This is to certify that the
thesis entitled

projectACCESS! INFORMATION AND TECHNIQUES FOR CREATING ACCESSIBLE WEBSITES

presented by

ADINA AFFREEN HUDA

has been accepted towards fulfillment
of the requirements for the

MASTER OF ARTS	degree in	TELECOMMUNICATION, INFORMATION STUDIES AND MEDIA

Major Professor's Signature

6-10-05

Date

projectACCESS! INFORMATION AND TECHNIQUES FOR CREATING ACCESSIBLE WEBSITES

By

Adina Affreen Huda

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Telecommunication, Information Studies and Media

2005

ABSTRACT

projectACCESS! INFORMATION AND TECHNIQUES
FOR CREATING ACCESSIBLE WEBSITES

By

Adina Affreen Huda

The production part of this thesis is an accessible website, called projectACCESS! that will help Web developers and designers with the techniques of practicing Web accessibility. The primary purpose of this project was to create an effective online tool to make creating accessible websites easy for Web developers. The site provides users with simple, step-by-step tutorials; detailed examples and quick implementation tips. The thesis also explores techniques for creating accessible websites and the production process.

The second objective was to get a basic idea if Web developers and designers, who are new to the concept of Web accessibility, are willing to consider it. Results of the exploratory survey show that people's interest in creating accessible websites increased as a result of exploring the projectACCESS! website. However, a more detailed study with a larger sample size need to be conducted to statistically establish the results.

ACKNOWLEDGEMENTS

I would like to thank Brian Winn for his support and feedback during this project and throughout the DMAT program. Carrie Heeter for her valuable inputs and also, for her course on design research that got me fascinated with usability issues and eventually led to my interest in accessibility. Thanks to Sarah Swierenga for her helpful feedback about accessibility issues and survey results. I would also like to thank Lisa Whiting Dobson for helping me stay motivated and on track during the whole process.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

Introduction

Background

Accessibility is about users being able to obtain the contents of a website in a logical, understandable fashion under different circumstances. There are people with disabilities who are not able to experience the Web the same way as those without physical disabilities. They may have to use an intermediary device such as a screen reader to access the contents of a website. Being accessible means the intermediary device will be able to deliver the contents meaningfully. Accessibility also enhances the usability of a site leading to a better user experience for all.

In United States 47.9 million people have some type of disability—that's 19.3% of the population (US Census Bureau report, 2003). The World Bank website mentions that 10% of the world's population has some form of disability. National Organization on Disability President Alan A. Reich says, "Americans with disabilities want to be involved in all aspects of life, and modern technology is making it more possible then ever. The Internet offers real hope!" (Internet Use, 2002)

The Web has come a long way since its inception. Internet provides new opportunities for people with disabilities—it is a means to connect, obtain information and move around the world in ways never possible before. Examples: the deaf or hard of hearing can converse in real time using instant messaging; the blind can read any news they choose to

using screen readers, the mobility impaired who have difficulty shopping without human assistance can do so more easily at an online store; provided that the site, of course, is accessible. Still, greater strides need to be taken. A study by the Disability Rights Commission (2004) found that 81% of websites did not meet the basic Web Accessibility Initiative guidelines[1]. The study also found that "Website designers have inadequate understanding of the needs of disabled users and how to create accessible websites." As a result, a large number of people with disabilities are left out, leaving a trail of legal, social, and business implications. Along with digital innovations came "the digital divide."

Project Objectives

The primary objective of this production thesis is to create an accessible website that will assist Web developers with the techniques of implementing Web accessibility. The website will provide information on accessibility, functional and situational disabilities, and make accessibility easy to practice through simple tutorials and detailed examples. Users will be able to navigate to various sections to obtain the information they want.

There are many resources on the Web about accessibility, a lot of these sites suggest things that can be done to make the Web accessible, but very few detail how. This production thesis aims to fill this gap, by providing information, step-by-step guidelines and quick tips for any developer interested in creating accessible websites.

---

[1] The study by Disability Rights Commission tested the homepages of 1000 websites using commercial software; 10% of these sites were evaluated by a group of 50 users with the following disabilities: blindness, poor sightedness, deaf/hard of hearing, learning disabilities and motion impairment.

The design challenges include creating an accessible and standards compliant site, using style sheets (CSS) for table-free layout, and ensuring that the site displays and works well across different browsers and platforms without compromising design and usability principles.

The secondary objective is to get a basic idea if Web developers and designers, who are new to the concept of Web accessibility, are willing to consider it. This will be achieved by conducting a brief qualitative survey asking. Users will be asked to complete a voluntary survey after they have browsed the site for a while and have been exposed to some basic information about Web accessibility.

CHAPTER 2

Accessibility

Web accessibility is a measure of how easy it is to access, read and understand the contents of a website. It is about everyone being able to use your website effectively.

Although the primary focus of Web accessibility is functional impairments like blindness where a user has to use a screen reader or limited motion where the user is confined to the tab key for navigation, accessibility also encompasses situational limitations related to wireless/handheld devices, mouse-less situations, low bandwidth, language barriers, etc. Accessibility is about more people being able to use websites effectively in more situations (Thatcher et al., 2002).

Functional Disabilities

Blindness

A user with no vision may use a screen reader to hear the contents of your website. A screen reader reads the HTML of a site back to the user. A person who is both blind and deaf will use a Braille display, where nylon or metal pins raise upwards to form Braille characters. An improperly marked up page is confusing/meaningless to the blind user.

Partial/poor sight

A person with partial/poor sight needs to have the ability to increase the size of your website's elements—text, images, etc. While most browsers support text resizing, hardly

any has the capacity to resize graphical elements. A screen magnifier can enlarge the text, image and anything else to the necessary size.

Color blindness

Approximately one in 12 men and one in 200 women have one or other form of color blindness (IEE, 2004). One in 20 visitors to a website is estimated to have some form of color deficiency. If only color is used to convey information in a website, a user who is unable to distinguish colors may completely miss the point. For example, many colorblind people have trouble finding the required fields of online forms if are indicated in red, or blue.

Deaf/hard of hearing

A hearing impaired person uses the Web in almost the same way as someone without any hearing disabilities. A website that is audio/video oriented will not be accessible to them unless transcripts or captioning are provided.

