

Participants also were asked to rate their overall satisfaction with the Ogallala Initiative Web site on a 4-point Likert scale of very satisfied, satisfied, somewhat satisfied, or not at all satisfied. Responses were as followed: 19 (38.8%) were satisfied, 12 (24.5%) were very satisfied, 11 (22.4%) were somewhat satisfied, one (2%) was not

satisfied at all, and six (12.2%) did not respond. *Figure 4.6* displays participants' satisfaction of the Web site.

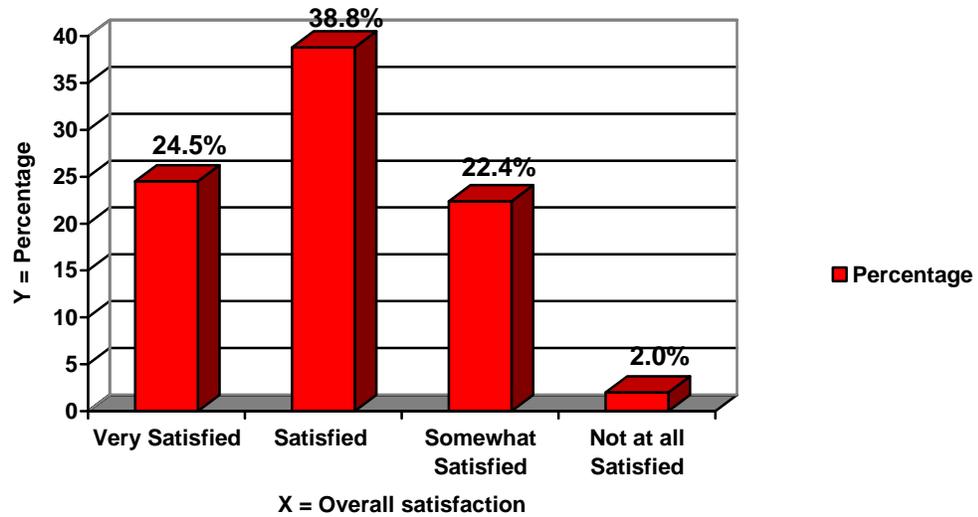


Figure 4.6. Participants' overall satisfaction of the Ogallala Initiative Web site.

Participants were asked if the site met their professional needs. These responses were answered on a yes or no basis only. Thirty-nine (71.4%) responded yes, five (10.2%) responded no, and nine (18.4%) did not respond. They were then asked to explain why it did or did not meet their needs. (see Appendix A for complete list of responses.)

Lastly, participants were asked to list any additional comments or recommendations they had for the Ogallala Initiative Web site. Table 4.9 describes in detail the responses given.

Table 4.9

Responses given for additional comments or recommendations for the Ogallala

Initiative Web site.

Additional comments or recommendations
Just remember you are dealing with producers who have a wide range of computer knowledge, from computer geek to ‘where is the on button at?’. Which I fit somewhere in the middle.
I assume this is a work in progress and not finished yet.
Some of the links were not found when I selected them, such as contact, resources, etc.
Too much information on the homepage.
Is this site for farmers or researchers? Some of the files could not be opened or were not found.
Have you thought about some audio too? For those of us in farm radio it would be good to have. Of course, it needs to be user friendly, and the only thing worst than no audio is audio that isn't posted for easy use by the media.
It seems to be a little cluttered, the information is great but there seems to be too much of it coming at you at once!
"circle" is misspelled on several of the photo captions
Keep the articles and information coming.
I have never opened the site - survey is worthless for me and you.

Findings Related to Objective One

Objective one sought to evaluate the overall usability of the Ogallala Initiative Web site by the identified consumers: agricultural producers, communication professionals, and the general public within the Ogallala region. These audiences were purposely chosen, because experts say that testing should be done with the target audience. Krug (2000) states how important it is to test Web sites with people who will be using it. If more than one audience will be using the Web site, test people from each of the audiences (Krug, 2000). Nielsen et al. (2001) agrees with Krug; if a Web site is tested by people who are not going to use it, the site will not be able to meet users’ needs. A site should be tested by the target audience, so their needs are met.

According to the descriptive analysis and qualitative analysis, the Ogallala Initiative Web site is usable by the targeted audience. Participants rated their overall satisfaction with the Ogallala Initiative Web site on a 4-point Likert scale of very satisfied, satisfied, somewhat satisfied, or not at all satisfied. Responses were as follows: 19 (38.8%) were satisfied, 12 (24.5%) were very satisfied, 11 (22.4%) were somewhat satisfied, one (2%) was not satisfied at all, and six (12.2%) did not respond. *Figure 4.7* displays participants' satisfaction of the Web site.

