

**Design and evaluation of an accessible website developed using SharePoint 2010**

by

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## Abstract

The internet and web applications are growing rapidly. People are, more than ever before, dependent on the web applications and this dependency will continue to increase. A large number of web users have various accessibility needs and hence it is very important to ensure that the web applications are made accessible.

This research deals with maximizing the accessibility of web sites. As a part of this research, accessibility was studied in detail. The research aimed at developing an accessible web site using SharePoint 2010. This was the object of a usability study. In this study, the usability of this web site was compared with that of inaccessible web sites. Participants for the usability tests were selected from Alabama Institute of Deaf and Blind. Results confirm that the degree of accomplishment of tasks, confidence level, learnability, and overall reaction of participants were higher while using accessible web sites built using SharePoint 2010 than while using inaccessible web sites.

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## List of Abbreviations

AIDB	Alabama Institute of Deaf and Blind
ADA	Americans with Disabilities Act
HTML	Hyper Text Markup Language
IRB	Institutional Review Board
SQL	Structured Query Language
W3C	World Wide Web Consortium
XML	Extended Markup Language

## **Chapter 1**

### **Introduction**

The Internet is growing at an ever-accelerating pace and has now become an integral part of human experience. It has been deployed in a wide spectrum of devices ranging from computers and phones to cameras and music players hosting numerous applications. Over the years, the ubiquity of web users and the increasing demand of web applications has led to large growth and improved quality of web applications. Quality of web applications refers to many attributes. Some of them are reliability, speed, security, usability, accessibility etc. Accessibility is one of the lesser-discussed and lesser-emphasized quality attributes of a web application. This thesis discusses the importance of web accessibility.

#### **1.1 Web accessibility**

Web accessibility means that people with disabilities (such as visual impairment) are able to use the web to access content and information. There are many factors that contribute to making the web accessible. Some of the factors include textual and graphic information in the web site, browser, screen readers, screen magnifiers, assistive keyboards, and finally the web developers themselves. A successful blend of all these features is important in order to make the web accessible. If one of these components is not accessible, it might affect the user experience drastically. For instance, if a web development software tool does not allow or does not make it easy to implement the accessibility guidelines (e.g. adding the “alt” attribute to images in HTML), the tool would pose an impediment in implementing accessibility.

## **1.2 SharePoint**

SharePoint is a web application platform developed by Microsoft. [1] It was launched in 2001 as a single replacement for various web applications that support a wide range of enterprise web needs including web content management and document management. As a result of its versatility, SharePoint is a widely used web development platform.

In this thesis an accessible web site is designed using SharePoint 2010 and its performance is evaluated by conducting usability studies with subjects having accessibility needs.

## **Chapter 2**

### **Objective**

Emphasis on web accessibility is increasing rapidly. Hence, understanding and implementing web accessibility, learning how users with disabilities and accessibility needs interact with web sites and developing techniques to enhance accessibility are essential. The objective of this research is to systematically understand and statistically quantify users' efficiency in interacting with an accessible web site.

The specific goals of this research work are:

1. To develop a highly accessible and interactive web site with various web components like blog, forms, images and multi-media content using SharePoint 2010
2. To systematically evaluate various components of this web site, such as forms, images, links, navigation etc. and to compare them with that of an inaccessible web site
3. To design usability tests for blind, partially blind, and deaf participants to achieve the abovementioned objective
4. To obtain and analyze quantitative data by measuring the users' degree of accomplishment of tasks, confidence, learnability, and overall reaction to the different aspects and components of the web site.
5. To obtain qualitative data by interviewing the participants of the usability test to obtain feedback.

## Chapter 3

### Literature Survey

#### 3.1 Need for web accessibility

Web Technology is one of the fastest growing areas of technology. In addition to traditional devices such as computers, other devices such as cell phones, cameras, music players etc. incorporate web technologies [2]. Figure 1 shows the steep increase in the number of web users since 1995.

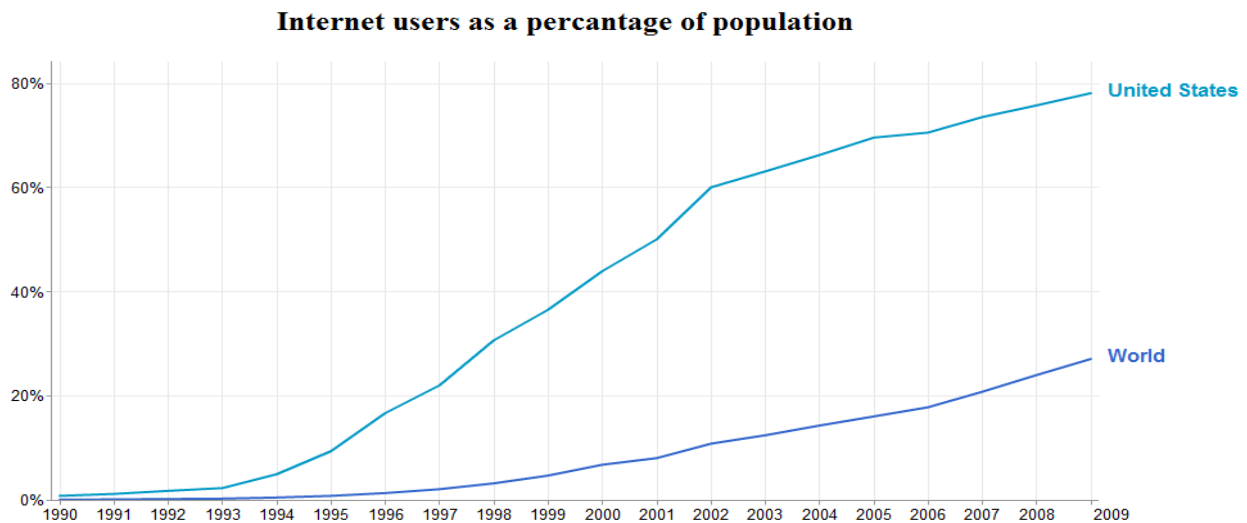


Figure 3.1: Chart showing the increase in the number of web users since 1995 [3]

The popularity and penetration of web technology has made it one of the most powerful tools for communication and interaction. To make this interaction efficient, it is desirable to make web technology inclusive. As the skills and limitations of individuals are varied, accessible

technology must be engineered by minimizing the overlap between the user's shortcomings and the demands of the technology. This can be accomplished by training humans to fulfill the technological demands or by building technology that can accommodate the user's skills and shortcomings. [4]

The term web accessibility refers to an individual's ability to use all aspects of the web, such as browsers online document editing, media players, internet applications over phone etc. regardless of his/her disabilities. [4] A large number of individuals using the web have variety of special needs, some of which are listed below [5]:

- Visual – Limited or complete blindness, color blindness
- Hearing - Deafness
- Motor- Inability to use a mouse/ keyboard
- Cognitive - Learning disabilities and distractibility

Making web technologies accessible is of paramount importance because of the following reasons

- Ethical aspect
- Population of people with special needs
- Long-term cost saving
- Legal responsibility

### **3.1.1 Ethical aspect**

Web accessibility empowers all individuals to be included in the society we live in. Since internet has become an inalienable part of human experience and enrichment, it is extremely

important to ensure that a section of the society is not deprived of this experience due to their disabilities. The Internet opens doorways to endless possibilities, and web developers around the globe have the responsibility to ensure that all individuals have access it. [6]

### **3.1.2 Population of people with special needs**

Disabilities among some individuals are congenital, but most people develop special needs as they age. Statistics reveal that one in every five individuals over the age of 65 (totaling 53 million) has special needs. Also it is important to note that the population demographics have indicated an increase in the average age of humans around the world. Research shows that 8% of American children have special needs and world over there are 750 million children with disabilities. [7]

### **3.1.3 Long term cost saving**

Building accessible web sites can result in long-term cost and time savings because building such web sites involves preparation and research. In addition to that, web accessibility encourages best practices such as separating the presentation of a web site from its content. Hence adhering to accessibility guidelines makes managing and migrating contents cheaper. Such web sites also eliminate the need of alternative accessible formats such as braille, large prints, and transcriptions. [6]

### **3.1.4 Legal responsibility**

The US federal government requires that all web sites be accessible. Web accessibility requirements are discussed in three federal laws namely: Sections 504 and 508 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 (ADA). Section 504 of the Rehabilitation Act mandates that all educational programs aided by federal government must be accessible. It also iterates accessibility is a form of civil right and is covered by the 14<sup>th</sup>



amendment of the US constitution. ADA mandates that all public educational institutions must communicate effectively with students with disabilities unless doing so will result in fundamental alteration of the program. Section 508 of Rehabilitation Act of 1973 requires that all web-based information be equipped with the following:[8]

- Text explanation for non-text elements
- Synchronized accessible alternative for multimedia contents
- Accessible alternative for information conveyed by color
- Redundant links for all regions of server side maps
- Client side image maps in place of server side image maps
- Identification of data type in all rows and columns of all tables
- Text for frame identification and navigation
- Assistive technology friendly electronic forms that avoid screen flicker with a frequency greater than 2 Hz and lower than 55 Hz

### **3.2 Towards accessible web sites**

Many researchers have made key contributions in making web sites accessible. To name a few, Petrie and coworkers' report disproves the popular myth that accessible web sites cannot be visually pleasing [9]; Kurniawan and coworkers [10] developed a research driven web-development guidelines for older people; Craven and coworkers' work was aimed at creating awareness to build accessible web sites [11]; Mankoff and coworkers developed a comparative study for accessing webpages that are accessible for the blind [12]; and Lazar and coworkers studied webmaster perception in improving web accessibility [13].

This work develops and evaluates a web site that is accessible to blind, partially blind and deaf users.

## **Chapter 4**

### **Design of accessible web site**

This chapter discusses the design aspects of an accessible web site developed by the researcher. The web site developed in this work serves as the web presence for Dr. Marghitu at Auburn University and provides information about her research, publications, books, mentoring offered to students with special needs, etc. The web site was created using Sharepoint 2010 and tested for accessibility using an online evaluation tool.

#### **4.1 Background work**

Before developing the web site, the researcher performed a thorough evaluation of an educational web site (myitlab.com) for accessibility. This process involved checking every page of the web site for accessibility using the following online tools and assistive technologies:

- WAVE (online tool to test accessibility)
- JAWS screen reader
- ZoomText screen reader
- ZoomText screen magnifier

This evaluation also listed out the technical errors in faulty pages and described how these errors can be fixed to make the web site accessible.

Before the design phase of the web site, the researcher visited Alabama Institute of Deaf and Blind (AIDB) at Talledega, AL to better understand how users with accessibility needs interact with the web using various assistive tools. From these interactions it was hypothesized that even

web sites that pass accessibility tests may pose challenges to users. For instance, images in the web sites could have alt attribute that enables it to pass the accessibility guidelines, but it is not of much help to the user if the attribute is not descriptive.

The background work provided a basis for developing an intuitive web site that addresses the accessibility needs of users.

## **4.2 Web design**

### **4.2.1 Software Process**

The software process used to develop the web site was user-centered design (UCD). At the beginning of the process, the following objectives were identified: A SharePoint site collection was created and a prototype of the web site was developed. The prototype was then tested and verified during weekly research meetings. Toward the end of the development, a pilot test was conducted. Feedbacks obtained from the test were incorporated in the web site. Finally, usability tests were conducted to evaluate this web site.

### **4.2.2 Design implementation**

The software used for building this web site included:

- SharePoint 2010 - This software platform was used to develop most parts of the web site. SharePoint allows providing access to users at different levels. Hence it facilitates the contribution of ideas by different people and managing content. Many students were given permission to contribute to the content of the “Baccalaureate” page.
- SharePoint Designer 2010 – This was used to understand the implementation of the web site. It was used as an HTML editor and to customize the web site. Understanding this software was necessary to make any customization of the web site.