Mobility Impaired

For those who have limited motion (esp. hands) and have difficulty typing or using the mouse, page navigation is a big issue. The users are confined to mostly the tab, then shift-tab and return keys. Unordered tabbing can make a website very difficult to navigate.

Learning Disabled

Images and audio may be helpful to a user with dyslexia, but they may distract someone with another form of learning disability. This is a broad group and the hardest to cater to.

Language Barriers

Users unfamiliar with industry jargon may not be able to comprehend your website and understand acronyms. Non-English speaking users or those whose first language is not English may have difficulty understanding complex text or audio.

According to a 2003 Pew Internet & American Life Project study[2], 38% of those with disabilities use the Internet. Table 1 and 2 shows data, published about Americans with disabilities by the Survey on Income and Program Participation (SIPP) in 1999 (Clark, 2003).

Disability	*Number*	*Percent*
Vision Problems	7,310,000	3.5%
Hearing Problems	6,961,000	3.3%
Difficulty Using Hands	6,272,000	3.0%
Learning Disabilities	2,945,000	1.4%

Table 1. Americans with Disabilities

Disability	*Number with Internet Access*	*Percent*
Vision Problems	1,542,410	21.1%
Hearing Problems	1,893,392	27.2%
Difficulty Using Hands	1,411,200	22.5%
Learning Disabilities	1,242,790	42.5%

Table 2. Americans with Disabilities having Internet Access

[2] See http://www.pewinternet.org/pdfs/PIP_Shifting_Net_pop_report.pdf

Situational Disabilities

Handheld, small screen and wireless devices

Every year more people are accessing the Web via handheld devices. Most of these devices do not yet provide good support for large images, JavaScript, Flash and even CSS. Almost all are mouse-less and have slow download speed. Catering to other types of disabilities also helps the users of these devices.

Slow connections

Not everyone has broadband. In the U.S., as of July 2004 62% of users still connects to the Internet using dial-up (Nielsen//NetRatings, 2004). In the U.K., 73 % used dial-up (Cheap broadband, BBC, 2004) Dial up can be very slow especially for images; having ALT attributes for images will let users know what the image is about in less time. Some users may even turn off images to decrease download time.

No JavaScript or Other Plug-ins

As of this writing, 4% of users (9,880,473) are browsing the Web without JavaScript (thecounter.com, 2005). A lot of users may not have the latest plug-ins (e.g. Flash, Shockwave, QuickTime) needed to view many sites. Some may find it time consuming and difficult to download and install before they can view the website; this can cause them to leave the site.

CHAPTER 3

Reasons for Making Websites Accessible

There are legal, economic, social and ethical demands for companies and individuals to create accessible websites. The World Wide Web Consortium (W3C)[3], Section 508[4] of the U.S. Government's Rehabilitation Act, and governments of some other countries established guidelines to assist in developing websites accessible to a wider audience. These standards and guidelines were set up to remove barriers in information technology and to make available new opportunities for the disabled.

Compliance with Guidelines and Legal Requirements

The W3C's Web Accessibility Initiative's (WAI) Web Content Accessibility Guidelines comprise a set of Checkpoints (design practices). There are three ranks of these checkpoints, defined by the WAI as Priorities 1, 2 or 3. Compliance with W3C's guidelines is voluntary. The W3C includes some guidelines that are not a part of Section 508.

Section 508 requires that all Federal agencies make their electronic and information technology accessible to people with disabilities. It does not require public organizations to be compliant; but Americans with Disabilities Act (ADA) can find them liable. On November 4, 1999 the National Federation of the Blind (NFB) filed a lawsuit against

---

[3] See http://www.w3.org/TR/WAI-WEBCONTENT

[4] See http://www.section508.gov/index.cfm?FuseAction=Content&ID=12

America Online (AOL) identifying the following: (1) violation of the ADA's communication barriers removal mandate; (2) violation of the ADA's auxiliary aids and services mandate; (3) violation of the ADA's reasonable modification mandate; and (4) violation of the ADA's full and equal enjoyment of services mandate (Waddell, 2000). There was an out of court agreement, NFB did not continue with litigation, and AOL adopted a corporate policy on accessibility, formed an Accessibility Advisory Committee, and released versions of its software that have shown steadily improving compatibility with assistive technology (Chong, 2003).

In 1999, Bruce Macguire brought a lawsuit against the 2000 Sydney Organizing Committee for the Olympic Games (SOCOG). Their website, www.olympics.com, failed to meet accessibility standards and was inaccessible to him as a blind person. On August 2000, the Australian Human Rights and Equal Opportunities Commission (HREOC) ordered the website to be made accessible before the start of the Sydney Olympics. Later SOCOG was fined $20,000 (AUS) by the HREOC for not complying with the ruling (Worthington, 2003).

Buying Power

According to a Harris Poll, Internet use among people with disabilities is increasing at double the rate of non-disabled users (Internet Use, 2002). A lot of people with disabilities may not be physically able to go to shopping centers, but with the help of accessible websites and/or assistive technology may be able to purchase goods online. 52% of disabled Internet users are likely to buy a product when they go online (Pew,

2003). According to the National Organization on Disability, the disability community has over $220 billion in collective spending power and responds positively to companies who take disability into account while marketing their products (Economic participation, n.d.).

Social and Ethical Considerations

People with disabilities have the right to enjoy the conveniences of the Internet like the non-disabled. They should be able to obtain the same goods and services as everyone else. Imagine not being able to pay your own bills, not buying your own shirt without asking for assistance, not having the space in a store to browse the products, not being able to read the news on your own, not being able to browse the headlines at your own pace, not buying your own music, or not being able to converse on the phone.

Making the opportunities provided by the Internet accessible—shopping, bill payment, tax filing, entertainment, news, information—leads to easier lives for those with disabilities, a lot of whom may find physically traveling to places very difficult. For someone who cannot physically go to a store and compare prices before buying something, the Internet provides cost-saving opportunities. More importantly, valuable medical/health resources are available online. It can connect the disabled to people and resources. The Internet is a means of making the world more accessible and thus, it must be accessible.

Other Reasons

Accessible websites are standards compliant, meaning more browsers support them and will work similarly in most of the popular ones. They take less time to download and usually search engines rank them higher. The meaningful use of the ALT attribute for images and multimedia content makes them visible to search engines which, generally cannot understand or find information for images and multimedia without alternate descriptions. Accessible websites are usually lighter (no unnecessary codes and nested tables) and download faster. This also makes them more adaptable to hand-held and wireless devices, the usage of which is increasing tremendously.