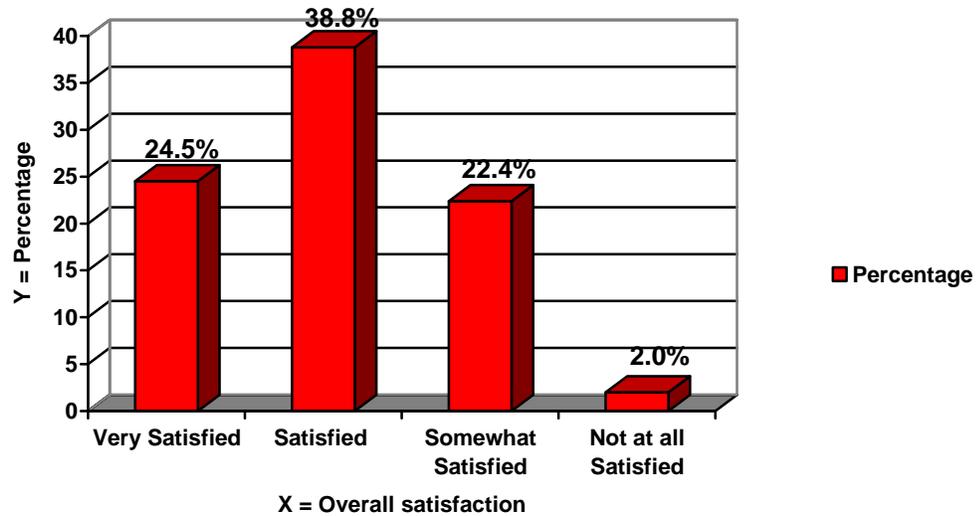


Figure 4.7. Participants' overall satisfaction of the Ogallala Initiative Web site.

Results were similar when participants were asked to respond on a yes or no basis only, if the site met their professional needs. The responses were as follows: 39 (71.4%) responded yes, five (10.2%) responded no, and nine (18.4%) did not respond. They were then asked to explain why it did or did not meet their needs. *Figure 4.8* displays responses of the Web site meeting their professional needs.

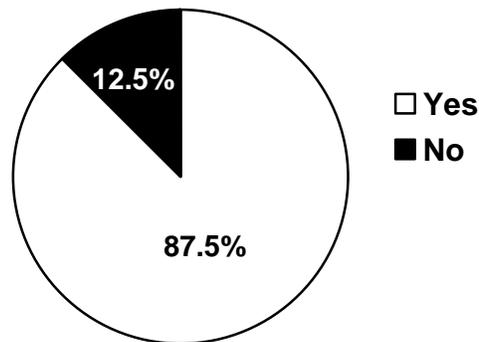


Figure 4.8. Participants’ responses about the Ogallala Initiative Web site meeting their professional needs ($N = 40$).

Other findings that should be noted for objective one include results relating to the site offering an adequate amount of information and contact information being provided; both of these had low means. The statement ‘the Web site offers an adequate amount of information’ had a mean of 2.88 and responses were as follows: 23 (46.9%) agree, 11 (22.4%) disagree, eight (16.3%) strongly agree, one (2%) strongly disagree, and six (12.2%) did not respond. The statement “contact information is provided” had a mean of 2.55 and responses were as follows: 19 (38.8%) agree, 10 (20.4%) strongly disagree, seven (14.3%) strongly agree, six (12.2%) disagree, and seven (14.3%) did not respond. Refer back to content responses in Tables 4.7 and 4.8.

Findings Related to Objective Two

Objective two sought to determine if there is a difference in overall usability satisfaction among identified consumers of the Ogallala Initiative Web site. The Levene’s test showed the audiences to be homogenous. Table 4.10 reports Levene’s test for homogeneity of variances.

Table 4.10

Levene's test for homogeneity of variances.

F	<i>df1</i>	<i>df2</i>	Sig
.795	4	38	.536

Therefore, an ANOVA was conducted. There were no significant findings. An alpha level of .05 was used for all statistical tests. Table 4.11 gives the detailed results of the ANOVA used to test this objective.

Table 4.11

Analysis of variance (ANOVA) comparing the difference in consumers' overall satisfaction of the usability of the Web site.

