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Usability Testing and Evaluation of Texas Tech Sorghum Research Initiative Website

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The efficiency, error, learnability, and satisfaction of a representative and non-representative user groups were measured during a usability test of the Texas Tech SRI site that employed mixed-method data collection. The users were given a series of tasks to perform that related to the site's navigational scheme, layout, and content. The representative and non-representative groups efficiently navigated the site and were able to repeatedly utilize the site's functions. However, it was concluded that the representative user group committed less errors during their interaction with the site and that their overall satisfaction with the site was higher than the non-representative user group. Representative user groups may find a higher satisfaction level in this website than non-representative groups.

Keywords
MEELS, efficiency, website usability, learnability, satisfaction, sorghum, representative user group

Research

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Keywords

MEELS, efficiency, website usability, learnability, satisfaction, sorghum, representative user group

Introduction

As with any agricultural industry, sorghum interest encompasses a diverse population. Researchers, scientists, producers, growers, and those simply interested in sorghum research and information need credible, accurate resources to further their studies. The Texas Tech Sorghum Research Initiative (Texas Tech SRI) website was established in 2006 in response to a need for adequate and up-to-date research information for the sorghum industry. The purpose of the TTSRI site is to provide current and archived research from sorghum-related organizations and individuals. Sorghum news and links to other helpful sites are also part of the site. The TTSRI satisfies Texas Tech's responsibilities as a part of the Great Plains Sorghum Improvement and Utilization Initiative. Researchers at Texas Tech are working in conjunction with researchers at Kansas State University (lead entity for the initiative) and Texas A&M University to improve the future of sorghum. Specifically, Texas Tech researchers are focusing on increasing profitability across all facets of the U.S. sorghum industry by developing educational programs relating to sorghum.

The demand for readily-available information has increased rapidly along with the growth and advancement of technology. Today, the Internet is most often how people choose to retrieve and receive information and those people assume the website has what they are looking for (Nielsen & Loranger, 2006). Usability testing is becoming more and more important as the use of websites increases. "Usability is a quality attribute relating to how easy something is to use. More specifically,

it refers to how quickly people can learn to use something, how efficient they are while using it, how memorable it is, how error-prone it is, and how much users like using it" (Nielsen & Loranger, 2006, p. xvi). If a site is not usable, users will simply stop using it and look somewhere else for the information they need. The initial purpose of the site is lost when this happens (Nielsen & Loranger, 2006).

Multiple usability researchers including Nielsen (2004), Krug (2006), and Still (personal communication, January 27, 2009) recommend testing a site numerous times from the moment it is created. Ayers (2008) conducted a general usability study on the Texas Tech SRI site. Her findings encompassed multiple usability variables such as credibility, efficiency, effectiveness, and utility. The findings indicated overall satisfaction relating to the usability of the Texas Tech SRI site. She stated a different kind of usability test should be completed in order to gain further perspective on the site.

Quesenbery (2013) described five characteristics of interface usability: effective, efficient, engaging, error tolerant, and easy to learn. Barnum, Henderson, Hood, and Jordan (2004) employed these five characteristics in their usability study titled "Index Versus Full-Text Search: A Usability Study of User Preference and Performance." The steps of their testing included heuristic evaluation, participant profile and recruitment, test scenarios, testing methodology, and information gathering. In order to retrieve as much information as possible from the study, the researchers gathered quantitative and qualitative data. This method allowed them to administer a pre-tasks, post-tasks, and satisfaction questionnaire and observe the users' comments and facial expressions. A similar test plan was carried out for this study.

"Users must be able to use a website successfully, in a short amount of time, without any prior training or documentation" (Lazar, 2006, p. 7). It has been determined, through a quantitative study, that the information available on the TTSRI website is organized in a usable fashion (Ayers, 2008). However, to fully determine the interface usability of the site, a mixed-methods study must be performed. Through these methods, the researcher was able to accurately determine the changes that must be made to the site after analyzing the comments and facial expressions of the users testing the TTSRI site, therefore, making the site as usable as possible for sorghum researchers, producers, and others interested in obtaining information about the sorghum industry.