- InfoPath 2010- This software was used to create XML forms. An event registration form was created using InfoPath. It is implemented in two ways in the web site. In one implementation, a hyperlink is provided for the form. Upon clicking on the link, the form opens up as different webpage. In another implementation the form is implemented as a web part i.e. the form is the part of the web page.
- Microsoft Access 2010 -This was used to make a dynamic search form. The form was linked to an Access database. The content entered in the textbox or selected in the combo box in the form was used to query the database and generate the results. Macros and SQL queries were used to query the database.
- Html Tidy was used to test the web site for accessibility. This tool allowed testing the web site with Priority 1, 2 and 3 accessibility guidelines recommended by the W3C.

Figures below show screenshots of the web site developed in this work. Fig. 4.1 provides the screenshot of the home page of the web site created. The interactive web site also has a form page (Fig. 4.2) for the users to register and a blog page (Fig. 4.3) where the users can contribute.

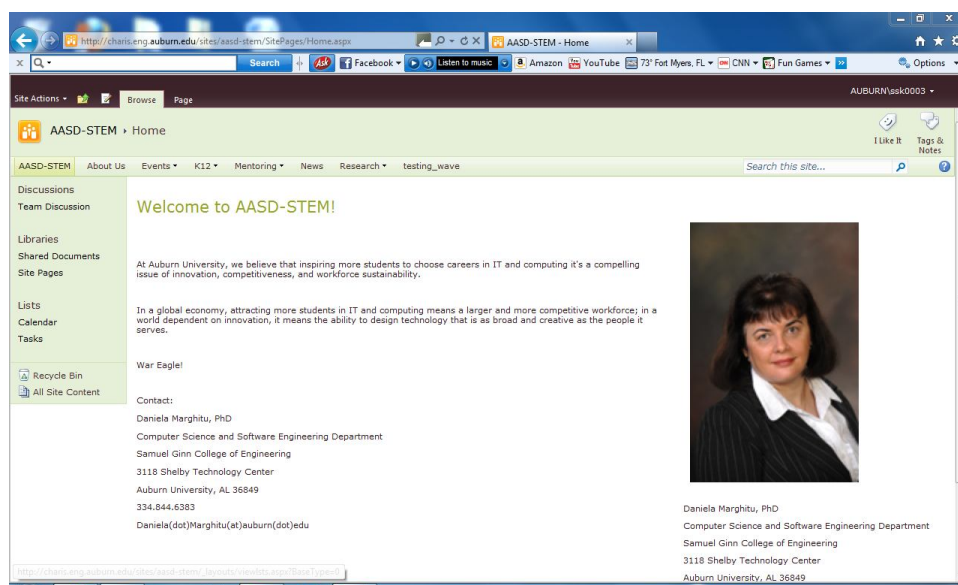


Fig. 4.1 Screenshot of the homepage of the web site developed in this work

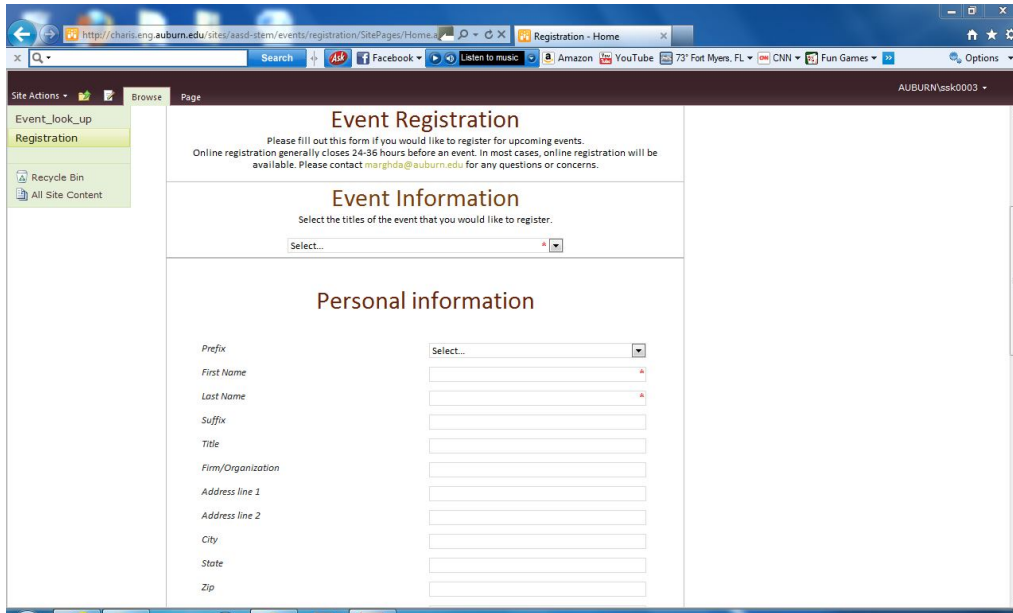


Fig. 4.2: Screenshot of the event registration form

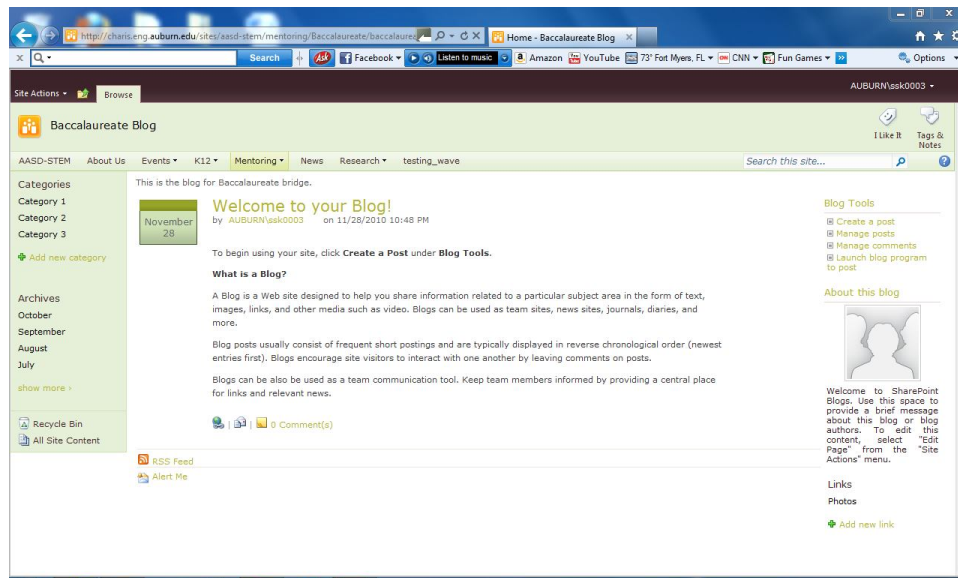


Fig 4.3: Screenshot of the blog page

## **Chapter 5**

### **Usability evaluation**

An experiment was conducted to test the usefulness and efficiency of the web site developed in this work. The participants for this usability studies were chosen from AIDB and the test was administered in a computer laboratory. The subjects were provided with the necessary equipment and software like screen reader, speakers, screen magnifier etc.

#### **5.1 Participants**

The participants of this study were students from Alabama Institute of Deaf and Blind (AIDB), Talladega, Alabama. A diverse group of participants who had no vision, partial vision and hearing impairment were selected for this study. There were 5 participants from each category, making a total of 15 participants. The selection criteria for the participant population were:

1. The participant must be 19 years or older
2. The participant should have at least one of the following disabilities.
  - a. Completely blind
  - b. Partially blind
  - c. Deaf
3. The participant should know how to use a computer, the Internet, and the necessary accessible software.
4. The participant should not have intellectual disabilities

The participants were recruited by contacting the instructors at the Gentry Facility in AIDB.

### **5.1.1 Demographic Data of the participants**

The participants were asked to complete a survey before beginning the experiment. This survey consisted of questions about the participants' age, sex and disability. The participants were free to not answer these questions. Subsequently, the survey consisted of questions that captured the participants' grasp of computers, the Internet, use of keyboards, use of assistive software, and the duration for which they have been using them. Detailed demographic information of test subjects can be found in Appendix C.

## **5.2 Design**

A within-subject design was used. As a part of this design, the participants were asked to use both accessible and inaccessible web sites. This provided qualitative and quantitative information on their performance in both accessible and inaccessible interfaces. A within-subject design was also used because it helped to work around the problem of limited participant population.

### **5.2.1 Designing the tasks**

The tasks assigned to the participants on both the web sites were similar in nature. The tasks for blind participants involved filling forms and accessing images. The tasks for partially blind participants involved navigating and finding information and accessing images. The tasks for deaf participants involved accessing videos and other audible contents.

### **5.2.2 Designing the questionnaire**

The tests were designed to gather both qualitative and quantitative data. A Likert scale questionnaire was used to collect quantitative data. Two kinds of questionnaires were designed. One was used to perform a comparative study about both the web sites. This questionnaire had the same set of questions for both the web sites. It gauged the level of "accomplishment of

tasks”, “confidence”, “learnability” and “overall reaction” of the participants. The other questionnaire dealt with questions about features that were unique to the accessible web site. At the end of the test, the participants were interviewed about their experience with the accessible web site. The questionnaire used in this work can be found in Appendix C.

### **5.2.3 Selecting Inaccessible Web sites**

The usability tests required inaccessible web sites as a basis for comparison with the accessible web site that was built for the study. Many things had to be taken into consideration before selecting an inaccessible web site. For instance, blind subjects were asked to fill an accessible form and an inaccessible form. It was important to make sure that both forms had similar fields. This would help in making a fair comparison. The characteristics that were required in an inaccessible form were:

- Presence of text field
- Presence of combo box
- Presence of check box or radio button

Fig. 5.1 shows the inaccessible form chosen for this study



**Volunteer Form**

**Full Name**   
**Phone Number**   
**Email Address**   
**Verify Email**   
**Street Address**   
**Street Address 2**   
**City, State, Zip**  Alberta   
U.S. & Canada  
**Country**  United States

**Position(s)**  
 Multiple positions in multiple classifications may be applied for.

<b>Law Enforcement Only</b> <input type="checkbox"/> Advisory Committee <input type="checkbox"/> Assist the COI <input type="checkbox"/> Intelligence Preparation <input type="checkbox"/> Assist the CLELO <input type="checkbox"/> Assist in Investigations	<b>Technical</b> <input type="checkbox"/> .NET Programming Lead <input type="checkbox"/> PHP Programming Lead <input type="checkbox"/> SQL DB Lead <input type="checkbox"/> .NET Programmer <input type="checkbox"/> PHP Programmer <input type="checkbox"/> DBA	<b>Project</b> <input type="checkbox"/> Project Manager <input type="checkbox"/> Business Analyst
<b>Education Volunteers</b> <input type="checkbox"/> Assistant to Course Developer <input type="checkbox"/> Educational Web Site Developer <input type="checkbox"/> Tools For Educators Developer <input type="checkbox"/> Work Shop Content Developer <input type="checkbox"/> Seminar Content Developer <input type="checkbox"/> Accreditation Facilitator <input type="checkbox"/> Bi-lingual cultural educator	<b>Administrative Assistants</b> <input type="checkbox"/> Assistant to CEO <input type="checkbox"/> Assistant to CSO	<b>Legal Consultants</b> <input type="checkbox"/> Assistant to SFVA
<b>Scam Email Analysis</b>	<b>Bank Liaison Advisory</b>	<b>Fraud Prevention Specialists</b>

Fig. 5.1: Inaccessible form chosen for usability study for blind users

Images without an alt attribute are inaccessible as they cannot communicate with blind users.