Source	SS	df	MS	F	Sig
Between	1.458	4	.364	.543	.705
Within	25.519	38	.672		
Total	26.977	42			

Findings Related to Objective Three

Objective three sought to develop a usability survey instrument for agricultural and natural resources Web sites. Cronbach's Alpha was used to test the reliability of the instrument. For the pilot test, Cronbach's Alpha yielded a 0.68. The reliability of the instrument was surveyed after data was collected with Cronbach's Alpha. The posttest yielded a reliability of 0.923. This reliability score for the instrument is sufficient and the score could not increase significantly if a question was deleted. If the final question on the instrument that asked participants to rate their overall satisfaction was deleted, the reliability would increase to 0.943. However, if any of the other Likert-type questions were deleted the reliability would decrease to a score in the range from 0.916 to 0.923.

Cronbach's Alpha was also conducted for each usability section of the instrument: general appearance yielded a 0.861, navigation yielded a 0.935, efficiency yielded a 0.896, and content yielded a 0.849.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to determine the external user preferences of the USDA-ARS Ogallala Initiative Web site and to develop a baseline Web site usability instrument for future agricultural and natural resources Web sites. The following were objectives for this research:

- 1) Evaluate the overall usability of the Ogallala Initiative Web site by the identified consumers.
- 2) Determine if there is a difference in overall usability satisfaction among identified consumers of the Ogallala Initiative Web site.
- 3) Develop a usability survey instrument for agricultural and natural resources Web sites.

Summary

This study was conducted to determine the external user preferences of the USDA-ARS Ogallala Initiative Web site and to develop a baseline Web site usability instrument for future agricultural and natural resources Web sites. The uses and gratifications approach best describes this study. It is “how people use media to gratify their needs,” (North, 2000). With the main objective of the Ogallala Initiative Web site to disseminate information, it is pertinent that user’s needs be met.

Several factors determine user preferences, which include age, gender, and education level, just to name a few. A usability tests enables Web designers to make a

more informative decision on how to create their site and what works and doesn't work on their site.

The target audience for the Ogallala Initiative Web site is agricultural producers, communication professionals, and the general public. Therefore a stratified purposeful sample of this audience was taken to evaluate the usability of the site. Krug (2000) states how important it is to test Web sites with people who will be using it. If a Web site is tested by people who are not going to use it, the site will not be able to meet users' needs.

As stated in Chapter II, literature in the area of Web site usability instrumentation is low, so a survey instrument was created by the researcher to evaluate the usability of the Web site. This instrument had a Cronbach's Alpha reliability score of 0.923 and was deemed acceptable for this study. This instrument was created on standards set by Web site usability experts, Nielsen (2000, 2001, 2005) and Krug (2000).

Conclusions Related to Objective One

Objective one was to evaluate the overall usability of the Ogallala Initiative Web site by the identified consumers. The Web site deemed usable by the sample. More than 85% ($n = 42$) of the participants surveyed were either satisfied, very satisfied, or somewhat satisfied with the Web site. Only one (2%) participant was not at all satisfied. The Web site was acceptable for general appearance, ease of navigation, speed and efficiency of downloads. Participants did indicate that they would like to see more content, but content that was on the site was informative and easy to locate. Some comments about content were as follows:

- “It provides basic information about the Ogallala Initiative and would be easy to direct producers to the site for information.”
- “Great information and research based!”
- “Once more information is provided; it should be a good site for getting information about the aquifer.”
- “Nothing here useful for a farmer.”
- “Too much information on the home page.”

The entire purpose of a Web site is the content. Too many times, Nielsen (2000) believes Web designers focus on the structure and navigation of the site, rather than putting information users want easily accessible. Spool et al. (1999) also agrees that the main point of a Web site should be information. Users do not go to a Web site to see the design or layout, they view the site for its content, so keep design to a minimum (Nielsen, 2000).

Results also indicated that contact information needs to be provided on the Web site. Experts believe that by providing contact information of a real human is a comfort to many people. Parlinska and Parlinski (2003) say contact information for the Web site should be available. For some users, if they can contact an actual person, it is a comfort to them and can make a Web site more reliable.

Conclusions Related to Objective Two

Objective two was to determine if there was a difference in overall usability satisfaction among identified consumers of the Ogallala Initiative Web site. Agricultural producers, communication professionals, and the general public of the Ogallala Aquifer

region were surveyed and no difference was reported concerning usability satisfaction as shown in Figure 4.6; the group was homogenous. More than 85% of the participants surveyed were either satisfied, very satisfied, or somewhat satisfied with the Web site. Only one (2%) participant was not at all satisfied. Audiences' responds were similar for each Likert-type question, as stated in Chapter IV.