Conceptual Framework

The conceptual framework used to guide this study was MEELS (Texas Tech University English Department, 2012). MEELS focuses on:

- Memorability: If a user has used the system before, can he or she remember enough to use it effectively the next time or does the user have to start over again learning everything?
- Efficiency: Once an experienced user has learned to use the system, how fast can he or she accomplish tasks?
- Errors: How often do users make errors while using the system, how serious are these errors, and how do users recover from these errors?
- Learnability: How fast can a user who has never seen the user interface before learn it sufficiently well to accomplish basic tasks?
- Satisfaction: How fast can a user who has never seen the user interface before learn it sufficiently well to accomplish basic tasks? (Texas Tech English Department, 2012)

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Purpose and Objectives

Usability is an important aspect of any information on the Web. The purpose of this study was to test and evaluate the usability of the Texas Tech SRI Website. The following objectives were investigated throughout the course of this study:

1. Determine the efficiency of the Texas Tech SRI Website as perceived by representative users and non-representative users.
2. Determine how error tolerant (to see how the design continued to function in the presence of faults) the Texas Tech SRI Website is as perceived by representative users and non-representative users.
3. Determine the learnability of the Texas Tech SRI Website as perceived by representative users and non-representative users.
4. Determine the satisfaction rate of the Texas Tech SRI Website as perceived by representative users and non-representative users.

Methodology

One method used to conduct usability testing is in a laboratory type setting. The Usability Research Laboratory at Texas Tech is an example of a usability testing lab. The lab is divided into two rooms—an observing room and a room in which the test is conducted. The two rooms are divided by a one-way mirror. Cameras and microphones are set up to record the users' actions while the observer watches from behind the mirror. In some instances, usability software such as Morae may be utilized. This software allows the observer to note of observations while watching video of the user in real time. Morae also allows pre-tasks, post-tasks, and System Usability Scale (SUS) surveys to be sent to the user via the computer (Brooke, 1996).

In addition to the observer, a facilitator is needed to assist with testing procedures. He or she is responsible for all communication to the users including the introduction and explanation of scenario, user tasks and task completion, pre-tasks and post-tasks questionnaires, keeping the user on topic, and giving answers to the user(s) should the question fit the pre-defined criteria of what can be answered. Think-aloud protocol is an important part of usability testing (Lazar, 2006). With think-aloud protocol, the users are asked to talk out loud and reveal their thoughts while they navigate through the website and complete tasks. User tasks are formulated prior to testing. The tasks should encompass various areas of the website and encourage the user to make use of the site's navigational scheme and layout and should be arranged from simple to complex (Barnum, 2002). For the purpose of this study, both user groups were assigned seven tasks that ranged in difficulty.

A mixed-methods, or qualitative and quantitative, approach may be applied in usability testing (Nielsen, 2013). Data collected for this particular study included direct quotes from the users, basic demographics, computer and Internet usage, open-ended responses to the post-tasks questions, mouse clicks, error rates, and SUS survey answers and ratings. One or more of these data sources was used in analyzing the findings for each of the four objectives. The data collection process was conducted at the time of the test using Morae Recorder and Observer software. In order to prevent researcher-bias, further, in-depth analysis took place after all the testing was completed when a pair of researchers evaluated each video using Morae Manager. The two researchers went through the scripts identifying the ease and difficulty of the tasks. The tasks were coded based on the following scale by Dumas and Redish (1999): 0 = subtle or no problem; 1 = has minor effect on usability; 2 =

creates significant delay or frustration; 3 = prevents completion of task. The coding scale was decided upon prior to the testing and the researchers discussed how they felt each task should be rated. The researchers discussed each task score until a 100% consensus was reached. When differences arose, the researchers discussed until consensus was reached.

Establishing trustworthiness through transferability, dependability, triangulation and conformability were important aspects in this study. Establishing validity and reliability for the qualitative aspects were fairly simple. Verbatim transcription has been cited as being central to the reliability, validity, and veracity of qualitative data collection (Davidson, 2006). Trustworthiness is essential to the study because it gives the study credibility. Following are the four aspects of trustworthiness used to evaluate this study:

Transferability is the extent to which the study is able to make general claims about the world (Halldórssom & Aastrup, 2003). "The conventional term of this world would be external validity, generally described as a measure for generalizability of a question" (Guba & Lincoln, 1989). Dependability is conventionally termed reliability, which concerns the stability of the data over time. Dependability is achieved when replication of the same or similar instruments of the same phenomenon results in a similar measurement (Guba & Lincoln, 1989).