Accessible websites are easier to manage because content (HTML) is separate from presentation (CSS). This is especially true if absolutely no tables are used for layout, only CSS. It is much simpler to make changes to a single CSS file rather than each and every page of a site.

Creating an accessible website is not only good practice but absolutely necessary. It increases the sites' reach to people with functional and situational disabilities and improves usability for those without any disabilities.

CHAPTER 4

Target Audience

projectACCESS! is designed for Web developers who are new to the concept of Web accessibility. The Web developers will be the primary users of the product, but can also be used as a resource by students and anyone else interested in the topic. It is expected that the primary audience has basic knowledge and understanding of HTML, CSS and JavaScript; can use tools like Macromedia Dreamweaver, Adobe GoLive and Microsoft FrontPage; and has created professional-quality websites.

Persona Analysis

Primary persona: The Web developer

Jana Willis, 29, works for a small company called Blue Bug Design and does most of their Web work. She graduated from Michigan State University with a degree in Computer Science. Recently, she has been hearing about accessibility. The only thing she knows about accessibility is providing alt tags; she's a bit confused about what to do for spacer images and wants to learn more. She has a very busy schedule and wants to pick up accessibility tips during downtime at work. Her company is small and can't afford to pay for external training/courses. She had searched for accessibility on Google and found a lot of websites talking about the issue but could not find a site with straight forward tips and techniques.

She has a 17-month old son and barely has time once she gets home from work to sit down with a book. Jana has always been goal oriented and likes to be the first to know about anything that can help her excel. She has always given knowledge top-priority and finds it frustrating because she is unable to do so now. Every now and then, she goes online at night to check her e-mails and communicate with friends and family and catch up with news. She also likes to browse design sites and blogs.

Secondary persona: The graphic designer

Onida Taggart, 35, has 10 years of experience. Lately her clients have been asking for site designs that are more usable and accessible. Compared to just a few years ago, recently she has been doing way more reiterations of her designs. She is used to giving her creativity full reign and creating Photoshop files that her clients' Web developers would slice up and lay out using complex tables. Now she is getting requests for designs that can be translated easily into accessible websites. She is pretty set in her ways and doesn't understand what the big deal is about. Her attitude: so what? But for the sake of keeping her clients happy she has unwillingly decided to learn just the bare minimum and nothing more. She has no interest in buying a book or getting professional training. She is just going to find whatever is out there on the Internet.

Tertiary persona: The project manager

Kirk Duvall, 43, manages most of the projects that his firm gets from external clients. He understands and appreciates the need for accessible sites, and wants to pitch it to his clients. He has years of Web development experience and understands the process well,

but accessibility is a new arena. He wants to learn more about implementing accessibility so he can better analyze project costs, create detailed design documents and proposals for his clients.

The client

Wants to know just how much extra work accessibility is and what it's going to cost him. He wants to make sure he is not being over charged.

CHAPTER 5

Methods

Pre-production

Comparative analysis

Popular search engines (Google, Yahoo and MSN) were used to search for sites on Web accessibility. The top ranked results were reviewed for their usability of layout, navigation, and content. Special attention was paid to their definitions of accessibility and their tutorials. The various tutorials were analyzed for the type of information they provided, the length and clarity of instructions and the topics they covered. Most were extremely text heavy, difficult to read and six or seven pages long. It was difficult to scan a page and find something specific on a topic. Tutorials were broken up into multiple pages, interrupting text flow. The user would have to go back a few pages to refer to something they read earlier. Many suggested things that can be done to create accessible websites, but not how (e.g. one site suggested use of "long desc" for images, but did not provide further instruction). HTML syntaxes and clearly detailed implementation instructions were not provided in most places. Some examples were difficult to follow.

Secondary Research

Various books, reports, articles and websites were reviewed for information on different types of disabilities and assistive technologies; latest statistics on disabilities, Internet use and Web accessibility; current research on issues related to accessibility; various guidelines, standards and laws; practices and techniques for creating accessible websites;

and, available testing and validation software and methods. Information gathered during the secondary research process has been used in previous sections and also during the production of the projectACCESS! website.

Production

Content and Information Design

Information generated during the pre-production phase was used to generate content for the website. The book and websites in the reference section were used to compile text for the various sections of the website. Special care was taken in developing the contents of the tutorials section, since that is the core of this project.

The website is arranged into these following main sections: Home (Accessibility Overview), Disabilities, Tutorials, Testing, Quick Tips, Standards, and Resources. Other sections include Accessibility Features, Contact, About, Site Map and Submit Tutorials (Figure 1).

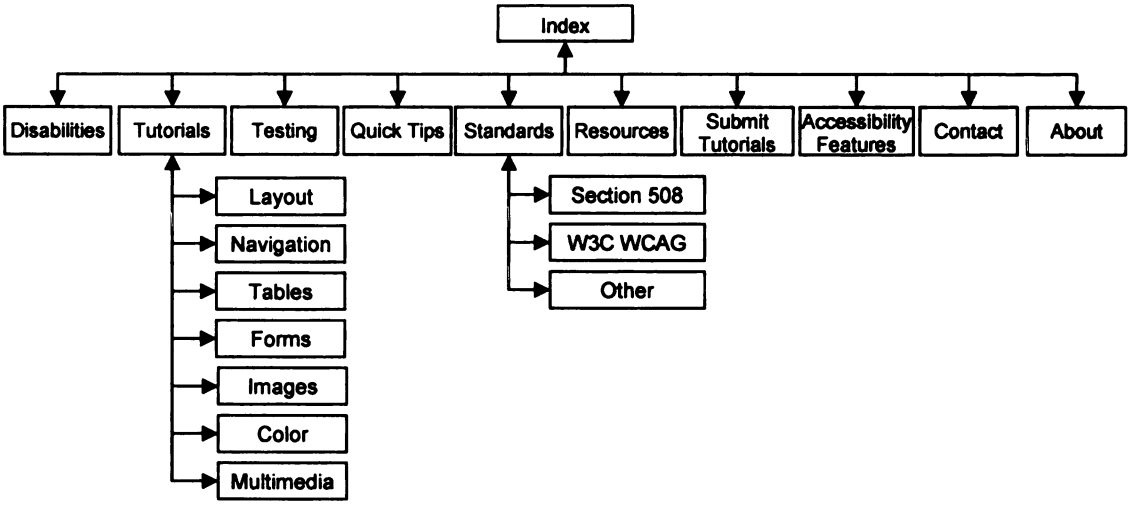

Figure 1. Site Map

Home (Accessibility Overview)

Describes what Web accessibility is, its importance, and mentions when and how to practice it.