Fig. 5.2 shows a screenshot of a tourism page that has images without corresponding alt attributes. This image was chosen for this study.

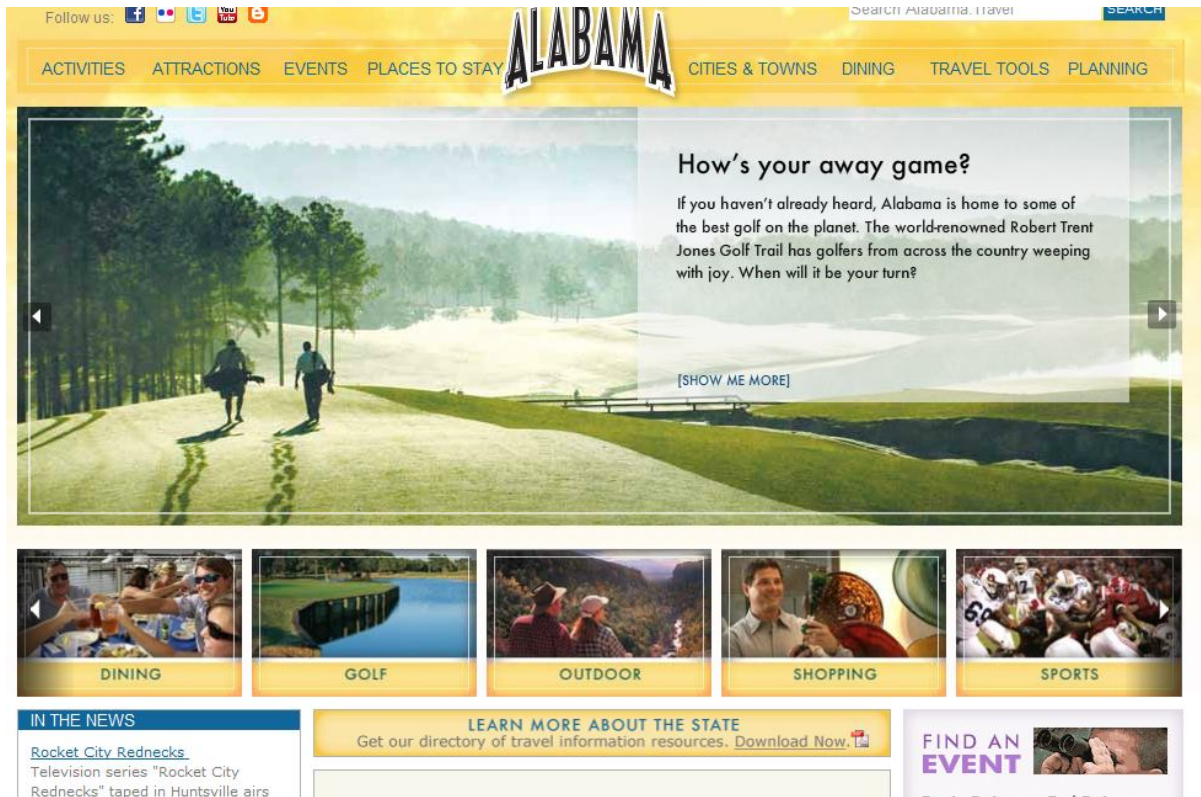


Fig. 5.2: Inaccessible image chosen for usability study for blind users

The following makes web content inaccessible for users with partial vision

- Images that are not still, e.g. flashing or moving images.
- Images of very dark or light color
- Images with poor resolution

The inaccessible image chosen (see Fig. 5.3) for usability study had one or more of the above accessibility conflicts.



Fig 5.3: Inaccessible image chosen for usability study blind users

Inaccessible web site chosen for deaf subjects had video content with closed captions or subtitles.

### **5.3 Test execution**

The usability tests were conducted one participant at a time except for the deaf population. When a participant arrived at the computer laboratory, the IRB consent form was handed out. Participants with low or no vision were given access to a document reader to listen to the consent form and verify it personally. It was reiterated to them that the data was collected in an anonymous fashion and that their privacy was protected. Also, they were allowed to step out of the experiment at any point in time during the experiment.

Upon receiving the consent from the participants, the experiment was started. The participants were first asked a few pre-test questions about demographic data and their level of proficiency in computers, keyboards, accessibility software, the Internet etc.

Following the pre-test, they were given a list of tasks to perform. An identical set of tasks was assigned for both accessible and inaccessible web sites. The researcher observed the participants performance and made a log of common mistakes. After the completion of tasks, the participants were presented with a Likert scale questionnaire. The participants were also interviewed about their experience with the web sites.

### **5.4 Evaluation**

The usability test was measured both qualitatively and quantitatively. It was measured quantitatively through a 5-point Likert scale ranging from strongly agree to strongly disagree and qualitatively through an interview at the end of the experiment.

The evaluation was broken down into three categories: for the blind, partially blind, and deaf. For the blind population the independent variables are blind forms and blind images. The

dependent variables are accomplishment of tasks, confidence, learnability and overall reaction. For the partially blind and deaf population the independent variables were accessible and inaccessible web sites, and the dependent variables were accomplishment of tasks, confidence, learnability, and overall reaction.

### **5.5 Equipment and other support**

The devices used for conducting this experiment were a computer with Internet connection, a document reader, a screen magnifier, a screen reader and speakers. The deaf participants were provided with sign language translations whenever required.

## Chapter 6

### Results and Discussion

#### 6.1 Quantitative analysis of data

The experimental data was collected using a 5-point (1- Strongly Agree to 5-Strongly Disagree) Likert scale questionnaire. Unique questionnaires were formed for each kind of disability. Each questionnaire collected data in four different categories: Level of accomplishment of tasks, confidence, learnability, and overall reaction. The questionnaire had two to five questions pertaining to each category and the average of the responses provided by each participant for questions relating to a particular category was determined for both the web sites. For example, tables 6.1 and 6.2 below show how learnability of blind participants was computed for accessible and inaccessible web sites, and table 6.3 consolidates the average scores for accessible and inaccessible web sites.

Table 6.1: Participants' response to questions pertaining to learnability in accessible web site

<b>Participant</b>	<b>Question 1</b>	<b>Question 2</b>	<b>Question 3</b>	<b>Average</b>
1	5	5	5	5.000
2	5	5	5	5.000
3	5	5	5	5.000
4	5	5	5	5.000
5	5	5	5	5.000

Table 6.2: Participants' response to questions pertaining to learnability in inaccessible web site

<b>Participant</b>	<b>Question 1</b>	<b>Question 2</b>	<b>Question 3</b>	<b>Average</b>
1	3	2	4	3.000
2	5	5	5	5.000
3	5	5	5	5.000
4	1	2	5	2.667
5	4	1	5	3.333

Table 6.3: Consolidated participants' response pertaining to learnability in accessible and inaccessible web sites

<b>Participant</b>	<b>Average scores inaccessible web site</b>	<b>Average scores accessible web site</b>
1	3.000	5.000
2	5.000	5.000
3	5.000	5.000
4	2.667	5.000
5	3.333	5.000

Using the above technique, average scores for accessible and inaccessible web sites for all four categories were obtained. These average response scores were treated as interval data, permitting use of the paired t-test to analyze the data set. A single tail paired t-test was used because prior to conducting the experiments, it was predicted that the average accessible scores for all categories would be higher than the average inaccessible scores.

Using the above technique the following null hypotheses were tested.

*H<sub>01</sub>: The degree of accomplishment for task by blind subjects while using forms in inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.092; hence there is not enough evidence to reject the null hypothesis.

*H<sub>02</sub>: The level of confidence of blind subjects while using forms in inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.036. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

H0<sub>3</sub>: *The overall reaction among blind subjects while using forms in inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.037. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

H0<sub>4</sub>: *Learnability of blind subjects while using forms in inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.016. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

H0<sub>5</sub>: *The degree of accomplishment for task by blind subjects while using images in inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.006. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

H0<sub>6</sub>: *The level of confidence of blind subjects while using images in inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.002. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

H0<sub>7</sub>: *The overall reaction among blind subjects while using images in inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.009. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

H0<sub>8</sub>: *Learnability of blind subjects while using images in inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.007. Since

the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

*H0<sub>9</sub>: The degree of accomplishment for task by partially blind subjects while using an inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.007. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

*H0<sub>10</sub>: The level of confidence of partially blind subjects while using an inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.003. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

*H0<sub>11</sub>: The overall reaction among partially blind subjects while using an inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.019. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

*H0<sub>12</sub>: Learnability of partially blind subjects while using an inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.021. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

*H0<sub>13</sub>: The degree of accomplishment for task by deaf subjects while using an inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.



H0<sub>14</sub>: *The level of confidence of deaf subjects while using an inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.011. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

H0<sub>15</sub>: *The overall reaction among deaf subjects while using an inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

H0<sub>16</sub>: *Learnability of deaf subjects while using an inaccessible web site is equal to higher than that of accessible web site.* The P-value for the one tail T test was found to be 0.006. Since the P-value is less than 0.05, there is enough evidence to reject the null hypothesis and accept the alternate hypothesis.

A summary of the above results is shown in table 6.4.

Table 6.4: Results of one-tail paired t-test

<b>Disability</b>	<b>Null hypothesis tested</b>	<b>P-value</b>	<b>Reject H0?</b>
Blind	H0 <sub>1</sub> : (Degree of accomplishment while using forms)	0.092	No
	H0 <sub>2</sub> : (confidence level while using forms)	0.036	Yes
	H0 <sub>3</sub> : (overall reaction while using forms)	0.037	Yes
	H0 <sub>4</sub> : (learnability while using forms)	0.016	Yes
Blind	H0 <sub>5</sub> : (Degree of accomplishment while using images)	0.006	Yes
	H0 <sub>6</sub> : (confidence level while using images)	0.002	Yes
	H0 <sub>7</sub> : (overall reaction while using images)	0.009	Yes
	H0 <sub>8</sub> : (learnability while using images)	0.007	Yes
Partially Blind	H0 <sub>9</sub> : (Degree of accomplishment)	0.007	Yes
	H0 <sub>10</sub> : (confidence level )	0.003	Yes
	H0 <sub>11</sub> : (overall reaction)	0.019	Yes
	H0 <sub>12</sub> : (learnability)	0.021	Yes
Deaf	H0 <sub>13</sub> : (Degree of accomplishment )	0	Yes

	H0 <sub>14</sub> : (confidence level )	0.011	Yes
	H0 <sub>15</sub> : (overall reaction)	0	Yes
	H0 <sub>16</sub> : (learnability)	0.006	Yes

The accessible web site designed in this work implemented the following features that attempted to enhance accessibility:

1. All images used in the accessible web site had meaningful descriptions. For instance, the image of Dr.Marghitu had its alt attribute as “image of Dr.Marghitu” as opposed to “Dr.Marghitu”. This is helpful because the screen reader parses the underlying HTML of a webpage and reads out the alt attribute of an image when pointed at an image. Without such an intuitive description, it is hard and sometimes impossible for a blind participant to know that the object under consideration is an image. The fig (6.1) shows the participants reaction to such a feature.
2. All fields in the forms used in the accessible web site had meaningful descriptions. For instance, the textbox which served as the second address line was read out by the screen reader as “This is the second address line” as opposed the “Address line”. Such a detailed description is helpful because, sometimes information, address in this case might run short of space. This feature gives the user a better grasp of the nature of the form. The fig (6.1) shows the participants reaction to such a feature.
3. The closed captions of the video were well synchronized. As indicated by fig (6.1), synchronization of video and closed captions were desired by users with hearing impairment.
4. All the links in the web site had meaningful names. For example, a link called “click here to create a post” is more meaningful than “click here”. This is helpful because, partially blind users who use extremely high magnification and blind users can lose the context in

which the link was presented or might accidentally click on a wrong link. Hence links with appropriate names are helpful. Fig.6.1 shows the participants reaction to such a feature.