"Triangulation is a term originally more common in surveying activities, map making, navigation, and military practices" (Berg, 2009, p. 4). However, when used in social sciences, it was used to describe multiple data-collection methods used to evaluate a concept or construct (Berg, 2009). Conformability is seen as being parallel to the conventional views on objectivity, meaning that the findings represent the results of the inquiry and are not influenced by the researcher's biases (Halldórssom & Aastrup, 2003).

Several drawbacks of usability testing are time, budget, and access. These issues go hand-in-hand when choosing which user group to test. Each user group chosen for testing was justified because they represent real users of the website. Contrarily, one non-representative group was chosen to further test the usability of the website. The researchers were interested in comparing representative and non-representative users and how they carried out the tasks given to them. It was important to keep in mind the accessibility of the user groups. The usability testing took place on campus. Therefore, emphasis was placed on the chosen users' accessibility along with their ability to provide accurate and representative test results.

Of the pre-determined user groups, three groups were selected for participation in the study. Senior students enrolled in the Spring 2009 semester in the Department of Agricultural Education and Communications were recruited for the pilot test. For the actual testing, graduate students enrolled in the Fall 2009 semester in the Department of Plant and Soil Sciences and undergraduate students enrolled in the Fall 2009 semester in the College of Mass Communications were recruited. The plant and soil science students were identified as representative users, while the mass communications students were recognized as non-representative users of the website. The number of users tested depends on the complexity of the system being tested. Head (1999) pointed out that it does not take a large number of users to point out the navigational problems of a site. Complex websites consist of more complicated functions such as purchasing and in-depth searches. "The range of tests one can conduct is considerable, from true classical experiments with large sample sizes and complex test designs to very informal qualitative studies with only a single participant" (Rubin & Chisnell, 2008, p. 21). The ideal number of users for each round is three to four participants (Krug, 2006). Nielsen (2013) suggested five users for each round of testing. Lazar (2006) acknowledged that budget, time-

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line, and access may limit testing. He stated testing with only five users is better than no testing at all.

Due to a low response from the plant and soil science user group, several follow-up e-mails were sent requesting participation. In order to ensure five users from each group, extra participants were recruited. Although the testing and users were on-campus, it was understood some participants may not show up or cancel on short notice. Testing was carried out in the usability lab during two different afternoon sessions. Five plant and soil science graduate students and five mass communications undergraduate students were tested.

Findings

Table 1 showcases age, gender, and classification by user group. The majority, 60.0% (n = 3), of PSS users were 20-24 years of age, one user was 25-29 years of age, and one user was 40-44 years of age; there was no mode for age within the PSS user group. All five, 100.0%, of the PSS users were male and classified as graduate students. All, 100.0%, of MCOM users were 20-24 years of age. The recorded mode for MCOM users was 22 years of age. The majority, 80.0% (n = 4), were female and one user was male. Also, 100.0% were classified as senior-level students.

Table 1

Demographic Characteristics of Texas Tech SRI User Groups (N = 10)

	PSS (n = 5)			MCOM (n = 5)		
Characteristic	f	f%	Mode	F	f%	Mode
Age			20-24			20-24
20-24	3	60.0		5	100.0	
25-29	1	20.0		0	0.0	
30-34	0	0.0		0	0.0	
35-39	0	0.0		0	0.0	
40-44	1	20.0		0	0.0	
Gender			Male			Female
Female	0	0.0		4	80.0	
Male	5	100.0		1	20.0	
Classification			Graduate			Senior
Graduate	5	100.0		0	0.0	
Senior	0	0.0		5	100.0	
Junior	0	0.0		0	0.0	
Sophomore	0	0.0		0	0.0	
Freshman	0	0.0		0	0.0	

Table 2 reports the users' description of their computer skills and the hours per day they spend on the Internet. Prior to the beginning of the study it was assumed that all users would have basic computer and Internet skills. Table 2 validates that assumption. In regard to the description of their computer skills 60.0% (n = 3) of PSS users described themselves as skilled, one user described himself as slightly skilled, and one user, described himself as very skilled. Two PS3 users, 40.0%, spent 1-2 hours per day on the Internet while one user spent 1 hour per day, one user spent 4-5 hours per day, and one user spent five or more hours per day on the Internet.

The majority, 80.0% (n = 4), of MCOM users described themselves as skilled computer users. Only one MCOM user described herself as slightly skilled. The majority of the MCOM users, 60.0% (n = 3), spent 1-2 hours per day on the Internet. One user spent one hour per day and one user spent 4-5 hours per day on the Internet. The mode for perceived computer skills and hours per day spent on the Internet was the same for both user groups—skilled and 1-2 hours.