Disabilities

Contains information about different types of disabilities—vision, hearing, mobility, technology—and the technological implications for Web developers.

Tutorials

The tutorials are divided according to topics—Layout, Navigation, Tables, Forms, Images, Color and Multimedia. A lot of websites visited during the pre-production process told users what to do, but provided very little information on how to achieve it. The tutorials section of **project**ACCESS*!* aims to fill that gap. Syntaxes, code and examples are provided to make Web accessibility easy to practice. The tutorials clearly list important information and make them easily discernable while scanning a page. The multimedia section also explores accessibility in Flash by providing an introductory tutorial.

Testing

This section talks about the different ways to test for accessibility and software available currently that can help someone test for accessibility. A simple flow chart of the process is provided as a quick guide.

Quick Tips

This section is essentially a bullet list of quick things that the user can do when something needs quick implementation. If the user wants more information, he/she can then go to the relevant tutorial.

Standards

This section links to the Section 508, World Wide Web – Web Content Accessibility and IBM's guidelines on creating accessible Web content.

Resources

A list of books, websites, articles and reports that can help the user learn more about accessibility, its current status, CSS (Cascading Style Sheets) to separate presentation from content, accessibility issues for Macromedia Flash, etc.

The other sections (Accessibility Features, Contact, About, Site Map and Submit Tutorials) include information about the website. The section Accessibility Features talks about accessibility of the projectACCESS! website and provides a list of short cut/access keys that can be used to navigate the site.

Navigation Design

Navigation for the site was designed with Web accessibility in mind. The navigation is always visible and stays constant, so users can easily find their way around without having to look for links that changed or disappeared. The site employs top and right

navigation. The top navigation leads to these main sections of the website—home, disabilities, tutorials and testing. The right (sub) navigation houses Quick Tips, Standards, Resources, and Submit Tutorials. There are also print, e-mail and text resize options on the right navigation. A link to the survey was also provided while it was in progress, but was taken down as soon as it was over.

The first two links available on all pages are *skip navigation* and *accessibility features* (Figure 2). The skip navigation link allows the blind and motion impaired user to go directly to the main content without tabbing through the main navigation and other links. Various sites (cnn.com, bbc.co.uk, fidelity.com) visited during the pre-production process use invisible skip navigation links keeping them out of the way of visual design. The skip navigation link for this site is kept visible, because an invisible link, while useful to those using a screen reader serves no purpose for the motion-impaired or those viewing the site in a mouse-free situation.

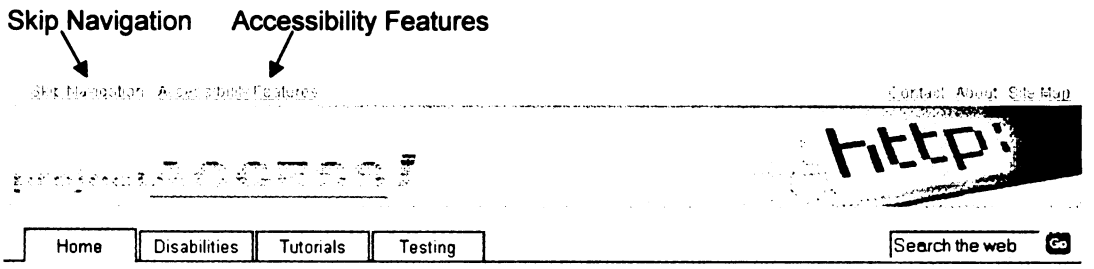

Figure 2 Site Navigation

The accessibility features link takes users to the page with a list of short cut/access keys that can be used to navigate the site. The access keys defined for this site are listed below (Table 3). The page also includes information about using access keys for different browsers and operating systems.

Navigating the site:	
Access Key	**Purpose**
0	go to Home page
1	go to Disabilities page
2	go to Tutorials page
3	go to Testing page
4	go to Quick Tips page
5	go to Standards
6	go to Resources
7	go to Contact page
8	go to About page
9	go to Site map page
A	go to Accessibility Features page
Navigating within a page:	
Access Key	**Purpose**
M	go to the **main content** of the page
R	go to the **right navigation** of the page
S	go to the **sub-navigation** of the page (tutorials section only)
T	go to **top** of the page

Table 3. Access Keys

The links—top, main content, and right navigation—are also available at the bottom of all pages to help navigation.

Layout and Interface Design

Design principles were considered for the layout so the site is not only accessible, but also usable, and aesthetically pleasant. Adobe Photoshop CS was used to create the graphic elements for this website. To ensure that content is separate from presentation, CSS (Cascading Style Sheets) was used for layout and also to control font type, size, color, spacing and underline effect. Tables were used only for information purposes, not for layout. Camtasia Studio was used for screen capture of examples showing how screen readers work. The files were saved in the SWF format so users can view them with a regular Flash Player. The tutorial about implementing accessibility in Flash was created in Macromedia Flash MX.

Macromedia Dreamweaver MX was used for HTML and CSS editing. Some problems related to CSS were experienced during the development process. Not all browsers are standards compliant, so the website would display erroneously in different browsers and operating systems. The CSS had to be manipulated quite a bit to ensure cross-platform, cross-browser look and functionality. Comments were removed from all HTML documents; Internet Explorer was unable to handle comments and would not display the pages properly. The CSS and HTML were validated throughout the development process to endure proper mark-up usage. Accessibility testing was also repeated. Important segments of the content and the right navigation were kept within the safe areas of 800 by 600 pixels.

Other Features

All font sizes of the HTML documents are relative. Text resizing options are provided directly on the pages, so users can easily manipulate the text to their desired size (Figure 3). E-mail function is also provided so users can directly send the link to a particular page they like to themselves or someone they know, instead of going through the process of logging into their e-mail, and then copying and pasting a link before hitting a send button (Figure 4). A separate CSS file was also created for the print version of the site, which displays only the main banner and the text for the section being printed (Figure 5) There is a submit tutorials section that the users can take advantage of if they want to add to a tutorial or submit a new tutorial entirely for the projectACCESS! website. PHP scripts were used for the e-mail and submit tutorials section.