Conclusions Related to Objective Three

Objective three was to develop a usability instrument for informational agricultural and natural resources Web sites. The survey instrument created by the researcher was deemed reliable by Cronbach's Alpha with a score of 0.923. Each usability section had Cronbach's Alpha conducted on it and all scores were satisfactory.

The instrument evaluated the demographics of the sample, Internet connection speed, time spent on the Internet per week for business and personal uses, and if they had Web design experience. It also evaluated the usability on a 4-point Likert scale through these categories: general appearance of the site, navigation ease, speed and efficiency of the site, and content of the site. Each question generated from literature by Nielsen and Krug did prove reliable when put in a 4-point Likert survey instrument.

Recommendations for Practitioners

The survey instrument was reliable for testing usability of agricultural and natural resources Web sites, however questions regarding age, years in the profession, and if they have Internet at their house or business need to be incorporated into the demographic section. One question needs to be addressed in the efficiency section of the survey; the

question states if the photos download quickly. This question needs more specificity, because the pictures upload as thumbnails on the page, but can also be downloaded. A simple solution would be to break the question into two parts: “The photo thumbnails upload quickly,” and “The photos download quickly.”

Experts suggest testing a Web site, making corrections, and then retesting. When dealing with Web site usability, do not just settle for the majority of the Web population being satisfied; continue to improve the Web site to meet the entire audiences’ needs. Nielsen et al. (2001) says to analyze the data. He warns to not make excuses for design and usability failures, but respect the responses and make changes, then repeat the test. Several, small usability tests should be ran throughout the development of a usable Web site (Krug, 2000).

Literature in Chapter II states the biggest issue the general public and agricultural producers face with Web site usability is Internet access. Close to 30% of the rural population only has one Internet provider available to them (Bell et al., 2004). The Pew Internet and American Life Project reported that only “52% of rural residents use the Internet” (Bell et al., 2004, p. 2). Internet access is also a challenge for most rural areas. Dial-up is the most common Internet connection speed; 80% of the rural population has dial-up compared to only 19% having a broadband connection of DSL, wireless, cable, or fiber optic (Bell et al., 2004). Other factors such as low literacy rates, poor communications infrastructure, and a lack of Internet providers, also inhibit rural areas ability to implement new technologies such as the Internet (Gopinath, 2004).

However, results showed that none of these factors were an issue. Only four (8.2%) participants had dial-up Internet connection, and the rest (91.8%) had high-speed

or wireless Internet. Internet access in rural areas was not an issue. The sample was also well educated with more than half having a bachelor's degree. Only four (8.2%) had just a high school diploma or GED. More than 90% of the participants had some college education. Even though the population for this study was highly educated and had fast Internet connection, keep in mind this was a purposeful sample. Internet connection speed should always be taken into account when testing Web site usability.

Although, results were positive for this study, the Ogallala Initiative Web site still has room for improvement. Constructive criticism comments were given for suggested improvements. Changes should be made and then the site needs to be tested several more times.

Recommendations for Research

Additional Web site usability tests need to be conducted. More content should be added to the site, and contact information should be included.

Live audiences should be tested in a lab type setting (Krug, 2000). For example, the participant should be given a task to accomplish and the test giver should observe the participant while accomplishing the task. This gives the test giver a better idea of how fast or slow the task was accomplished and any other problems the participant may have ran into that would not show up on a survey instrument. Nielsen et al. (2001) says to pick your participants and “watch them surf” (p. 1). First, as a usability tester, decide what you want to learn about the usability of the site. Then, create a list of tasks for participants to perform, and Nielsen et al. (2001) stresses to not use any specific terminology; this will allow the user to decide steps of accomplishing the task on their own. Tasks should be

listed on separate pieces of paper and handed to participants at the completion of each task. Nielsen et al. (2001) says if they can't complete a task, let them move on by providing them with the next sheet of paper. He believes this still provides a sort of accomplishment and encouragement. Participants should take the usability tests in a quiet room where the test giver can hear if and what the participants says (Nielsen et al., 2001). The test giver should pay close attention to where the participant struggled or was frustrated in accomplishing the task. Also, pay attention to what worked and make note so that can be kept in the Web design (Nielsen et al., 2001).