Table 2

Perceived Computer Skills and Hours Per Day Spent on Internet of Texas Tech SRI User Groups (N = 10)

	PSS (n = 5)			MCOM (n = 5)		
Statement	f	f%	Mode	f	f%	Mode
Describe your computer skills			Skilled			Skilled
Not very skilled	0	0.0		0	0.0	
Slightly skilled	1	20.0		1	20.0	
Skilled	3	60.0		4	80.0	
Very skilled	1	20.0		0	0.0	
Time per day spent on Internet			1-2 hours			1-2 hours
1 hour	1	20.0		1	20.0	
1-2 hours	2	40.0		3	60.0	
2-3 hours	0	0.0		0	0.0	
3-4 hours	0	0.0		0	0.0	
4-5 hours	1	20.0		1	20.0	
5 or more hours	1	20.0		0	0.0	

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Objective one examined the efficiency of the Texas Tech SRI site as perceived by representative and non-representative users. In the context of usability, efficiency relates to the intuitiveness of the site. The site should allow users to quickly find the information they are seeking and should enable them to do so repeatedly.

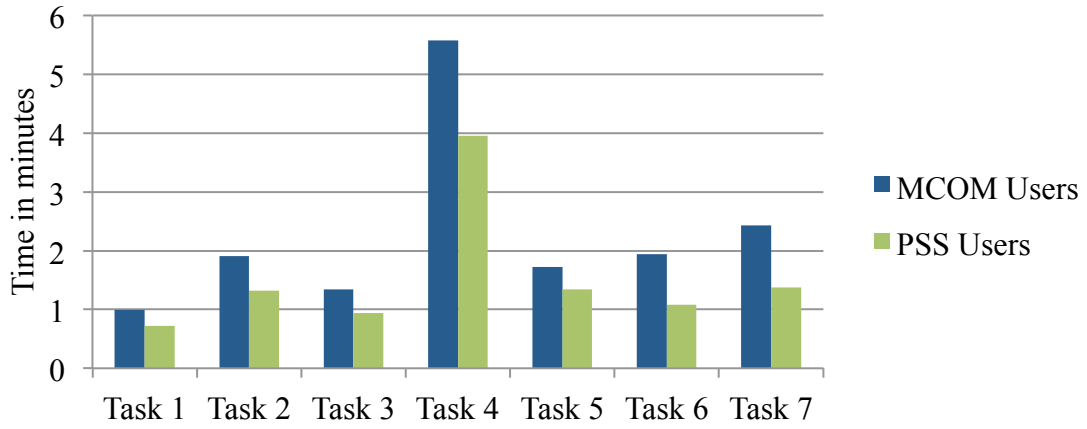
In order to determine the efficiency of the Texas Tech SRI site, the average time both groups spent on each task was recorded and the number of mouse clicks the users used to accomplish the tasks were compared to the number of mouse clicks required for task completion as established a priori. PSS users had a lower average of mouse clicks per task than MCOM users. Throughout the study, the researcher observed that MCOM users were more likely to quickly click and scan through pages of the site without taking much time to read the information located on the pages.

> MCOM User 1: I'll click on some of these. I guess I can click on these links to see if that's what I need to find.

> MCOM User 3: I'm just going to click one and see what it gets me. I'm just looking at these links and seeing if anything applies because I'm pretty sure I've been to all of them.

The time users spent on each task was also factored in to determine the efficiency of the site. Figure 1 shows the time MCOM and PSS users spent on each task.

Figure 1. MCOM and PSS users average time on task.



As illustrated in Figure 1, on average MCOM users spent more time on each task than the PSS users. As mentioned, the PSS users were chosen as representative users due to their familiarity with research and agriculture and the MCOM users were chosen due to their unfamiliarity in these areas. The difference in knowledge was noticeable various times during the usability testing. The following quotes help confirm these differences.

> MCOM User 5: I have no idea how to even try to find that stuff. If I don't even know where to go, do I have to find it?

> PSS User 5: It looks like it's going to give you a scholarly article but it doesn't. I think it's this

search over here, but what's coming up is not technically a scholarly article.

Knowledge of research, sorghum, and agricultural-related terminology seemed to help the PSS users complete the assigned tasks. For example, they tended to know exactly what a scholarly article was; whereas MCOM users had trouble identifying scholarly articles. Additionally, the average time on task for Tasks 4, 6, and 7 required the users to utilize the Research and Links tabs. These tasks had the greatest difference in average time between the PSS and MCOM users.