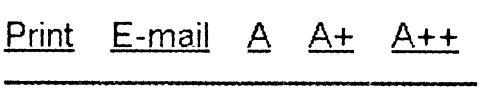

Figure 3. Print, E-mail and Text Resizing Options

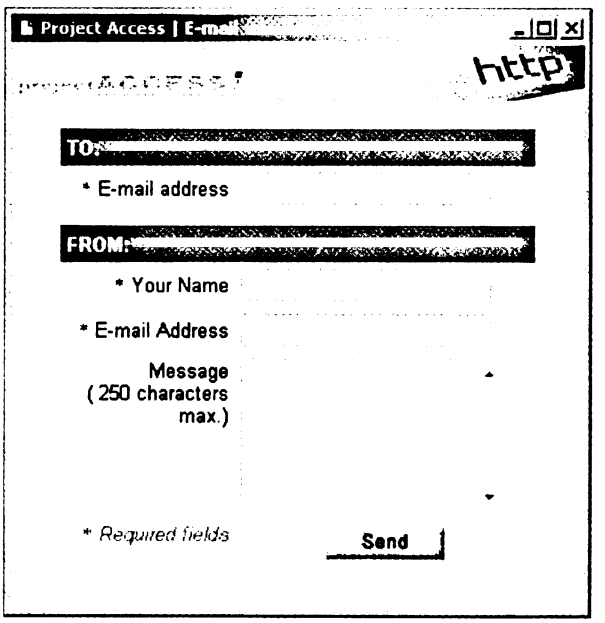

Figure 4. E-mail Window

Welcome to projectACCESS!

Our goal is to introduce you to accessibility and make it easy for you to practice. If you're new to accessibility, you may have heard some of the biggest myths - that accessible sites are boring, text only and difficult to make. In reality, you are only limited by your creativity, and accessibility is not that hard. Read on to find out the what, why, who, how, when and where of accessibility

What is accessibility?

So, what exactly is accessibility? It is about all users being able to access the contents of your site in a logical, understandable fashion under different circumstances. There are people with disabilities who are not able to experience the web the same way as those without disabilities. They may have to use an intermediary device such as a screen reader to access the contents of your website. Being accessible means the intermediary device will be able to deliver your contents meaningfully.

Accessibility also encompasses situational limitations related to wireless/handheld devices, mouse-less situations, low bandwidth, language barriers, etc. Accessibility is about more people being able to use websites more effectively in more situations.

Why is accessibility important?

Why not? It's the right thing to do. You not only cater to those with physical disabilities but also to those who are using newer technologies like handhelds and wireless devices. Because, you also believe in the best user experience possible. Other reasons: broadens your site's reach; ranks your site higher in search engines (thanks to meaningful `alt` attributes, etc.); increases usability; takes less time to download; easier to manage because content(HTML) is separate from presentation (CSS); comply with standards (thus, more browsers support them); and it makes you look good cause you know all the tricks. Also, it's the law.

Who should practice accessibility? Who benifits?

Who should practice accessibility? You! Who benefits? You and your users. You get lauded for creating wonderful and considerate sites. Your users benefit from a site that is easy to use and access.

How?

How should you practice accessibility? By learning a few simple things. This site includes techniques and step by step tutorials. Keep reading and then get your hands dirty.

When?

Always. You should keep accessibility in mind anytime you are building a website. The

Figure 5. Print Version

Flash and Accessibility

Flash has been bringing rich media content to the non-disabled users for a long time. Now with enhanced features for accessibility, Flash can be easily used to create engaging content for people with disabilities. The accessibility feature of Flash is fairly new, thus very few assistive software support it at the moment, and resources about creating accessible Flash content are hard to find. The purpose of creating accessible Flash content for projectACCESS! was to explore accessibility issues related to Flash.

When appropriately authored and used with technology that supports it, Flash content can become accessible. Because of Flash's multimedia support and audio capabilities, visually disabled users can use Flash content without the help of screen readers. Flash has the capability to provide highly interactive content and can be used to supplement HTML content with rich and engaging materials for users with disabilities.

Technology

Flash uses Microsoft Active Accessibility (MSAA) to deliver information about Flash movies to screen readers and other assistive technologies. MSAA uses COM-based technology (COM-Component Object Model) to interface between applications and assistive technology that runs on Microsoft Windows (Microsoft Active Accessibility, n.d.). MSAA is the intermediary between the Flash player and screen reader (Figure 6).

Figure 6. Flash and Microsoft Active Accessibility

System Requirements

Since Macromedia Flash uses MSAA, accessible Flash content is only available to screen readers and other assistive technology running on Windows. Microsoft Internet Explorer is the only browser that supports MSAA. The assistive technologies that currently support Flash content are currently Freedom Scientific's JAWS and GWMicro's Window Eyes. Macromedia Flash Player 6 or above is needed to access Flash content via screen readers.

How Flash Interacts with Screen Readers

When a screen reader comes across Flash content, it announces the beginning and end of the movie. Once the screen reader enters the Flash movie, it reads the content as it would a typical HTML page, given that the movie was properly authored for accessibly. Currently, Microsoft's Internet Explorer is the only browser where this can happen. Some browsers other than IE usually skip over Flash content; others allow the users to enter Flash content either by clicking on it or using the tab key. Once users enter Flash content, they normally have to click outside the movie to leave. Unless the content is Accessible, users of screen readers and mouse-free devices can get stuck inside the Flash movie. They will then have to close the browser to get out of the movie.

Screen readers consider motion as an update to the page. As Flash content changes, the screen reader goes back to the top of the movie and starts going through the content again. Looping elements cause screen readers to refresh constantly and start reading from the beginning again. To avoid this, child objects or entire movies can be made

inaccessible. This can be done by making objects within a movie or even entire movies inaccessible by deselecting "Make Child Objects Accessible" or "Make Object Accessible" in the Accessibility panel. Designers can also choose to enable or disable accessibility by using ActionScript (Figure 7).