Do not use focus groups, because there is a chance for one dominate participant. It is suggested to have individuals view the Web site individually, so they can draw their own conclusions and recommendations to improve the site (Nielsen, 1997).

The six participants who did not respond to the Likert type questions should be contacted to find out why they chose not to respond to those questions. These six participants responded to all the demographic questions, but not the Likert. This could affect the reliability of the instrument, thus making it important to discover the cause.

The following questions should be added to the survey instrument: age, years in the profession, and if participants have Internet at their house or business. Also, a wider Likert-type scale should be used in further research. This would better improve mean separation for inferential analysis. Finally, a larger population should be surveyed in future research; this could allow results to be generalized to the entire Ogallala population.

Discussion

As Internet audiences continue to increase, the number of Web sites increase as well. With so many Web sites on the Web, it is important to stay on top of the competition by making it usable. Web goers will simply not go back to a Web site they cannot navigate or understand; there are too many other sites information can be obtained from. I predict that testing Web site usability will be a necessity for every Web designer within the next five to 10 years. There are simply too many Web sites to pick from and usability is what is going to set a great Web site apart from a good one.

The Ogallala Initiative Web site received positive feedback, however there is still a lot of room for improve. The site is just in the early stages of development and has a ways to go yet. Not only does contact information and more content need to be added to the site, but file download sizes need to also be listed with every document and photo. Stories also need to be labeled as a PDF file or word document file. Web goers need to know what type of document and the size, so they know how long downloading will take.

As far as the design, the home button should be removed from the homepage; having this button on the home page may be confusing to some Web goers. The homepage also is quite busy at the top with all the project categories, goal of the Initiative, and a list of all that are involved. This would be an excellent example of deleting one design element at a time and if the site still works, then leave it off like Nielsen (2000) suggests.

When testing Web site usability, your target audience should be kept in mind. The survey instrument might have to be altered to meet the purpose of the Web site and its audiences' needs. For example, if you are testing a transactional Web site, where

products can be purchased, some of the survey instrument questions on this survey may not apply, and there may be others that would apply that need to be added.

Testing Web site usability could make or break a Web site. Each day, Web goers come across a Web site that is not appealing to them because of the appearance, navigation, content, or efficiency. However, if designers would do a simple usability test, they have the possibility of greatly improving their site.

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APPENDIX A
EXPLAINED RESPONSES ABOUT THE WEB SITE
MEETING PARTICIPANTS' PROFESSIONAL NEEDS

Yes/No Response	Explanation
Yes	Web page is well organized and information appears to be easily accessible.
No	Dummy reports would not load. Hit a lot of dead-ends.
Yes	This is a great Web site for us to use as information. Thank you for sharing.
No	Tough to say, since you are just starting I assume more info will become available. It is pretty generic right now.
No	Many of these questions are difficult to answer because the site doesn't contain very much information. That's probably because it is still being developed, but most of the links I clicked on took me to an error page. So the site doesn't meet my needs at the moment because there's nothing there.
Yes	It provides basic information about the Ogallala Initiative and would be easy to direct producers to the site for information.
No	nothing here useful for a farmer
Yes	I see where this will be useful to get photos and tips for conservation.
Yes	It can be beneficial to see efforts of conservation being done.
Yes	The things that I need through my work are readily available.
Yes	It is easy to access and has a great deal of information.
No	Many of the pages could not be found. Once all pages were functional I would probably agree that it would meet professional needs. As it is right now however, it does not.
Yes	I think it will when completed. Information on contacts did not come up - you may not have this added yet! Also - tabs at the top are a bit cramped with the Initiative titles, and information below the tabs. Recommend segmenting this out a little more! Overall a good start!
Yes	I believe that if I needed current information about water conservation I can get it from this site or the links.
Yes	Great information and research based! You did a fabulous job!
Yes	Once more information is provided; it should be a good site for getting information about the aquifer.
Yes	Friendly user and easy to navigate and find your searches.
Yes	It will be a good resource site for the Chamber of Commerce.