Objective two determined the relation of errors made during the usability testing by representative and non-representative users. In the context of usability, errors are defined as any action that does not accomplish the desired goal (Nielsen & Hackos, 1993). Errors were initially marked when a user began a task by clicking on the wrong page or chose a path other than the optimal one to complete a task. However, those errors were regarded as minor as long as the user completed the task successfully. Referring back to the definition of error in relation to usability, the researcher reported the number of errors that led to incompletion of tasks. These errors may also be referred to as catastrophic. The tasks were scored on a scale of zero to three. A score of zero indicated the task was completed with subtle or no error. A score of one indicated a minor effect on usability occurred. Significant delay or frustration with a task received a score of two. Most severely, a score of three identified a failed or incomplete task.

The tasks that were more complex received a higher number of incomplete scores. Task 4, the most complex task, received the highest number of incomplete scores. This task asked the users to locate three research resources on sorghum improvement. The focus was to lead the users to the three areas of the research tab—ongoing research, archived research, and Texas Tech research. Almost half, 40% (n = 4), of the users did not complete this task. Three of the four incompletions came from MCOM users who seemed frustrated and unsure of what Task 4 was asking them. They had the following responses in relation to what they would change about the site's research database:

MCOM User 2: Have the database grouped into categories based on date, location, context, etc.

MCOM User 3: I would definitely make the article link more noticeable. I would have given up on finding it if I were at home.

On several occasions throughout the test, users from both groups could not remain on their navigational path due to links that were not functioning correctly or pages that could not be found. Most often the "page cannot be found" error arose when users incorrectly used the search box at the top of the page, which will be discussed later. The broken link error on the site occurred when users tried to click directly on the "Research and Information Links" tab that was discussed earlier in this objective. PSS users were the only ones to comment on their experience with the broken links.

PSS User 2: Make sure the links are working.

PSS User 3: There were a couple of links that I found that were not found or not available. This was the only problem that I could find with the site navigation.

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As mentioned earlier, users would occasionally encounter a "page not found error." This error was due to improper use of the search function located on the site. The site features a database search box at the upper left-hand side of the page above the "Page Resources." The search box allows users to enter keywords relating to sorghum from the home page instead of trying to find the database search nestled at the bottom of the archived research page. The text above the box reads "Sorghum Database Search." The researcher noticed a trend regarding how users operated the search box throughout the testing. Many website, including the main Texas Tech site, offer a search function that allows users to type in any inquiry, specific or broad, and the entire site is searched for this information. The same is true with popular search engines. The search box only searches text located within the research database. Potential keywords users could search for are genetics, food, improvement, breeding, and sorghum.

On numerous occasions, users tried to repeatedly use the database search box as they would use a search function that explores the entire website. For example, when asked to find a keyword search area on the site for scholarly articles, several users typed in "scholarly articles" in the search box and received a "page not found error." MCOM users employed the database search box more often than PSS users. When asked what they would change about the site's navigation, the majority of MCOM users suggested making changes related to the search box and its functions.

> MCOM User 2: I would change the link for people to find a place to search for scholarly articles. I would make it easier to locate broad categories such as: affiliated organizations, submitting a suggestion, and how to determine which types of research are being done (nationally and locally).

Errors regarding the usability of the Texas Tech SRI occurred in several different ways. The researcher felt it was important to distinguish between the errors of the website itself and the errors of the user navigating through the site. Both of these errors can have an effect on the overall usability of the site. Although errors did exist, the users were still able to complete the assigned tasks in a timely manner.

Objective three assessed the learnability of the Texas Tech SRI site as perceived by the same users. Users should be able to quickly understand the navigational layout and perform similar actions throughout the duration of the test. Simply put, learnability focuses on how easy the system is to learn.

In general, the navigational layouts of most websites consist of one or more of the following: a left-hand toolbar, a right-hand toolbar, or a toolbar at the top of the page (Nielsen, 2004). Due to their Internet use and computer experience, the users for this study had an existing familiarity with the navigational layout of websites. Prior knowledge was evident when users said, "I'm assuming," "That's where I think it should be," and "Usually," in relation to where certain information was located on the site. The main navigation for the Texas Tech SRI site is located down the left-hand side of the interface and is referred to as "Page Resources." The navigational toolbar at the top of the site is not related to the Texas Tech SRI site, but offers choices associated with the university and the main campus website. Direct quotes from the users during testing and responses to post-tasks questions indicate familiarity with navigational layouts and the navigational layout of the Texas Tech SRI. These quotes also demonstrate the users' learnability of the site:

MCOM User 3: First I'm going to look for links. I usually look on the top and then I go to the left side. Usually it's toward the bottom of the left-hand side. There's usually a bunch of contact info at the bottom.