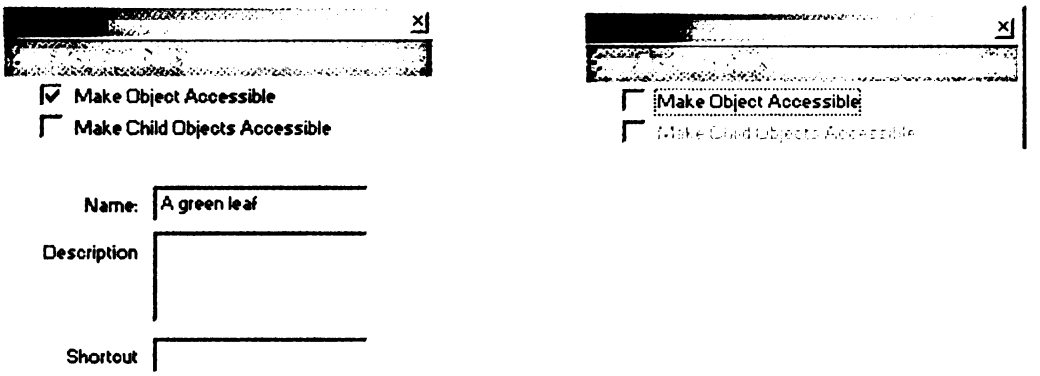

Figure 7. Flash Accessibility Panel

To optimize the accessibility of Flash content, text equivalents should be provides for graphic elements. Either the Accessibility panel (Name or Description field)) or ActionScript (F9) can be used. Text equivalents are not supported for graphic symbols. You have to save your object as a movie symbol or a button.

By default, screen readers read all text objects in a Flash movie. Changes to text objects are not required to make it readable by screen readers. If multiple text and graphic elements are arranged to form words, they will not be read correctly as text. These elements can be converted to a movie clip symbol; meaningful text equivalent should be provided. Dynamic text elements can also have meaningful text equivalents. Screen

readers will overlook any change in the dynamic text box and read the alternate text instead.

Screen readers will read text placed within buttons when they access the button symbol. If there is more than one text element in a button, then Flash randomly picks which text item to read. If there is no text in the button element, there should be an alternate text description for the screen reader to read so the user can know the button's purpose.

As long as there are text equivalents and accessibility is enabled for different types of objects and proper tab order is maintained, screen readers can meaningfully deliver the contents of a Flash movie to users with disabilities.

Flash in project*ACCESS*!

The design, navigation and contents of the Flash tutorial were kept simple to make it as accessible as possible. The content covered some of the basics of accessible Flash movies. The different sections of the movie are: Overview, Visual Elements, Text, Animation, Buttons, Best Practices and Conclusion (Figure 8). The navigation is always visible and users have the option to skip the intro movie (Figure 9). Transitions were avoided, because movies within movies and passing of variables can confuse the screen reader.

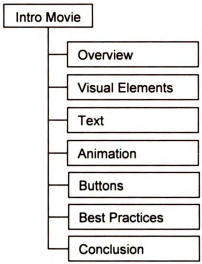

Figure 8. Site Map of Flash Tutorial

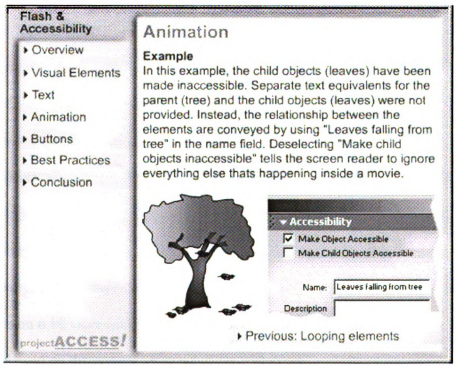

Figure 9. Screen Shot of Flash Tutorial

Accessibility Testing and Evaluation

The projectACCESS*!* website was tested during and after the production process to ensure correct syntax, compliance to laws and guidelines, meaningful content and accessibility. The goal both during the development and testing phase was to convey meaningful information no matter how the website was looked at in terms of device and browsers. Available tools and methods were used to minimize errors and find problems. These tools varied in their scope of testing and the things they checked for. Thus, manual checking was conducted along with using multiple applications. Figure 10 shows the process that was used for testing the website.

The HTML and CSS for all pages of the site was validated using W3C's online validation services, and are indicated by the icons at the bottom of each page of the projectACCESS*!* website. To test for keyboard accessibility, the site was navigated without a mouse using the tab, shift, return, and arrow keys. The access keys were also used. The Lynx browser was used to see how the site worked as text-only version. The Opera browser was intensively used to look at the site in various ways: as text only, with tables disabled, images turned off, in high contrast and in the accessibility layout view. Bobby and Wave were used to check for WCAG and Section 508 standards. To see how the site would look in different handhelds, a Wapalizer at www.gelon.net was used. Unfortunately, it is currently not available. IBM Homepage Reader version 3.02 and JAWS version 6.10 were used to see how the site performed in screen readers. The site was also viewed on different browsers and platforms (PC and MAC) over different bandwidths.