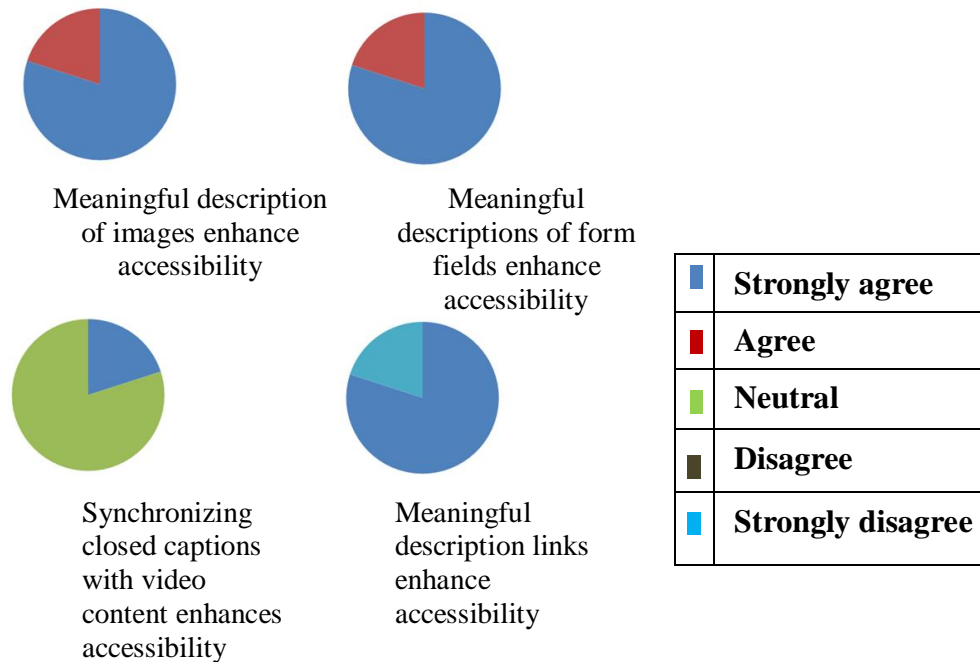


Fig. 6.1: Participants' response to accessibility related questions

The above images indicate that

- Four out of five participants strongly agreed that meaningful descriptions of images enhance accessibility. One person strongly agreed
- Four out of five participants strongly agreed that meaningful descriptions of fields in the form enhance accessibility. One person strongly agreed
- Four out of five participants were neutral about enhancement of accessibility by synchronizing closed captions with videos. One person strongly disagreed
- Four out of five participants strongly agreed that meaningful names of links enhance accessibility. One person strongly disagreed

## 6.2 Qualitative analysis

The questionnaire provided to the participants also had questions that were qualitative in nature.

Tables 6.5, 6.6 and 6.7 summarize the responses of blind, partially blind and deaf participants respectively.

Table 6.5: Response to qualitative questions provided by blind participants

Participant	Problems you generally face while using any web site?	Does this web site address your concerns?	What are the things you like about this web site?	What are the things you don't like about this web site?	Changes recommended
1	Not being able to complete forms  Accessing images without description	Yes	Accessibility  Images and forms with description  Easy to use	None	None
2	Inaccessible Calendar pages when paying the bill  Forms without data  Forms that do not read the correct edit box 4 Captchas and their audio	Yes	Enough description for images and forms but not too much  overall accessibility	None	None
3	Flash content  Unlabeled	Yes	Text labels on everything	None	None

	links and buttons  Unlabeled text edit boxes				
4	Information not formatted  Not enough description to let the user know what to do	Yes	Descriptions for everything  No room to not know  Forms and Images with extra descriptions	None	None
5	Buttons and Tabs that the screen reader does not read  Putting in passwords	Yes	Ranged in the order of using headings and other short cut key strokes for navigation	Takes long time to understand	None

Table 6.6: Response to qualitative questions provided by partially blind participants

<b>Participants</b>	<b>What are the problems you generally face while using the web site?</b>	<b>Does this web site address your concerns?</b>	<b>What are the things you like about this web site?</b>	<b>What are the things you don't like about this web site?</b>	<b>Do you recommend any changes to this web site?</b>
1	Trying to find the link or information  Too much information	Yes	Was not too cluttered and did not have too much going on	None	Brighter color
2	Locating information	Yes	Information was lined up.  Collapsible link on the top bar	None	None
3	Flashing images  Unlabeled	Yes	Links are in columns or in line across top	Nothing	Darker color

	buttons Chaotic organization of links		No flashing images Well labeled links		
4	Bright colors Cluttered information Flashy objects	Yes	Everything was spaced out	None	None
5	None	Nil	Links	None	None

Table 6.7: Response to qualitative questions provided by deaf participants

<b>Participants</b>	<b>What are the problems you generally face while using the web site?</b>	<b>Does this web site address your concerns?</b>	<b>What are the things you like about this web site?</b>	<b>What are the things you don't like about this web site?</b>	<b>Do you recommend any changes to this web site?</b>
1	Audio without subtitles	Yes	Closed captions Fewer Links	Very plain	Colorful background
2	Audio without subtitles	Yes	Closed captions Fewer Links	Very plain	Attractive background
3	Audio without subtitles	Yes	Closed captions Fewer Links	Very plain	More colors
4	Audio without subtitles	Yes	Closed captions Fewer Links	Very plain	Colorful
5	No closed captioning Absence of message errors while filling forms	Yes	Closed captions Fewer Links	Slow	1 Background images and colors 2 Background logo

The above tables have reiterated the results obtained from the statistical tests. From the above tables it is clear that the web site addresses all the needs of blind population. But, the responses from the partially blind population indicate that they would prefer a color contrast in the color scheme of the web site. However they have indicated satisfaction about images, navigation, and finding information. The responses from the deaf population indicate that they prefer more images, a different background color, and aesthetic appeal of the web site. These findings conclude that every set of population has unique needs. Hence it is the job of the web developer to create an aesthetically appealing web site while complying with all the accessibility standards. In this work, the participant population included 5 candidates from blind, partially blind and deaf categories. Since the population of the test subjects is very small, the statistical power of this work is limited.

## **Chapter 7**

### **Conclusion and Future work**

#### **7.1 Conclusion**

This research aimed at developing an accessible web site with SharePoint 2010 and to test the accessibility of that web site with a disabled population. Usability tests were conducted to establish the efficiency of the web site. The tests were conducted on participants from Alabama Institute of Deaf and Blind (AIDB), Talladega, Alabama. Every aspect of the web site such as forms, images, multimedia content and navigation was carefully examined. During the tests, every accessible aspect was coupled with another inaccessible counterpart. Quantitative and qualitative data was collected. Quantitative data was statistically analyzed. The results of the usability tests showed that an accessible web site increases the degree of accomplishment of tasks, confidence, overall reaction and learnability. These findings were corroborated by the interview responses (qualitative tests) from the participants of the usability tests. In addition, the research made an attempt to enhance the accessibility. This has received a positive feedback from the disabled population. The statistical power of these findings are limited because of a small sample size (N=5; M=15).

#### **7.2 Future Work**

This research can be enhanced in several ways. The web site can be developed further to include more features and information. The web site is currently hosted on an intranet password protected server. The web site can be hosted live in order to test it with the accessibility tools that



accept the URL of a web site as input. Further, the usability tests can be repeated for a larger audience and hence collect substantial data to help make new findings. The usability tests can monitor the time taken to complete each task. This will contribute to the quantitative data and have a higher statistical significance. Finally, the usability tests can have an error log that documents all the pit falls of the user during the course of task completion.

## References

1. Oleson, J., *7 Years of SharePoint - a History Lesson*. Joel Oleson's Blog - SharePoint Land. MSDN Blogs (Microsoft Corporation), 2007.
2. *Software & Information Industry Association Trends Report 2001: Trends Shaping the digital economy*. 2001; Available from: <http://www.trendsreport.net>.
3. Group, M.M. (Jan 2008) *internetworldstats.com*.
4. Raskin, J., ed. *The humane interface: new directions for designing interactive systems* 2000, Addison Wesley.
5. Waldrop, J. (2000) *Population profile of the United States, US Census Bureau. 2000*.
6. Bonner, P. (May 7, 2002) *And websites for all*. PC Magazine, IP01-IP03.
7. *World Health Organization: Future trends and challenges in rehabilitation*. June 18, 2002; Available from: <http://www.who.int/ncd/disability/trends.htm>.
8. Patrick, D., *Correspondence from Assistant Attorney General Deval Patrick to Senator Tom Harkin*. Sep 9, 1996.
9. Petrie, H., F. Hamilton, and N. King, *Tension, what tension?: Website accessibility and visual design*, in *Proceedings of the 2004 international cross-disciplinary workshop on Web accessibility (W4A)*. 2004, ACM: New York City, New York. p. 13-18.
10. Zaphiris, P., S. Kurniawan, and M. Ghiawadwala, *A systematic approach to the development of research-based web design guidelines for older people*. Universal Access in the Information Society, 2007. **6**(1): p. 59-75.

11. Craven, J., *Electronic access for all: awareness in creating accessible websites for the university library.*
12. Mankoff, J., H. Fait, and T. Tran, *Is your web page accessible?: a comparative study of methods for assessing web page accessibility for the blind*, in *Proceedings of the SIGCHI conference on Human factors in computing systems*. 2005, ACM: Portland, Oregon, USA. p. 41-50.
13. Lazar, J., A. Dudley-Sponaugle, and K.-D. Greenidge, *Improving web accessibility: a study of webmaster perceptions*. *Computers in Human Behavior*, 2004. **20**(2): p. 269-288.

**Appendix A**  
**IRB Documents**

**AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD for RESEARCH INVOLVING HUMAN SUBJECTS  
RESEARCH PROTOCOL REVIEW FORM**

For Information or help contact **THE OFFICE OF RESEARCH COMPLIANCE**, 115 Ramsay Hall, Auburn University  
Phone: 334-844-5966 e-mail: hsubjec@auburn.edu Web Address: <http://www.auburn.edu/research/vpr/ohs/>

Revised 03.26.11 – DO NOT STAPLE, CLIP TOGETHER ONLY.