PSS User 2: That's generally found under links on most web pages.

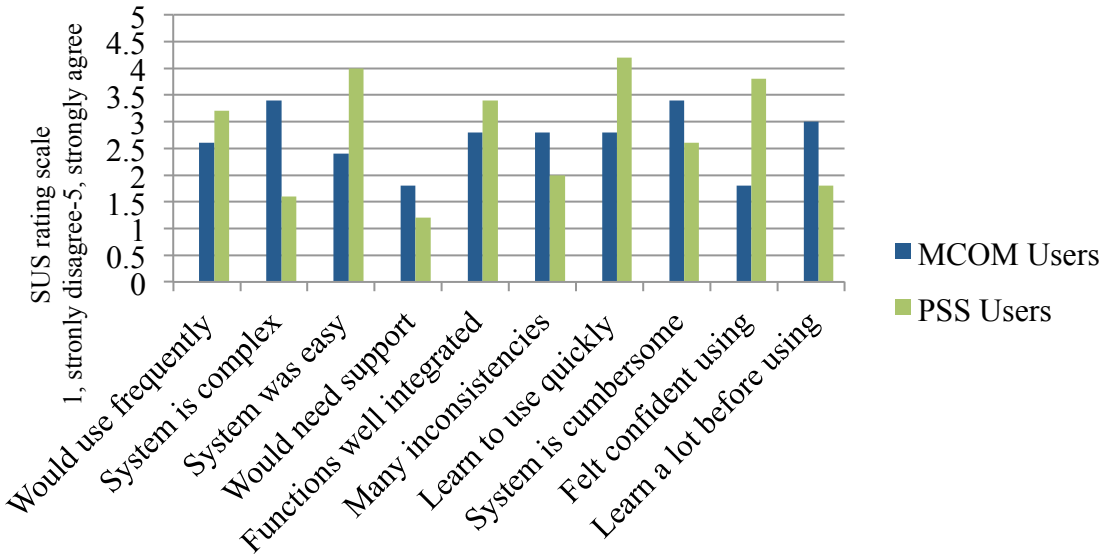
PSS User 3: I'll go back over to the page resources.

Throughout the tests, the users adopted the use of the "Page Resources" as the primary location for the beginning of each task. The only time this was not the case was in relation to the second task in which users were asked to find specific contact information. For this task, the users employed the top toolbar. Although this was not the optimal path, nine of the 10 users still completed the task.

In regard to learnability, overall, both the representative and non-representative users exhibited the skills necessary to navigate their way through the usability test. They were able to use the navigation scheme and layout available to continuously guide themselves through the Texas Tech SRI site.

Objective four determined the satisfaction of the representative and non-representative users during their interaction with the Texas Tech SRI site. Satisfaction refers to how pleasant the system is to use. Simply put, do users like using the system? User satisfaction with the Texas Tech SRI site was measured by using the results from the SUS survey taken by each user at the end of their test. This 10 question survey is used to measure the users' opinions of the site. The results from the SUS survey are shown in Figure 2.

Figure 2. Average SUS survey results by question.



Noticeable differences existed between the MCOM and PSS responses. The biggest differences in agreement related to questions regarding users' feelings about their use of the site. Case in point, MCOM users felt the system was more complex and PSS users felt that they system was easier to use. Also, PSS users disagreed with the question asking if they felt they would have to learn a lot before using the system. MCOM users responses were neutral in regard to the same question. Ac-

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cording to the survey, one of the biggest differences in MCOM and PSS users was their confidence level in using the site. PSS users indicated they felt confident using the system. An important area of the survey to note is the first question: I would use this system frequently. Only a small difference existed between MCOM and PSS users' response to this question. The average SUS score from each user group was also collected. MCOM users gave the site and average satisfaction rating of 45%, while PSS users gave the site a 73.5% satisfaction rating.