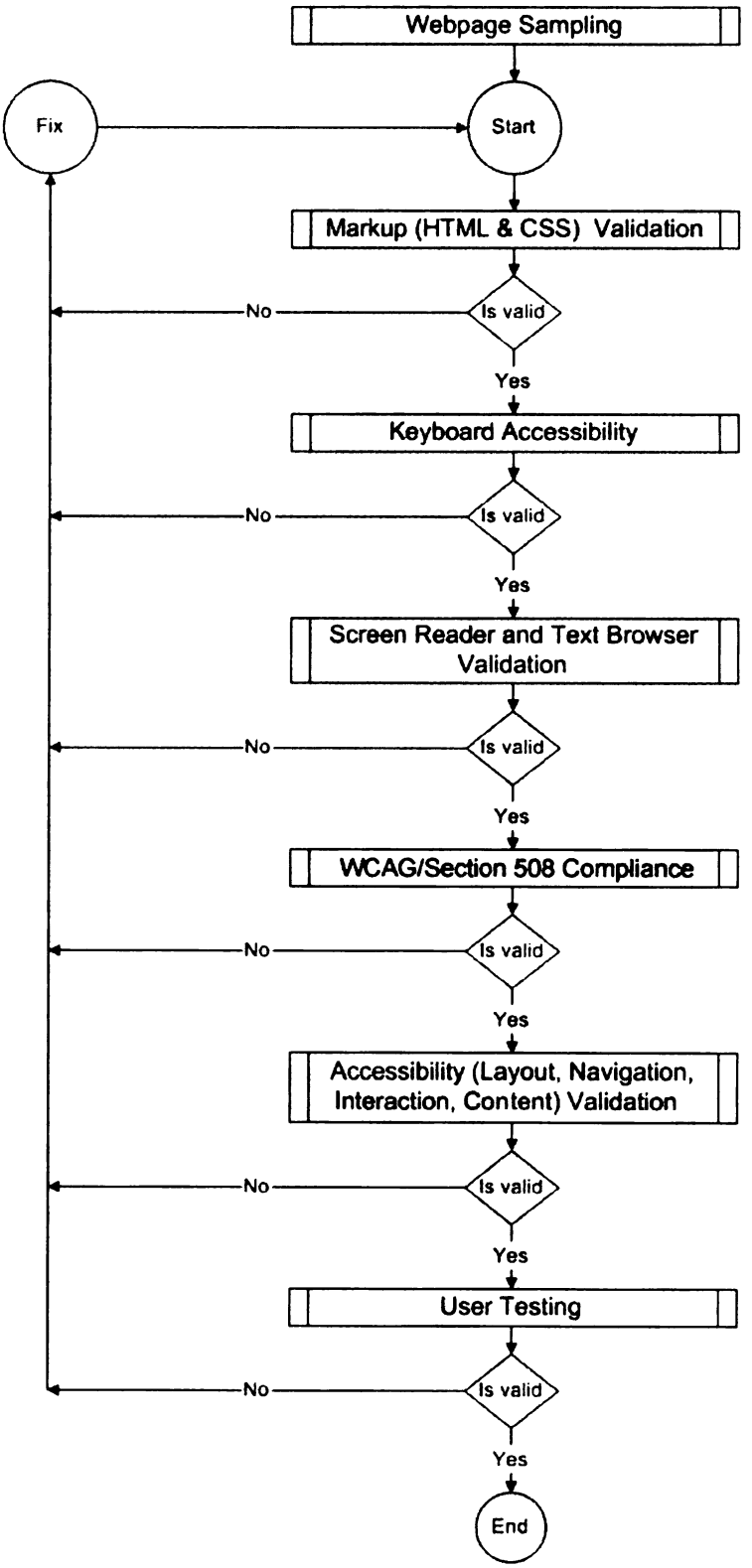

Figure 10. Flowchart of the Testing Process

CHAPTER 6

Post-Production Research

Research Method

Objective

The goals of the post-production research are: (1) to find out if the site is useful (2) to find out how this production can help the target users learn about and implement Web accessibility, and (3) to evaluate the effectiveness of this project.

Procedure

The target audience was students or professionals who create websites, and are either completely unfamiliar or somewhat familiar with the concept of accessibility. E-mails were sent out to undergraduate and graduate students in the Digital Media Art and Technology program and webmasters' electronic mailing list at Michigan State University informing them of the project, its purpose, duration of the survey, and the website link (See Appendix B: Recruiting Advertisement). Participants were asked to browse the website before completing an online survey (See Appendix D: Survey Instrument). The link to the survey was available on all pages on the website; it was removed afterwards. Twenty-three people (12 male, 11 female) completed the survey. Six people answered "Do not create websites." Since they are not part of the target audience their data were not included as part of the following analysis (See Appendix E: Responses of Participants Who Do Not Create Websites).

Survey Results and Findings

General Information about Participants

The survey results (only for the target audience) show that the participants (9 male, 8 female) are from varying age groups and display different skill levels. All participants answered that the Web is their most common method of obtaining information on a new topic. The tables below (Tables 4, 5) show information about the participants.

	Number	*Percentage*
22 or younger	2	12%
23-29	11	65%
30-39	3	18%
40-49	0	0%
50 or older	1	6%

Table 4. Age Range of Participants

	Number	*Percentage*
Do not create websites	0	0%
Less than 1 year	1	6%
1 - 2 years	4	24%
2 - 3 years	6	35%
3 - 4 years	2	12%
5 or more years	4	24%

Table 5. Years of Involvement in Creating Websites

The majority of the participants described themselves as "Web developer", "Web designer", "Web programmer" or "Webmaster" (Table 6). Participants could choose more than one answer for this question.

	Number	*Percentage*
Web developer	3	18%
Web designer	8	47%
Web programmer	2	12%
Webmaster	3	18%
Other	5	29%

Table 6. Participant Description

The highest number of expertise was seen in HTML. Only eight people were either "intermediate" or "somewhat" expert in CSS. XHTML and JavaScript had the highest number of "novices" (Figure 11).

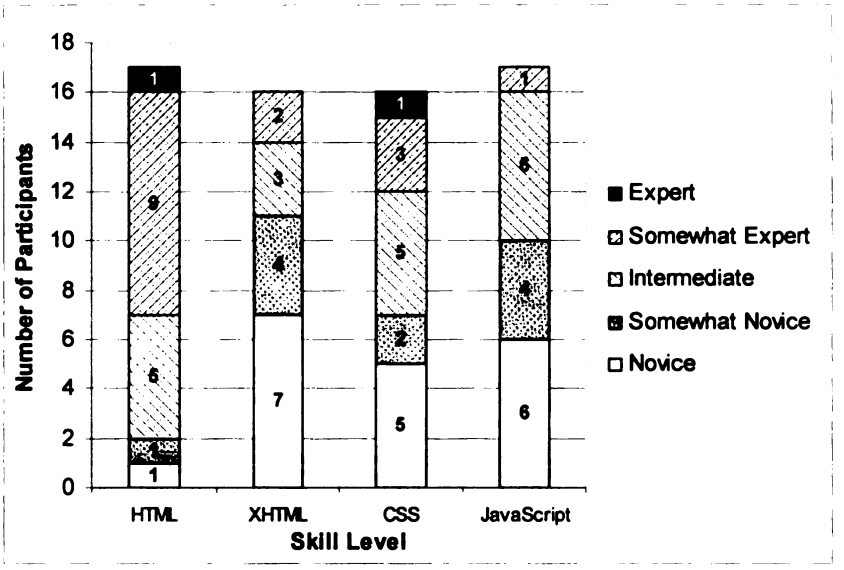

Figure 11. Skill Levels for HTML, XHTML, CSS and JavaScript

Table 7 shows that about half of the participants never used handheld devices to browse the Web. Thirty-five percent used it sometimes.