APPENDIX B

CRONBACH'S ALPHA SCORE IF QUESTION WAS DELETED

Question	Cronbach's Alpha if deleted
The home page is aesthetically pleasing.	0.920
The home page layout invites you to consume information placed on the site.	0.920
The home page is clearly designed.	0.920
Other pages of the site are aesthetically pleasing and clearly designed.	0.920
I can immediately tell where I am on the Web site.	0.918
I am able to move from page to page without getting lost.	0.919
The links are clearly recognized.	0.919
I am aware of where I am on the Web site at all times.	0.918
It is easy to identify downloadable documents.	0.916
The Web site menu assists navigation.	0.916
The Web pages are clearly organized.	0.917
Information on the pages are clearly organized.	0.917
The overall Web site is easy to navigate.	0.917
The Web pages load quickly in my browser.	0.918
The photos download quickly.	0.921
The Adobe PDF files download quickly.	0.917
The site offers quality information.	0.918
The site offers an adequate amount of information.	0.918
The information is easy to understand.	0.920
The information is current and up-to-date.	0.918
Contact information is provided.	0.923
Rate your overall satisfaction.	0.943

APPENDIX C

E-MAIL SENT TO AGRICULTURAL PRODUCERS

Ogallala Initiative Web site Survey

 Axtell, Shelby L

To: 

Dear 

As a master student in Texas Tech's Department of Agricultural Education and Communications, I am interested in developing tools to assist County Extension Agents and producers in gathering useful information, and I have accepted the task of evaluating the usability of the USDA's Ogallala Initiative Web site. The Web site is currently under development, and in order to build the best site possible, your feedback is needed. I would sincerely appreciate your assistance.

A primary goal of the Ogallala Initiative Web site is to assist County Extension Agents and producers by providing them with accessible information about Ogallala Aquifer sustainability research. As a professional agriculturalist, your feedback is important and will be used to modify and further develop the Ogallala Initiative Web site.

Please click on the link <http://www.zoomerang.com/survey.zgi?p=WEB224ZMZWS77E> and follow the directions provided on the first page. The survey should take no longer than a few minutes. I would appreciate it if you could complete the survey by **Wednesday, February 22**. If you have any questions or concerns, please do not hesitate to contact me.

We would also value feedback from producers (farmers or ranchers) in your county. Please forward the following link <http://www.zoomerang.com/survey.zgi?p=WEB224ZMZWS77E> in a separate e-mail to **three** producers in your county that have valid e-mail addresses and ask them to participate in this survey.

Again, thank you for your participation. Your thoughts and opinions, and the thoughts and opinions of producers in your county are valued. Information provided from this study is confidential and will only be used for Web site design and improvements.

Thank you,
Shelby Axtell & Chad Davis

Shelby Axtell
Agricultural Communications Graduate Student
Texas Tech University
P.O. Box 42131
Lubbock, TX 79409-2131
Ph (806) 742-2889
Fax (806) 742-2880
shelby.l.axtell@ttu.edu

Chad S. Davis, Ed.D.
Assistant Professor
Department of Agricultural Education and Communications
Texas Tech University

APPENDIX D

E-MAIL SENT TO COMMUNICATION PROFESSIONALS

Ogallala Initiative Web site Survey

 Axtell, Shelby L

You replied on 2/15/2006 3:21 PM.

To: 

Dear 

As a master student in Texas Tech's Department of Agricultural Education and Communications, I am interested in developing tools to assist the mass media, and I have accepted the task of evaluating the usability of the USDA's Ogallala Initiative Web site. The Web site is currently under development, and in order to build the best site possible, your feedback is needed. I would sincerely appreciate your assistance.

A primary goal of the Ogallala Initiative Web site is to assist mass media professionals by providing them with accessible information about Ogallala Aquifer sustainability research. As a mass media professional, your feedback is important and will be used to modify and further develop the Ogallala Initiative Web site.

Please click on the link <http://www.zoomerang.com/survey.zgi?p=WEB224ZMZ/W577E> and follow the directions provided on the first page. In question 5, you will be asked to enter a three digit code. Your code is  I would appreciate it if you could complete the survey by **Wednesday, February 22**. If you have any questions or concerns, please do not hesitate to contact me.

If you know of any other mass media professionals in your geographical area interested in Ogallala-related information, please, feel free to forward this e-mail to them.

Again, thank you for your participation. Your thoughts and opinions are valued. Information provided from this survey is confidential and will only be used for Web site development and improvements.

Thank you,
Shelby Axtell & Chad Davis

Shelby Axtell
Agricultural Communications Graduate Student
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Chad S. Davis, Ed.D.
Assistant Professor
Department of Agricultural Education and Communications
Texas Tech University
Education Specialist
Texas Cooperative Extension

APPENDIX E

E-MAIL SENT TO CHAMBERS OF COMMERCE

Ogallala Initiative Web site Survey

 Axtell, Shelby L

To: 

Dear 

As a master student in Texas Tech's Department of Agricultural Education and Communications, I am interested in developing Web sites that effectively disseminate Ogallala sustainability-related research to the public, and I am currently evaluating the usability of the USDA's Ogallala Initiative Web site. The Web site is currently under development, and in order to build the best site possible, your feedback is needed. I would sincerely appreciate your assistance.