MCOM and PSS users gave the following responses when asked about their overall experience with the Texas Tech SRI site:

MCOM User 4: Well I have never been on this particular website so it was a little bit confusing at first glance but overall I feel that the page resources which are located on the left hand side of the screen helped me during my navigation.

PSS User 5: The website was easy to navigate. The panel on the left side of the page made everything easy to find. Contact info was the hardest to find because it was not under the link at the top of the page that said 'Contact.'

Conclusions/Implications/Recommendations

Overall, the findings indicated the representative user group, plant and soil science graduate students (PSS), had a more general understanding of the Texas Tech SRI site than non-representative group of mass communications undergraduates (MCOM). The PSS users' knowledge of research and agriculture likely helped them relate to the site more than MCOM users. This conclusion is supported by the following observations.

Objective one sought to determine efficiency: when users experienced the system, how fast could they accomplish the tasks? To determine efficiency, the average time both groups spent on each task was recorded and the number of mouse clicks the users used were compared. PSS users had a lower average number of mouse clicks per task than MCOM users. While the study shows that overall, MCOM users had a higher number of incomplete tasks than PSS users, the PSS users were not error free. However, because of PSS users familiarity with research articles and libraries, their efficiency may have been improved. This shows that once an experiences user has learned to use the system, he or she is more efficient when accomplishing tasks (MEELS efficiency).

MEELS considers objective two errors to be another part of usability testing. Looking at the error rate in objective two, errors were regarded as minor as long as the user completed the task. Users were able to complete the task even with errors, so the website is still able to function with the errors. The researcher reported the number of errors that led to incompletion of tasks, and the tasks were scored on a scale of zero to three. The tasks that were more complex received a higher number of incomplete scores. Almost half of the users did not complete task 4. The researcher realizes that the question could have been phrased differently, and there may have been a potentially higher number of completion scores.

Objective three assessed the learnability (MEELS learnability) of the Texas Tech SRI site as perceived by the same users. Learnability was easy to establish because none of the users had ever seen the TTSRI website before. Most websites are set up similarly: header, left or top navigation, and more information at the bottom of the page. Users were able to navigate the website based on prior website experience; the site was learnable.

Continuing with objective three, both groups quickly learned and continuously used the "Page Resources" navigation to help guide them through the site. However, the average time PSS users

spent on each task was less than MCOM users. In regard to errors, both groups did have frustrations with several tasks or failed to complete a task. Overall, MCOM users received more incomplete task scores than PSS users. The SUS survey results indicated a higher, overall satisfaction (objective four) rate among PSS users than MCOM users. When looking at MEELS as a conceptual framework, PSS likely received more satisfaction from the TTSRI website, because the content was relevant to the user.

These findings confirm that the Texas Tech SRI site is beneficial to representative users—those with knowledge of research and agriculture (objective four). There was a significant difference in MCOM users and PSS users. According to MEELS principles, it is low on the satisfaction scale because users who had never seen the website struggled to accomplish some of the basic tasks. Representative users will find a higher level of satisfaction, higher efficiency, and less errors. Other industry professionals wishing to conduct a usability test need to ensure that the audience is representative; however, non-representative groups could ensure that your website is easy to use for the representative user group. If you can only select one group, it is good to use the target audience for your representative users.

After the conclusion of this study, several recommendations are provided for future testing of the Texas Tech SRI site. First and foremost, before future research is conducted, adjustments should be made to the site based on the findings and recommendations from this study. The mixed-methods approach employed for this study provided adequate and accurate data. The qualitative information gathered from direct quotes and post-tasks questions was beneficial in showcasing the users' feelings, positive and negative, during testing. Quantitative information retrieved from the recruitment form, pre-tasks, and SUS surveys gathered important information such as the users' demographics, computer skills, familiarity and use of databases, use of agricultural and sorghum-related websites, and feelings related to the overall usability of the Texas Tech SRI site. The data gathered from both methods of collection was instrumental in presenting the findings of the usability study. Applying both methods to future studies will help provide solid and informative results. Additionally, future researchers should follow usability recommendations for field testing or site visits.

This study highlights the importance how essential it is to test on representative user groups. The Internet is full of websites, loaded with vast amounts of information. If the site is difficult to use or understand, the user will search elsewhere for the information (Krug, 2006). Knowing that each site is competing for users means that each design flaw ultimately means a loss of business. Equally important are the users we are testing. If they will not be the ones ultimately be using the product, how will the researchers know how to better adapt for the intended audience? Usability testing will become more relevant as the number of sites online increases.

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