Save a Copy

1. PROPOSED START DATE of STUDY: Apr 7, 2011

PROPOSED REVIEW CATEGORY (Check one): FULL BOARD  EXPEDITED  EXEMPT

2. PROJECT TITLE: Usability tests directed towards determining the usefulness of accessible web sites

3. Sonal Kulkarni Graduate Student CSSE 334-333-4216 ssk0003@auburn.edu  
 PRINCIPAL INVESTIGATOR TITLE DEPT PHONE AU E-MAIL  
 #2114 Shelby Center, Auburn University, Auburn, AL 36849  
 MAILING ADDRESS FAX ALTERNATE E-MAIL  
 kulkarni.s.sonal@gmail.com

4. SOURCE OF FUNDING SUPPORT:  Not Applicable  Internal  External Agency: \_\_\_\_\_  Pending  Received

5. LIST ANY CONTRACTORS, SUB-CONTRACTORS, OTHER ENTITIES OR IRBs ASSOCIATED WITH THIS PROJECT:

6. GENERAL RESEARCH PROJECT CHARACTERISTICS

6A. Mandatory CITI Training	6B. Research Methodology								
<p><b>Names of key personnel who have completed CITI:</b>                      Sonal Kulkarni <input checked="" type="checkbox"/>                      Dr. Daniela Marghitu <input checked="" type="checkbox"/></p> <p><b>CITI group completed for this study:</b>  <input type="checkbox"/> Social/Behavioral <input type="checkbox"/> Biomedical</p> <p align="center"><b>PLEASE ATTACH TO HARD COPY ALL CITI CERTIFICATES FOR EACH KEY PERSONNEL</b></p>	<p><b>Please check all descriptors that best apply to the research methodology:</b></p> <p>Data Source(s): <input checked="" type="checkbox"/> New Data <input type="checkbox"/> Existing Data</p> <p>Will recorded data directly or indirectly identify participants?                      Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p> <p>Data collection will involve the use of:  <input checked="" type="checkbox"/> Educational Tests (cognitive diagnostic methods, etc.)  <input checked="" type="checkbox"/> Interview / Observation  <input type="checkbox"/> Physical / Physiological Measures or Specimens (see Section 4.2)  <input checked="" type="checkbox"/> Surveys / Questionnaires  <input checked="" type="checkbox"/> Internet / Electronic  <input checked="" type="checkbox"/> Audio / Video / Photos  <input type="checkbox"/> Private records or files</p>								
6C. Participant Information	6D. Risks to Participants								
<p><b>Please check all descriptors that apply to the participant population.</b>  <input checked="" type="checkbox"/> Males <input checked="" type="checkbox"/> Females <input checked="" type="checkbox"/> AU students</p> <p><b>Vulnerable Populations</b>  <input type="checkbox"/> Pregnant Women/Fetuses <input type="checkbox"/> Prisoners  <input type="checkbox"/> Children and/or Adolescents (under age 19 in AL)</p> <p><b>Persons with:</b>  <input type="checkbox"/> Economic Disadvantages <input checked="" type="checkbox"/> Physical Disabilities  <input type="checkbox"/> Educational Disadvantages <input type="checkbox"/> Intellectual Disabilities</p> <p>Do you plan to compensate your participants? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p><b>Please identify all risks that participants might encounter in this research.</b></p> <table border="0"> <tr> <td><input type="checkbox"/> Breach of Confidentiality*</td> <td><input type="checkbox"/> Coercion</td> </tr> <tr> <td><input type="checkbox"/> Deception</td> <td><input type="checkbox"/> Physical</td> </tr> <tr> <td><input type="checkbox"/> Psychological</td> <td><input type="checkbox"/> Social</td> </tr> <tr> <td><input checked="" type="checkbox"/> None</td> <td><input type="checkbox"/> Other:</td> </tr> </table> <p>_____                      _____                      _____</p> <p><small>*Note that if the investigator is using or accessing confidential or identifiable data, breach of confidentiality is always a risk.</small></p>	<input type="checkbox"/> Breach of Confidentiality*	<input type="checkbox"/> Coercion	<input type="checkbox"/> Deception	<input type="checkbox"/> Physical	<input type="checkbox"/> Psychological	<input type="checkbox"/> Social	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Other:
<input type="checkbox"/> Breach of Confidentiality*	<input type="checkbox"/> Coercion								
<input type="checkbox"/> Deception	<input type="checkbox"/> Physical								
<input type="checkbox"/> Psychological	<input type="checkbox"/> Social								
<input checked="" type="checkbox"/> None	<input type="checkbox"/> Other:								
<p>Do you need IBC Approval for this study? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes - BUA # _____ Expiration date _____</p>									

The Auburn University Institutional Review Board has approved this document for use from 4/27/11 to 4/26/12  
 Protocol # N-134 EP 1104

RECEIVED  
MAR 30 2011

**FOR OHSR OFFICE USE ONLY**

DATE RECEIVED IN OHSR: original 2-30-11 by GB PROTOCOL # N-134 EP 1104  
 DATE OF IRB REVIEW: 4/27/11 by AB/que APPROVAL CATEGORY: 45 CFR 46.110(6.7)  
 DATE OF IRB APPROVAL: \_\_\_\_\_ by \_\_\_\_\_ INTERVAL FOR CONTINUING REVIEW: 1 year  
 COMMENTS: original reviewed 4/8/11; not approved KJE  
revisions in 4/13/11; APR by AB on 4/27/11  
final revisions in 6/13/11; approved SRA

7. PROJECT ASSURANCES

PROJECT TITLE: Usability Tests Directed Towards Determining the usefulness of accessible web sites

**A. PRINCIPAL INVESTIGATOR'S ASSURANCES**

1. I certify that all information provided in this application is complete and correct.
2. I understand that, as Principal Investigator, I have ultimate responsibility for the conduct of this study, the ethical performance this project, the protection of the rights and welfare of human subjects, and strict adherence to any stipulations imposed by the Auburn University IRB.
3. I certify that all individuals involved with the conduct of this project are qualified to carry out their specified roles and responsibilities and are in compliance with Auburn University policies regarding the collection and analysis of the research data.
4. I agree to comply with all Auburn policies and procedures, as well as with all applicable federal, state, and local laws regarding the protection of human subjects, including, but not limited to the following:
  - a. Conducting the project by qualified personnel according to the approved protocol
  - b. Implementing no changes in the approved protocol or consent form without prior approval from the Office of Human Subjects Research
  - c. Obtaining the legally effective informed consent from each participant or their legally responsible representative prior to their participation in this project using only the currently approved, stamped consent form
  - d. Promptly reporting significant adverse events and/or effects to the Office of Human Subjects Research in writing within 5 working days of the occurrence.
5. If I will be unavailable to direct this research personally, I will arrange for a co-investigator to assume direct responsibility in my absence. This person has been named as co-investigator in this application, or I will advise OHSR, by letter, in advance of such arrangements.
6. I agree to conduct this study only during the period approved by the Auburn University IRB.
7. I will prepare and submit a renewal request and supply all supporting documents to the Office of Human Subjects Research before the approval period has expired if it is necessary to continue the research project beyond the time period approved by the Auburn University IRB.
8. I will prepare and submit a final report upon completion of this research project.

My signature indicates that I have read, understand and agree to conduct this research project in accordance with the assurances listed above.

Sonal Kulkarni  
Printed name of Principal Investigator

[Signature]  
Principal Investigator's Signature

3/30/2011  
Date

**B. FACULTY ADVISOR/SPONSOR'S ASSURANCES**

1. By my signature as faculty advisor/sponsor on this research application, I certify that the student or guest investigator is knowledgeable about the regulations and policies governing research with human subjects and has sufficient training and experience to conduct this particular study in accord with the approved protocol.
2. I certify that the project will be performed by qualified personnel according to the approved protocol using conventional or experimental methodology.
3. I agree to meet with the investigator on a regular basis to monitor study progress.
4. Should problems arise during the course of the study, I agree to be available, personally, to supervise the investigator in solving them.
5. I assure that the investigator will promptly report significant adverse events and/or effects to the OHSR in writing within 5 working days of the occurrence.
6. If I will be unavailable, I will arrange for an alternate faculty sponsor to assume responsibility during my absence, and I will advise the OHSR by letter of such arrangements. If the investigator is unable to fulfill requirements for submission of renewals, modifications or the final report, I will assume that responsibility.
7. I have read the protocol submitted for this project for content, clarity, and methodology

Dr. Daniela Marghita  
Printed name of Faculty Advisor / Sponsor

[Signature]  
Signature

3/30/2011  
Date

**C. DEPARTMENT HEAD'S ASSURANCE**

By my signature as department head, I certify that I will cooperate with the administration in the application and enforcement of all Auburn University policies and procedures, as well as all applicable federal, state, and local laws regarding the protection and ethical treatment of human participants by researchers in my department.

Dr. Kai Chang  
Printed name of Department Head

[Signature]  
Signature

3/30/2011  
Date

**8. PROJECT OVERVIEW: Prepare an abstract that includes:**

(400 word maximum, in language understandable to someone who is not familiar with your area of study):

**I.) A summary of relevant research findings leading to this research proposal:**

(Cite sources; include a "Reference List" as Appendix A.)

**II.) A brief description of the methodology,**

**III.) Expected and/or possible outcomes, and,**

**IV.) A statement regarding the potential significance of this research project.**

8 I I had been to Alabama Institute of Deaf and Blind (AIDB), Talladega, Alabama, for a workshop. During my visit, I saw students with disabilities struggle to use web sites. This led me into reading and understanding more about web accessibility. Further, as a part of my directed study with Dr. Marghitu, I was required to evaluate a web site (myitlab.com). This web site provides online assessment and training of Microsoft Office and basics of Computer. During my evaluation, I found out that the web site is inaccessible. I performed some accessibility tests on many web sites using some online tools and found that most of the web sites are inaccessible. Above mentioned research findings led me to this research proposal.

8 II The participants will be asked to use two web sites. One web site is built for this study and complies with accessibility standards. Another web site does not comply with some or all accessibility standards. Users with low/no vision will be provided with screen magnifiers and screen readers respectively and users with hearing impairment will be provided closed captioning for audible content in the web site. The users will be assigned well defined tasks (e.g. looking up for a particular link in the page). During the course of their performance, the time taken to accomplish every task and the errors made will be recorded. After the task is accomplished, the participants will be interviewed about their experience and will be given a Likert scale questionnaire (see appendix). This will be communicated through sign language whenever necessary and users with vision problems will have an accessible digital form that they will be asked to fill out.

8 III The outcome of this research study is that it would give a web developer insight into "user experiences" of people with accessible needs.

8 IV This study will indirectly help and encourage the practice of making digital media (webs ite in this case) more accessible.

**9. PURPOSE.**

**a. Clearly state all of the objectives, goals, or aims of this project.**

The objective is to perform usability tests on a web site (built with SharePoint 2010) from an accessibility standpoint. To perform qualitative (through interviews after the test) and quantitative (through measuring the time taken and number of errors made) tests. These results will be used to further improve the web site.

**b. How will the results of this project be used? (e.g., Presentation? Publication? Thesis? Dissertation?)**

Presentations, publications and a thesis.

10a. **KEY PERSONNEL.** Describe responsibilities. Include information on research training or certifications related to this project. **CITI is required.** **Be as specific as possible.** (Attach extra page if needed.) *All non AU-affiliated key personnel must attach **CITI certificates of completion.***

Principle Investigator Sonal Kulkarni Title: Graduate Student E-mail address ssk0003@auburn.edu  
 Dept / Affiliation: Department of Computer Science and Software Engineering

**Roles / Responsibilities:**

Project Principal Investigator. Development and implementation of the experimental design. Inviting participants, Data collection and analyzing results. Anonymize all identifiable student data for analysis purposes; do statistical analysis; safe-keeping of all data collected.

Individual: Dr. Daniela Marghitu Title: COORD, COMP 100 E-mail address marghda@auburn.edu  
 Dept / Affiliation: Department of Computer Science and Software Engineering

**Roles / Responsibilities:**

Advisor for the research and experiment.