A primary goal of the Ogallala Initiative Web site is to provide the general public with accessible information about Ogallala Aquifer sustainability research. As a chamber of commerce affiliate, your feedback is important and will be used to modify and further develop the Ogallala Initiative Web site.

Please click on the link <http://www.zoomerang.com/survey.zgi?p=WEB224ZMZW577E> and follow the directions provided on the first page. I would appreciate it if you could complete the survey by **Wednesday, February 22**. If you have any questions or concerns, please do not hesitate to contact me.

We would also value the thoughts and opinions of your colleagues. Please forward the following link <http://www.zoomerang.com/survey.zgi?p=WEB224ZMZW577E> in a separate e-mail to **three** chamber affiliates having valid e-mail addresses and residing in your city, and ask them to conduct the study.

Again, thank you for your participation. Your thoughts and opinions, and the thoughts and opinions of your chamber members are valued. Information provided from this study is confidential and will only be used for Web site design and improvements.

Thank you,
Shelby Axtell & Chad Davis

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Assistant Professor
Department of Agricultural Education and Communications
Texas Tech University
Education Specialist

APPENDIX F
ELECTRONIC SURVEY INSTRUMENT



Ogallala Initiative Web Usability Study

Thank you for providing useful information about the Ogallala Initiative Web site. When you click on the link below, the Ogallala Initiative Web site will appear in a new window. Please navigate through the Web site and access all features. Once you have viewed all features, minimize the Ogallala Initiative Web site window and answer the questions on this survey. You may again access the Web site at any time by maximizing the window.

<http://ogallala.tamu.edu>



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Ogallala Initiative Web Usability Study

1 Gender

- Male
- Female

2 State of Residence

3 Zip Code

4 What is your occupation? (Select all that apply)

- Farming
- Ranching
- Extension
- Mass Media
- Other, Please Specify

- 5 If you checked Mass Media for question 4, please enter your three digit code. If you are not Mass Media, please proceed to question 6.

- 6 Education Level

- Some high school
- High school diploma/GED
- Some college
- Technical degree
- Bachelor's degree
- Master's degree
- Doctoral degree
- N/A

- 7 What type of Internet connection do you most often use?

- High-speed/Broadband
- High-speed/Cable
- High-speed/DSL
- Dial-up
- Other, Please Specify

http://www.zoomerang.com - Zoomerang - Microsoft Internet Explorer

8 How much time during a week do you spend on the Internet for professional/business purposes?

- Less than 1 hour
- 1-5 hours
- 6-10 hours
- More than 10 hours

9 How much time during a week do you spend on the Internet for purposes other than your business/profession?

- Less than 1 hour
- 1-5 hours
- 6-10 hours
- More than 10 hours

10 Do you have Web design experience?

Done Internet

http://www.zoomerang.com - Zoomerang - Microsoft Internet Explorer



Ogallala Initiative Web Usability Study

11 Please provide feedback about the general appearance of the Ogallala Initiative Web site.

1	2	3	4
Stongly Disagree	Disagree	Agree	Strongly Agree
The home page is aesthetically pleasing.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The home page layout invites you to consume information placed on the site.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The home page is clearly designed.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other pages of the site are aesthetically pleasing and clearly designed.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Done Internet

12 Please provide feedback about the general navigation of the Web site.

1 Strongly Disagree	2 Disagree	3 Agree	4 Strongly Agree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can immediately tell where I am on the Web site.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am able to move from page to page without getting lost.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The links are clearly recognized.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am aware of where I am on the Web site at all times.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is easy to identify downloadable documents.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Web site menu assists navigation.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Web pages are clearly organized.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information on the pages are clearly organized.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The overall Web site is easy to navigate.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Done Internet



Ogallala Initiative Web Usability Study

13 Please provide feedback about the speed and efficiency of the Ogallala Initiative Web site.

1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree
The Web pages load quickly in my browser.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The photos download quickly.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Adobe PDF files download quickly.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14 Please provide feedback about the content on the Ogallala Initiative Web site.