Individual: \_\_\_\_\_ Title: \_\_\_\_\_ E-mail address \_\_\_\_\_  
 Dept / Affiliation: \_\_\_\_\_

**Roles / Responsibilities:**

Individual: \_\_\_\_\_ Title: \_\_\_\_\_ E-mail address \_\_\_\_\_  
 Dept / Affiliation: \_\_\_\_\_

**Roles / Responsibilities:**

Individual: \_\_\_\_\_ Title: \_\_\_\_\_ E-mail address \_\_\_\_\_  
 Dept / Affiliation: \_\_\_\_\_

**Roles / Responsibilities:**

Individual: \_\_\_\_\_ Title: \_\_\_\_\_ E-mail address \_\_\_\_\_  
 Dept / Affiliation: \_\_\_\_\_

**Roles / Responsibilities:**

11. **LOCATION OF RESEARCH.** List all locations where data collection will take place. (School systems, organizations, businesses, buildings and room numbers, servers for web surveys, etc.) **Be as specific as possible.** **Attach permission letters in Appendix E.**

(See sample letters at <http://www.auburn.edu/research/vpr/ohs/sample.htm>)

Lab 2114, Shelby Center, Auburn University, Auburn, Alabama.

Gentry Facility, Alabama Institute of Deaf and blind, Talladega, Alabama



12. PARTICIPANTS.

a. Describe the participant population you have chosen for this project.

Check here if there is existing data; describe the population from whom data was collected & include the # of data files.

Students of Alabama Institute of Deaf and Blind (AIDB), Talladega, Alabama, with low/no vision and hearing impairment  
Special needs student (low/no vision and hearing impairment) at Auburn University.  
The above mentioned subjects are of age 19 and older.

b. Describe why is this participant population is appropriate for inclusion in this research project. (Include criteria for selection.)

This research is an effort to promote compliance to accessibility standards. In order to test a website and evaluate its usability from an accessibility standpoint, subjects with special needs are required. Also, their feedback is invaluable for building accessible websites.

c. Describe, step-by-step, all procedures you will use to recruit participants. Include in Appendix B a copy of all e-mails, flyers, advertisements, recruiting scripts, invitations, etc., that will be used to invite people to participate.

(See sample documents at <http://www.auburn.edu/research/vpr/ohs/sample.htm>.)

An email will be sent out to the instructors in Gentry facility in AIDB and to all the special needs student in Auburn University.  
Email list will be obtained by the instructors in Gentry Facility and by Dr. Marghitu for subjects of Auburn University.

What is the minimum number of participants you need to validate the study? <sup>10</sup> \_\_\_\_\_

Is there a limit on the number of participants you will recruit?  No  Yes – the number is \_\_\_\_\_

Is there a limit on the number of participants you will include in the study?  No  Yes – the number is \_\_\_\_\_

d. Describe the type, amount and method of compensation and/or incentives for participants.

(If no compensation will be given, check here .)

Select the type of compensation:  Monetary  Incentives

Raffle or Drawing incentive (Include the chances of winning.)

Extra Credit (State the value)

Other

Description:

Lunch will be provided.

13. PROJECT DESIGN & METHODS.

a. Describe, step-by-step, all procedures and methods that will be used to consent participants.

(  Check here if this is "not applicable"; you are using existing data.)

We will include participants who provide permission for their data to be used in the research and sign the consent form. On receiving an e-mail confirmation for participation from the students, an appointment would be scheduled for meeting at the Research Lab in Auburn University (Room 2114, Shelby Center for Engineering and Technology) and in Gentry Facility classroom in AIDB. On arrival at the research lab, the IRB-approved informed consent for the project will be handed out (Participants with low/no vision would be given access to a Document Reader. They will use the Document Reader to listen to the Consent Form and hence will verify it personally). It would be emphasized that the data would be anonymous and confidentiality of the participant will be maintained. On consent from the participant I will proceed with the experiment. If the participant wishes to leave without consenting, he/she would be allowed to do so.

b. Describe the procedures you will use in order to address your purpose. Provide a step-by-step description of how you will carry out this research project. Include specific information about the participants' time and effort commitment. (NOTE: Use language that would be understandable to someone who is not familiar with your area of study. Without a complete description of all procedures, the Auburn University IRB will not be able to review this protocol. If additional space is needed for this section, save the information as a .PDF file and insert after page 6 of this form.)

- i) a computer will be set up for the experiment. First the accessible website will be loaded on the browser. Screen readers, screen magnifiers and speakers for audible content will be set up.
- ii) the participant will be provided with a list of tasks(e.g. looking up for a particular link in the page) to be accomplished.
- iii) during the course of their performance, the time taken to accomplish every task and the errors made will be recorded.
- iv) the above steps are repeated for an inaccessible website.
- v) the participants are given a Likert questionnaire.
- vi) the participants will be interviewed about their experience with both the websites.(The interview questions are attached in the appendix). The interview will be recorded.

**13c. List all data collection instruments used in this project, in the order they appear in Appendix C.**

(e.g., surveys and questionnaires in the format that will be presented to participants, educational tests, data collection sheets, interview questions, audio/video taping methods etc.)

- i) A questionnaire about the user experience of both the websites will be collected.
- ii) Audio recording of the participant's interview after the completion of experiment to evaluate the user experience.
- iii) Mouse clicks and key presses will be logged.

**d. Data analysis: Explain how the data will be analyzed.**

Descriptive statistics will be used to analyze data. Inferential statistics will be used to compare debugging experiences. Qualitative data (such as from interviews) will be subjected to theme analysis.

**14. RISKS & DISCOMFORTS: List and describe all of the risks that participants might encounter in this research. If you are using deception in this study, please justify the use of deception and be sure to attach a copy of the debriefing form you plan to use in Appendix D. (Examples of possible risks are in section #6D on page 1.)**

There are no risks associated with this experiment. Data will be collected confidentially and analyzed anonymously.

15. **PRECAUTIONS.** Identify and describe all precautions you have taken to eliminate or reduce risks as listed in #14. If the participants can be classified as a "vulnerable" population, please describe additional safeguards that you will use to assure the ethical treatment of these individuals. **Provide a copy of any emergency plans/procedures and medical referral lists in Appendix D.**

There are no risks and discomforts associated with this experiment. If at any point the participant decides to quit the experiment, he/she will be allowed to do so. Audio recording will be kept in a secure location (Locked file cabinet in principal investigators office 2114, Shelby Center) and destroyed as soon as they have been transcribed. These transcripts will not contain any identifiable data. All other data are collected and stored anonymously. Interview transcripts, questionnaires and audios will be on paper or in electronic format. Both will be kept in a locked file cabinet in the principal investigator's office. She will safeguard the key.

**If using the Internet to collect data, what confidentiality or security precautions are in place to protect (or not collect) identifiable data? Include protections used during both the collection and transfer of data.**

*(These are likely listed on the server's website.)*

NA

16. **BENEFITS.**

- a. **List all realistic direct benefits participants can expect by participating in this specific study.**  
*(Do not include "compensation" listed in #12d.)* Check here if there are no direct benefits to participants. ✓

- b. **List all realistic benefits for the general population that may be generated from this study.**  
This research encourages web accessibility and provides in depth understanding it.

17. PROTECTION OF DATA.

a. Will data be collected as anonymous?  Yes  No If "YES", skip to part "g".  
("Anonymous" means that you will not collect any identifiable data.)

b. Will data be collected as confidential?  Yes  No  
("Confidential" means that you will collect and protect identifiable data.)

c. If data are collected as confidential, will the participants' data be coded or linked to identifying information?  
 Yes (If so, describe how linked.)  No

All data collected from the same participant will be linked using a unique number. However, no code list that links name or any other identifiable information to this number will be made or kept.

d. Justify your need to code participants' data or link the data with identifying information.

Data will not be linked with identifiable info. As audio recording would voice recording of the subject, it will be transcribed, given the same number as that of the other data collected from the same participant and destroyed (deleted).

e. Where will code lists be stored? (Building, room number?)

NA

f. Will data collected as "confidential" be recorded and analyzed as "anonymous"?  Yes  No  
(If you will maintain identifiable data, protections should have been described in #15.)

g. Describe how and where the data will be stored (e.g., hard copy, audio cassette, electronic data, etc.), and how the location where data is stored will be secured in your absence. For electronic data, describe security. If applicable, state specifically where any IRB-approved and participant-signed consent documents will be kept on campus for 3 years after the study ends.  
Interview transcripts, questionnaires, consent forms and audios will be on paper or in electronic format. Both will be kept in a locked file cabinet located in the principal investigator's office 2302, Shelby Center. She will safeguard the key.

h. Who will have access to participants' data?

(The faculty advisor should have full access and be able to produce the data in the case of a federal or institutional audit.)

The project personnel listed in item 10.

i. When is the latest date that confidential data will be retained? (Check here if only anonymous data will be retained. )  
Confidential data will be destroyed before June,01,2012. Anonymous data will be kept indefinitely.

j. How will the confidential data be destroyed? (NOTE: Data recorded and analyzed as "anonymous" may be retained indefinitely.)  
Paper data will be shredded. Electronic data will be deleted/wiped.

## **Appendix A1**

### **IRB Documents - Consent Form**



**(NOTE: DO NOT SIGN THIS DOCUMENT UNLESS AN IRB APPROVAL STAMP WITH  
CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)**

**INFORMED CONSENT for a Research Study entitled**

*“Usability tests directed towards determining the usefulness of accessible websites”*

**You are invited to participate in a research study** that is directed towards determining the usefulness of accessible websites. The study is being conducted by Sonal Kulkarni (graduate student) under the direction of Dr. Daniela Marghitu from Auburn University, Department of Computer Science and Software Engineering. The usability tests will be performed in Auburn University and in Alabama Institute of Deaf and Blind (AIDB), Talladega, Alabama. You were selected as a possible candidate because you are either a student of AIDB or registered as a special needs student at Auburn University.

**What will be involved if you participate?** If you decide to participate you will be asked to use two websites. One website is built for this study and complies with accessibility standards. Another website does not comply with some or all accessibility standards. If you have low/no vision, you will be provided with screen magnifiers and screen readers. If you have hearing impairment you will be provided closed captioning for audible content on the website. You will be assigned well defined tasks (e.g. looking up for a particular link in the page) to complete. During the course of your performance, the time taken to accomplish each task and the errors made will be recorded. After the task is completed, you will be interviewed about your experience with the two websites. The interview will be recorded. Also, you will be given a likert scale questionnaire. This will be communicated through sign language whenever necessary and if you have vision problems, you will be given an accessible digital form. The tape containing the interview will be destroyed (deleted) after it is transcribed.

**Are there any risks or discomforts?** There is no risk or discomfort associated with this study. Your name and personal information will not be released.

**Are there any benefits to yourself or others?** Upon participating in this study, you will be indirectly helping and encouraging the practice of making digital media (website in this case) more accessible. This study would give a web developer insight into “user experiences” of people with accessible needs. Additionally, the software platform that is used to build this website (i.e. SharePoint 2010) will be used as one of the study materials in COMP 5000/6000(Web Application Development) course that is offered by Dr. Marghitu at Auburn University, in Department of Computer Science and Software Engineering.

**Will you receive compensation for participating?** To thank you for your time, you will be offered lunch.

**Are there any costs?** No.

**Participant’s Initials** \_\_\_\_\_





## **Appendix A2**

### **IRB Appendix A - References**

## References

1. Microsoft SharePoint 2010: Building Solutions for SharePoint 2010, By Sahil Malik
2. Microsoft Office SharePoint Designer 2007, By Robert T. Grauer, Daniela Marghitu
3. Web accessibility for people with disabilities, By Michael G. Paciello
4. Web accessibility: a foundation for research, By Simon Harper, Yeliz Yesilada
5. <http://www.w3.org/WAI/>

**Appendix A3**  
**IRB Appendix C**  
**Data Collection tools**

## Pre Test Survey

1. Age-
2. Disability-
  - a. Completely Blind
  - b. Limited vision
  - c. Hearing Impairment
  - d. Other(Please explain)
  - e. Choose not to disclose
3. Sex
  - a. Male
  - b. Female
  - c. Choose not to disclose
4. Which of the following best describes the duration for which you have been using computers?
  - a. 0-3 months
  - b. 4-6 months
  - c. 7-12 months
  - d. More than 12 months
5. Which of the following best describes the duration for which you have been using computers?
  - a. 0-3 months
  - b. 4-6 months
  - c. 7-12 months
  - d. More than 12 months
6. Which of the following best describes your keyboard skills?
  - a. Very proficient
  - b. Proficient
  - c. I am not very proficient
  - d. I have no idea how to use it
7. How proficient are you when using the mouse?
  - a. Very proficient
  - b. Proficient
  - c. I am not very proficient
  - d. I have no idea how to use it
8. How proficient are you when using the screen reader?
  - a. Very proficient
  - b. Proficient
  - c. I am not very proficient
  - d. I have no idea how to use it
9. How proficient are you when using the screen magnifier?
  - a. Very proficient

- b. Proficient
  - c. I am not very proficient
  - d. I have no idea how to use it
10. Which of the following best describes your computer skills?
- a. Very proficient
  - b. Proficient
  - c. I am not very proficient
  - d. I have no idea how to use it
11. Which of the following best describes your internet skills
- a. Very proficient
  - b. Proficient
  - c. I am not very proficient
  - d. I have no idea how to use it

## Questionnaire for the blind on forms

### Accomplishment of tasks

1 I was able to accomplish most of the tasks

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

2 It was easy to accomplish the tasks

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

### Confidence level

1 I felt confident using this form

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

2 I felt confused using this form

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

### Learnability

1 Learning to use this form was easy.

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

2 Learning to perform the tasks associated with this form was straightforward.

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

3 I need more skills to access this form

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

**Overall Reaction**

1 I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Terrible								Wonderful	NA

2 I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Difficult								Easy	NA

3 I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Frustrating								Satisfying	NA

## Questionnaire for the blind on images

### Accomplishment of tasks

1 I was able to accomplish most of the tasks

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

2 It was easy to accomplish the tasks

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

### Confidence level

3 I felt confident using the webpage with images

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

4 I felt confused using the webpage with images

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

### Learnability

1 It was easy to learn to spot images on this web site

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree



2 Upon pointing the cursor on an image it was easy to understand that the object under consideration was an image

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

### Overall Reaction

1 I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Terrible								Wonderful	NA

2 I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Difficult								Easy	NA

3 I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Frustrating								Satisfying	NA

**Accomplishment of tasks**

1 I was able to accomplish most of the tasks

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

2 It was easy to accomplish the tasks

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

**Confidence level**

1 I felt confident using the media content

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

2 I felt confused using the media content

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

**Questionnaire for the deaf**

**Learnability**

1 Learning to use the web site was easy.

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

2 Learning to perform the tasks was straightforward.

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

3 I need more skills to access this web site

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

**Overall Reaction**

1 I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Terrible								Wonderful	NA

2 I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Difficult								Easy	NA

3

I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Frustrating								Satisfying	NA

**Questionnaire for the partially blind**  
**Accomplishment of tasks**

1 I was able to accomplish most of the tasks

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

2 It was easy to accomplish the tasks

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

**Confidence level**

I felt the webpage was cluttered with too much information

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

I had to use the scroll bars extensively

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

I thought the information was well organized and categorized

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

The images were distracting.

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

I felt confident using this web site

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

I felt confused using this web site

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

**Learnability**

1 Learning to use this web site was easy.

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

2 Learning to perform the tasks in this web site was straightforward.

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

3 I need more skills to access this web site

1	2	3	4	5
---	---	---	---	---

●	●	●	●	●
Strongly Disagree				Strongly Agree

**Overall Reaction**

1 I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Terrible								Wonderful	NA

2 I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Difficult								Easy	NA

3 I find this web site

0	1	2	3	4	5	6	7	8	9
●	●	●	●	●	●	●	●	●	●
Frustrating								Satisfying	NA

**Questionnaire exclusively on forms and images in the accessible web site. The below questionnaire was designed for the blind participants**

**FORMS**

1 I thought the description of the fields in the form was very helpful

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

2 All the fields in the form had a description

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

3 Meaningful description of fields in the form is more important than just a description for the fields in the form e.g. (a comment saying “this is the last address line” as opposed to “this an address line”)

1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

4 I feel descriptive tags for all fields in the form are very important






1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

5 Having descriptive tags make me feel more confident while filling the form






1	2	3	4	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree



6 All areas of the form are reachable.






1	2	3	4	5
				
Strongly Disagree				Strongly Agree

7 I thought the form was very easy to use.






1	2	3	4	5
				
Strongly Disagree				Strongly Agree

**IMAGES**






8 I thought the description of the images was very helpful

1	2	3	4	5
				
Strongly Disagree				Strongly Agree






9 Meaningful description of the image is more important than just a description of the image e.g. (a comment saying “image of Dr.Marghitu” as opposed to “Dr.Marghitu”)

1	2	3	4	5
				
Strongly Disagree				Strongly Agree

10 I feel descriptive tags of images are very important

1	2	3	4	5
				
Strongly Disagree				Strongly Agree

11 Having descriptive tags for images make me feel more confident while using the web site

1	2	3	4	5
				
Strongly Disagree				Strongly Agree

**Questionnaire exclusively on the video content of the accessible web site. This was used for deaf participants**

**VIDEOS**

1 The absence of sound alerts helped me use the web site

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

2 The closed captions were well synchronized with the video.

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

3 I was able to locate the closed captions easily

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

**Questionnaire about links and images of the accessible web site. This was used for partially blind participants**

1 The links had meaningful names (e.g. A link saying “Create a post” is more useful than a link saying “click here”)

1	2	3	4	5
●	●	●	●	●
Strongly Disagree				Strongly Agree

2 The absence of flickering images helped me

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

**A general questionnaire about the accessible web site. This was used for all participants.**

1 I thought the web site was easy to use.

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree

2 Do you think it is easy for people to learn to use this web site?

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree






3 I felt very confident using this web site

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree






4 I need to learn a lot about this web site before I could effectively use it.

1	2	3	4	5
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strongly Disagree				Strongly Agree






5 I thought it was easy to navigate around the web site

1	2	3	4	5
				
Strongly Disagree				Strongly Agree






6 I thought it was easy to locate the links in the web site

1	2	3	4	5
				
Strongly Disagree				Strongly Agree






7 I will never be able to learn how to use this web site

1	2	3	4	5
				
Strongly Disagree				Strongly Agree






8 I find the information on this web site well organized

1	2	3	4	5
				
Strongly Disagree				Strongly Agree






9 There was too much information on one page

1	2	3	4	5
				
Strongly Disagree				Strongly Agree






10 There were too many links on the page

1	2	3	4	5
				
Strongly Disagree				Strongly Agree

11 I was able to find the information on the web site

1	2	3	4	5
				
Strongly Disagree				Strongly Agree

12 I find this web site easy to use

1	2	3	4	5
				
Strongly Disagree				Strongly Agree

**Appendix A4**

**IRB Appendix E**

**Permission letter from AIDB to conduct the experiment**



AUBURN UNIVERSITY

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SAMUEL GINN COLLEGE  
OF ENGINEERING

COMPUTER SCIENCE  
AND  
SOFTWARE ENGINEERING

**(NOTE: DO NOT SIGN THIS DOCUMENT UNLESS AN IRB APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)**

### INFORMED CONSENT

For a Research Study entitled

**“Usability tests directed towards determining the usefulness of accessible websites”**

**Objective-** To perform usability tests on a website (built with SharePoint 2010) from an accessibility standpoint. In order to improve our project it might be necessary to conduct the tests multiple times. This helps in refining the website from the feedback obtained from the prior usability tests.

**Note-** This form will be communicated in braille to participants with low/no vision and through sign language to participants with hearing impairment.

**Your organization is invited to participate in the usability tests that are a part of the research study that is directed towards determining the usefulness of accessible websites.**

The study is being conducted by Sonal Kulkarni (graduate student) under the direction of Dr. Daniela Marghitu from Auburn University, Department of Computer Science and Software Engineering. The usability tests will be performed in Auburn University and in Alabama Institute of Deaf and Blind (AIDB), Talladega, Alabama. Your organization was selected as a possible candidate because it has the students with special needs.

#### **What will be involved if your organization participates?**

The participants will be asked to use two websites. One website is built for this study and complies with accessibility standards and hence is accessible. Another website does not comply with some or all accessibility standards. Users with low/no vision will be provided with screen magnifiers and screen readers respectively and users with hearing impairment will be provided closed captioning for audible content in the website. The users will be assigned well defined tasks (e.g. looking up for a particular link in the page). During the course of their performance, the time taken to accomplish every task and the errors made will be recorded. After the task is accomplished, the participants will be interviewed about their experience with the two websites and also express their thoughts through a Likert scale. This will be communicated through sign language whenever necessary and users with vision problems will have an accessible digital form that they will be asked to fill out.

Participant's initials \_\_\_\_\_

Page 1 of 1



**Are there any risks or discomforts?**

There is no risk or discomfort associated with this study. The participant's name and personal information will not be released.

**Are there any benefits to your organization and others?**

Upon participating in this study, the users will be indirectly helping and encouraging the practice of making digital media (website in this case) more accessible. This study would give a web developer insight into "user experiences" of people with accessible needs. Additionally, the software platform that is used to build this website (i.e. SharePoint 2010) will be used as one of the study materials in COMP 5000/6000(Web Application Development) course that is offered by Dr. Marghitu at Auburn University, in Department of Computer Science and Software Engineering.

**Will you or your organization receive compensation for participating?**

The participants will be provided with lunch.

**Are there any costs?**

If your organization decides to participate in the study, the usability tests require access to computers equipped with screen readers and screen magnifiers.

**If your organization (or the student) change your mind about participation**

The student(s) can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, Department of Computer Science and Software Engineering.

**Your privacy will be protected**

Any information obtained in connection with this study will remain anonymous and *confidential*. The results of this study might be used by the department of Computer Science and Software Engineering Department in Auburn University with the intent to publish the results in professional journals. Following the linking of all results all identifying information will be destroyed.

**If your organization (or students) has questions about this study, please ask them now or contact** Sonal Kulkarni at [ssk0003@auburn.edu](mailto:ssk0003@auburn.edu) or 334-333-4216. A copy of this document will be given to you to keep.

**If your organization (or students) has questions about your rights as a research participant,** you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone (334)-844-5966 or e-mail at [hsubjec@auburn.edu](mailto:hsubjec@auburn.edu) or [IRBChair@auburn.edu](mailto:IRBChair@auburn.edu).