1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree
The site offers quality information.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The site offers an adequate amount of information.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information is easy to understand.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The information is current and up-to-date.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Contact information is provided.			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

http://www.zoomerang.com - Zoomerang - Microsoft Internet Explorer

15 Please rate your overall satisfaction with the Ogallala Initiative Web site.

Very Satisfied	Satisfied	Somewhat Satisfied	Not at all Satisfied
1	2	3	4

16 Does this site meet your professional needs.

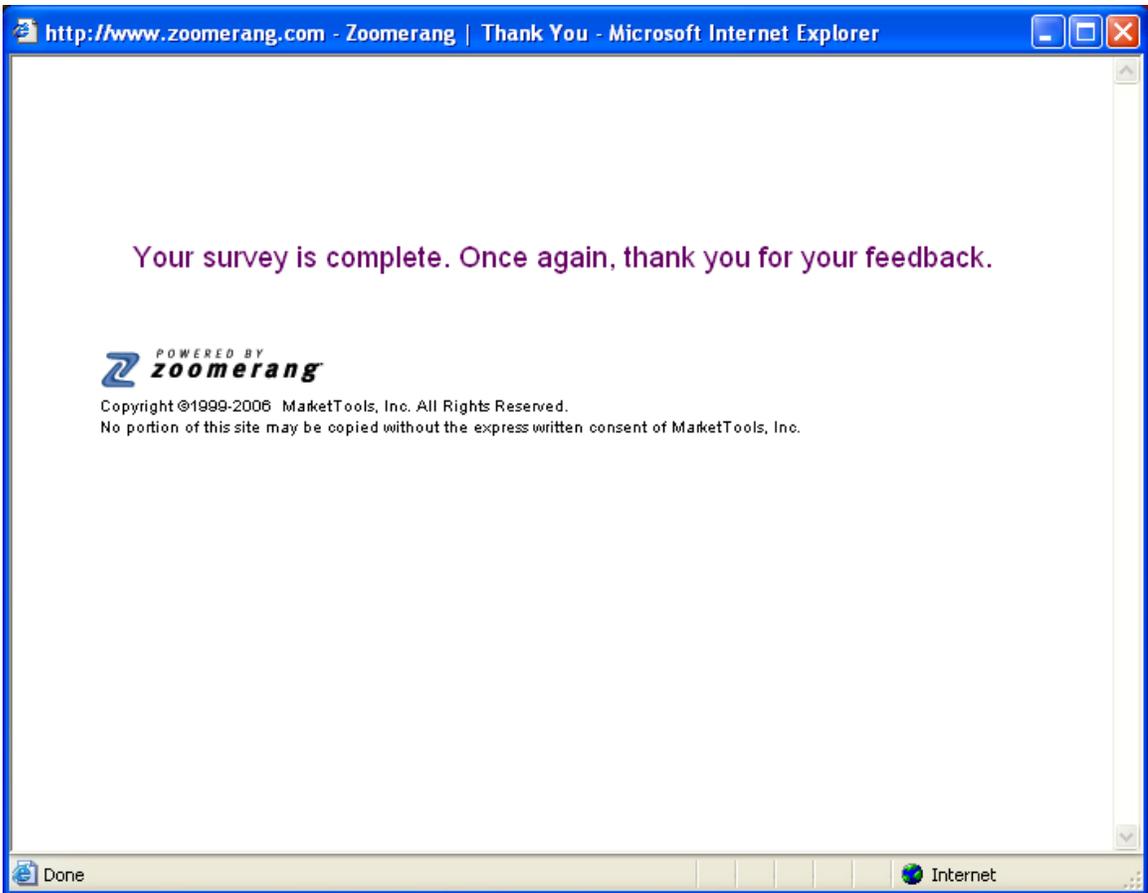
YES NO

Please explain:

17 Please list any additional comments or recommendations you have for the Ogallala Initiative Web site.

SUBMIT

Internet



PERMISSION TO COPY

In presenting this thesis in partial fulfillment of the requirements for a master's degree at Texas Tech University or Texas Tech University Health Sciences Center, I agree that the Library and my major department shall make it freely available for research purposes. Permission to copy this thesis for scholarly purposes may be granted by the Director of the Library or my major professor. It is understood that any copying or publication of this thesis for financial gain shall not be allowed without my further written permission and that any user may be liable for copyright infringement.

Agree (Permission is granted.)

Shelby L. Axtell
Student Signature

April 19, 2006
Date

Disagree (Permission is not granted.)

Student Signature

Date