Participant's initials \_\_\_\_\_

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HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE

  
Travis Fields, Executive Director

March 25, 2011  
Date Investigator obtaining consent Date

TRAVIS FIELDS  
Printed Name

Sonal Kulkarni  
Printed Name



## **Appendix B**

### **Calculation of results of the experiment**

<b>Accomplishment of tasks for accessible forms for the blind</b>						
Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
5	3.5	1.5				
5	5	0		<i>Data1</i>	<i>Data2</i>	
5	5	0	Mean	4.8	4.1	
4	4	0	Variance	0.2	0.8	
5	3	2	Observations	5	5	
			Pearson Correlation	0.0625		
			Hypothesized Mean Difference	0		
			df	4		
			t Stat	1.606		
			P(T<=t) one-tail	0.092		Accept Null Hypothesis because p > 0.05 (Means are the same)
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.184		Accept Null Hypothesis because p > 0.05 (Means are the same)
			T Critical Two-tail	2.776		

<b>Confidence for accessible forms for the blind</b>						
Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
4.5	2	2.5				
5	5	0		<i>Data1</i>	<i>Data2</i>	
5	5	0	Mean	4.9	3.3	
5	2	3	Variance	0.05	2.45	
5	2.5	2.5	Observations	5	5	
			Pearson Correlation	0.464286		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	2.426		
			P(T<=t) one-tail	0.036		Reject Null Hypothesis because p < 0.05 (Means are

						Different)
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.072		Accept Null Hypothesis because p > 0.05 (Means are the same)
			T Critical Two-tail	2.776		

Learnability for accessible forms for the blind						
Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
5	3	2				
5	5	0		<i>Data1</i>	<i>Data2</i>	
5	5	0	Mean	5	3.8	
5	2.67	2.33	Variance	0	1.256	
5	3.33	1.67	Observations	5	5	
			Pearson Correlation	#DIV/0!		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	2.395		
			P(T<=t) one-tail	0.037		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.075		Accept Null Hypothesis because p > 0.05 (Means are the same)
			T Critical Two-tail	2.776		

**Overall Reaction for accessible forms for the blind**

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
8	4.67	3.33				
8	5.67	2.33		<i>Data1</i>	<i>Data2</i>	
7.67	7	0.67	Mean	7.866667	4.533333	
7.67	0.67	7	Variance	0.033333	5.588889	
8	4.67	3.33	Observations	5	5	
			Pearson Correlation	0.270299		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	3.211		
			P(T<=t) one-tail	0.016		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.033		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical Two-tail	2.776		

**Accomplishment of tasks for accessible images for the blind**

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
5	4	1				
5	2	3		<i>Data1</i>	<i>Data2</i>	
5	4	1	Mean	4.9	2.7	
4.5	2	2.5	Variance	0.05	1.45	
5	1.5	3.5	Observations	5	5	
			Pearson Correlation	0.324967		
			Hypothesized Mean Difference	0		

			Df	4		
			t Stat	4.274		
			P(T<=t) one-tail	0.006		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.013		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical Two-tail	2.776		

### Confidence for accessible images for the blind

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
4.5	2.5	2				
5	2	3		<i>Data1</i>	<i>Data2</i>	
5	4	1	Mean	4.9	2.7	
5	2	3	Variance	0.05	0.7	
5	3	2	Observations	5	5	
			Pearson Correlation	0.133631		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	5.880		
			P(T<=t) one-tail	0.002		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.004		Reject Null Hypothesis because p

						< 0.05 (Means are Different)
			T Critical Two-tail	2.776		

**Learnability for accessible images for the blind**

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
5	1	4				
5	2	3		<i>Data1</i>	<i>Data2</i>	
5	5	0	Mean	5	2	
5	1	4	Variance	0	3	
5	1	4	Observations	5	5	
			Pearson Correlation	#DIV/0!		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	3.873		
			P(T<=t) one-tail	0.009		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.018		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical Two-tail	2.776		

**Overall Reaction for accessible images for the blind**

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
7.67	1.33	6.33				
8	4	4		<i>Data1</i>	<i>Data2</i>	
8	7	1	Mean	7.866667	3.066667	
7.67	0	7.67	Variance	0.033333	7.188889	
8	3	5	Observations	5	5	
			Pearson Correlation	0.817127		



			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	4.235		
			P(T<=t) one-tail	0.007	Reject Null Hypothesis because p < 0.05 (Means are Different)	
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.013	Reject Null Hypothesis because p < 0.05 (Means are Different)	
			T Critical Two-tail	2.776		

**Accomplishment of tasks for accessible multimedia content for the deaf**

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
5	1	4				
5	1.5	3.5		<i>Data1</i>	<i>Data2</i>	
5	1.5	3.5	Mean	4.9	1.4	
4.5	1.5	3	Variance	0.05	0.05	
5	1.5	3.5	Observations	5	5	
			Pearson Correlation	-0.25		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	22.136		
			P(T<=t) one-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.000		Reject Null Hypothesis because p < 0.05 (Means are Different)

			T Critical Two-tail	2.776		
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**Confidence for accessible multimedia content for the deaf**

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
5	2	3				
3	1	2		<i>Data1</i>	<i>Data2</i>	
3	1	2	Mean	3.4	1.6	
3	1	2	Variance	0.8	0.8	
3	3	0	Observations	5	5	
			Pearson Correlation	0.25		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	3.674		
			P(T<=t) one-tail	0.011		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.021		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical Two-tail	2.776		

**Learnability for accessible multimedia content for the deaf**

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
5	2.333333	2.666666667				
5	2.333333	2.666666667		<i>Data1</i>	<i>Data2</i>	
5	2.333333	2.666666667	Mean	5	2.066667	
5	2.333333	2.666666667	Variance	0	0.355556	
5	1	4	Observations	5	5	
			Pearson Correlation	#DIV/0!		
			Hypothesized Mean Difference	0		

			Df	4		
			t Stat	11.000		
						Reject Null Hypothesis because $p < 0.05$ (Means are Different)
			P(T<=t) one-tail	0.000		)
			T Critical one-tail	2.132		
						Reject Null Hypothesis because $p < 0.05$ (Means are Different)
			P(T<=t) two-tail	0.000		)
			T Critical Two-tail	2.776		

**Overall Reaction for accessible multimedia content for the deaf**

			t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
Data1	Data2	Diff				
8	0.33	7.67				
7	3.33	3.67		<i>Data1</i>	<i>Data2</i>	
6	1.67	4.33	Mean	6.666667	2.466667	
6.33	2.67	3.67	Variance	0.722222	2.366667	
6	4.33	1.67	Observations	5	5	
			Pearson Correlation	-0.6374		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	4.307		
						Reject Null Hypothesis because $p < 0.05$ (Means are
			P(T<=t) one-tail	0.006		)

						Different)
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.013		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical Two-tail	2.776		

**Accomplishment of Tasks for the accessible web site for the partially blind**

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	$\alpha$	0.05	
5	3.5	1.5				
4	2	2		<i>Data1</i>	<i>Data2</i>	
5	3.5	1.5	Mean	4.6	2.9	
5	2	3	Variance	0.3	0.675	
4	3.5	0.5	Observations	5	5	
			Pearson Correlation	0.166667		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	4.185		
			P(T<=t) one-tail	0.007		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.014		Reject Null Hypothesis because p < 0.05 (Means are Different)
			T Critical Two-tail	2.776		

**Confidence for the accessible web site for the partially blind**

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
4.83	3.17	1.67				
4.5	2.33	2.17		<i>Data1</i>	<i>Data2</i>	
4	2.67	1.33	Mean	4.533333	2.5	
5	1.5	3.5	Variance	0.158333	0.402778	
4.33	2.83	1.5	Observations	5	5	
			Pearson Correlation	-0.41249		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	5.183		
			P(T<=t) one-tail	0.003	Reject Null Hypothesis because $p < 0.05$ (Means are Different)	
			T Critical one-tail	2.132		
			P(T<=t) two-tail	0.007	Reject Null Hypothesis because $p < 0.05$ (Means are Different)	
			T Critical Two-tail	2.776		

**Learnability for the accessible web site for the partially blind**

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
5	3.33	1.67				
4	2.67	1.33		<i>Data1</i>	<i>Data2</i>	
4	4	0	Mean	4.4	3.06666 7	
5	2.33	2.67	Variance	0.3	0.41111 1	
4	3	1	Observations	5	5	
			Pearson Correlation	-0.33221		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	3.068		
			P(T<=t) one-tail	0.019		Reject Null

						Hypothesis because $p < 0.05$ (Means are Different)
			T Critical one-tail	2.132		
						Reject Null Hypothesis because $p < 0.05$ (Means are Different)
			P(T<=t) two-tail	0.037		
			T Critical Two-tail	2.776		

**Overall Reaction for the accessible web site for the partially blind**

Data1	Data2	Diff	t-Test: Paired Two Sample for Means	<input type="checkbox"/>	0.05	
6	5.666667	0.33				
8	3	5		<i>Data1</i>	<i>Data2</i>	
7.33	4	3.33	Mean	7.4	3.6	
8	0	8	Variance	0.688889	5.188889	
7.67	5.333333	2.33	Observations	5	5	
			Pearson Correlation	-0.65821		
			Hypothesized Mean Difference	0		
			Df	4		
			t Stat	2.938		
						Reject Null Hypothesis because $p < 0.05$ (Means are Different)
			P(T<=t) one-tail	0.021		
			T Critical one-tail	2.132		

						Reject Null Hypothesis because $p < 0.05$ (Means are Different)
			P(T<=t) two-tail	0.042		
			T Critical Two-tail	2.776		

**Appendix C**  
**Demographic Data**



**Deaf participants**

	1	2	3	4	5
Age	24	46	28	21	30
Disability	Deaf	Deaf	Deaf	Deaf	Deaf
Sex	Female	Male	Female	Female	Male
Duration of using computers	More than 12 months	More than 12 months	More than 12 months	More than 12 months	More than 12 months
Duration of using internet	More than 12 months	More than 12 months	More than 12 months	More than 12 months	More than 12 months
Proficiency in using keyboard	Very proficient	Proficient	Proficient	Very Proficient	Very Proficient
Proficiency in using mouse	Very proficient	Proficient	Very Proficient	Very Proficient	Very Proficient
Proficiency in using screen reader	NA	NA	NA	NA	NA
Proficiency in using screen magnifier	NA	NA	NA	NA	NA
Proficiency in using computers	Proficient	Proficient	Proficient	Very Proficient	Very Proficient
Proficiency in using internet	Proficient	Proficient	Proficient	Very Proficient	Very Proficient

**Partially Blind participants**

	1	2	3	4	5
Age	42	39	39	36	19
Disability	Partially Blind	Partially Blind	Partially Blind	Partially Blind	Partially Blind
Sex	Female	Male	Male	Female	Male
Duration of using computers	7-12 months	More than 12 months	More than 12 months	More than 12 months	More than 12 months
Duration of using internet	4-6 months	More than 12 months	More than 12 months	More than 12 months	More than 12 months
Proficiency in using keyboard	Proficient	Very proficient	Not very proficient	Very proficient	Proficient
Proficiency in using mouse	Proficient	Very proficient	Very proficient	Very proficient	Very proficient
Proficiency in using screen reader	Not very Proficient	Very proficient <b>Magnification of 24x</b>	Very proficient	Very proficient	NA
Proficiency in using screen magnifier	Proficient	Very proficient	Very proficient <b>Magnification of 3x</b>	Very proficient <b>Magnification of 6x</b>	Proficient
Proficiency in using computers	Proficient	Very proficient	Proficient	Very proficient	Very proficient
Proficiency in using internet	Not very proficient		Proficient	Very proficient	Very proficient

### Blind Participants

	1	2	3	4	5
Age	49	40	38	42	Not disclosed
Disability	Blind	Blind	Blind	Blind	Blind
Sex	Female	Female	Male	Male	Male
Duration of using computers	More than 12 months	More than 12 months	More than 12 months	More than 12 months	More than 12 months
Duration of using internet	More than 12 months	More than 12 months	More than 12 months	More than 12 months	More than 12 months
Proficiency in using keyboard	Very proficient	Very proficient	Proficient	Proficient	Proficient
Proficiency in using mouse	NA	Not proficient	Not very proficient	NA	NA
Proficiency in using screen reader	Very proficient	Very proficient	Proficient	Proficient	Proficient
Proficiency in using screen magnifier	NA	Not very proficient	NA	NA	NA
Proficiency in using computers	Very proficient	Very proficient	Proficient	Proficient	Proficient
Proficiency in using internet	Very proficient	Very proficient	Proficient	Proficient	Proficient