	Number	*Percentage*
Never	8	47%
Rarely	2	12%
Sometimes	6	35%
Often	1	6%
Always	0	0%

Table 7. Using Handheld Devices to Browse the Web

Participants and Accessibility

Almost a fourth of the participants were "hardly" or "not at all familiar" with Web accessibility. A little over a third were "somewhat familiar", about a fifth were "fairly familiar" and almost a quarter of the participants "very familiar" with the concept. Despite 76% of the participants being "somewhat", "fairly" and "very familiar", about a quarter of the respondents said they "always" consider accessibility. Another 31% said they "often" or "sometimes" consider accessibility. When asked reasons for not considering accessibility, 35% said they "did not think about it", 6% said "didn't know how to implement", and 59% chose "other" (Table 8).

Familiarity with Web Accessibility Prior to Visiting projectACCESS!	*Number*	*Percentage*
Not at all familiar	3	18%
Hardly familiar	1	6%
Somewhat familiar	6	35%
Fairly familiar	3	18%
Very Familiar	4	23%
Currently consider Web accessibility	*Number*	*Percentage*
Never	3	18%
Rarely	3	18%
Sometimes	3	18%
Often	4	23%
Always	4	23%
Reasons for not considering accessibility	*Number*	*Percentage*
Do not create websites	0	0%
Don't know what accessibility is	0	0%
Did not think about it	6	35%
Did not need to do it	0	0%
Too Complicated to implement	0	0%
Don't know how to implement	1	6%
Other	10	59%

Table 8. Participants and Accessibility

A majority (88%) of the respondents "strongly agreed" and "agreed" that they were interested in creating accessible websites (Table 9).

	Number	*Percentage*
Strongly Disagree	0	0%
Disagree	0	0%
Neutral	1	6%
Agree	5	29%
Strongly Agree	10	59%

Table 9. Interest in Creating an Accessible Website

Fifty-three percent of the participants said their interest "increased" as a result of visiting the projectACCESS! website. About a quarter of the participants said their interest "slightly increased" (Table 10).

	Number	*Percentage*
Decreased	0	0%
Slightly Decreased	0	0%
Did not Change	3	18%
Slightly Increased	5	29%
Increased	9	53%

Table 10. Change in Interest in Creating Accessible Websites

Gender and Accessibility

Figure 12 shows that 7 males and 6 females were "somewhat", "fairly" and "very familiar" with Web accessibility. Four participants (2 males and 2 females) were "not at all" and "hardly familiar" with Web accessibility.

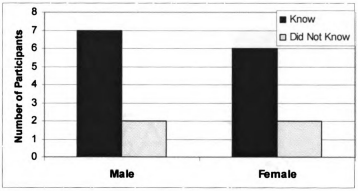

Figure 12. Familiarity with Web Accessibility Prior to Visiting project<u>ACCESS</u>*!* (Gender)

More males (78%) than females (50%) said they "sometimes", "often" and "always" considered Web accessibility while creating Web pages. Only half of the female participants (4) said they "sometimes", "often" and "always" considered Web accessibility (Figure 13).

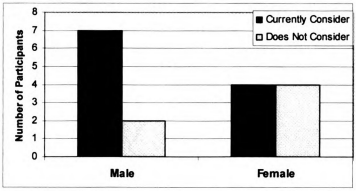

Figure 13. Currently Consider Web Accessibility (Gender)

Only 6 of the male participants "agreed" and "strongly agreed" that their interest in creating accessible websites increased as a result of visiting the projectACCESS! website. All the female participants "agreed" and "strongly agreed" that their interest went up after visiting the site (Figure 14).

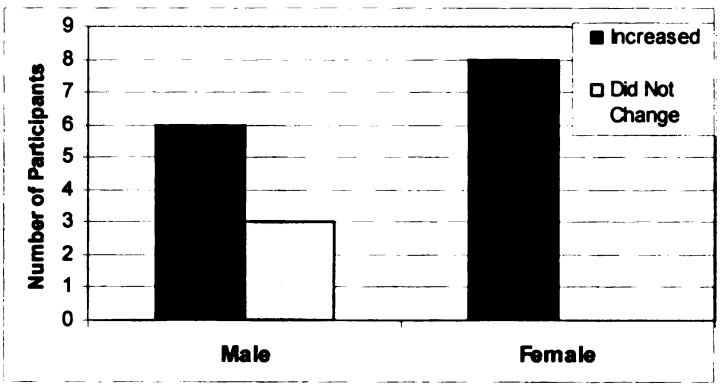

Figure 14. Change in Interest after Visiting projectACCESS! (Gender)

Age Group and Accessibility

All the participants who were 22 or younger and between "33-39" were "Somewhat", "Fairly" and "Very Familiar" with Web accessibility. Eight (73%) of the participants between 23 and 29 were "Somewhat", "Fairly" and "Very Familiar" with Web accessibility (Figure 15).

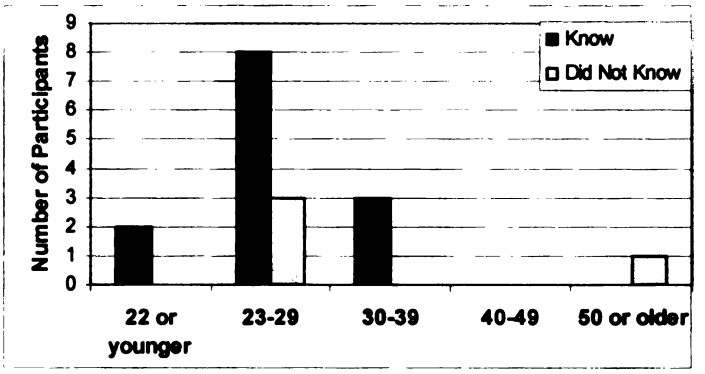

Figure 15. Familiarity with Web Accessibility Prior to Visiting projectACCESS! (Age Groups)

Not everyone who said they were familiar with Web accessibility practiced it. The highest disparity was in the 30–39 age group; the second highest in the 23–29 group (Figure 16).

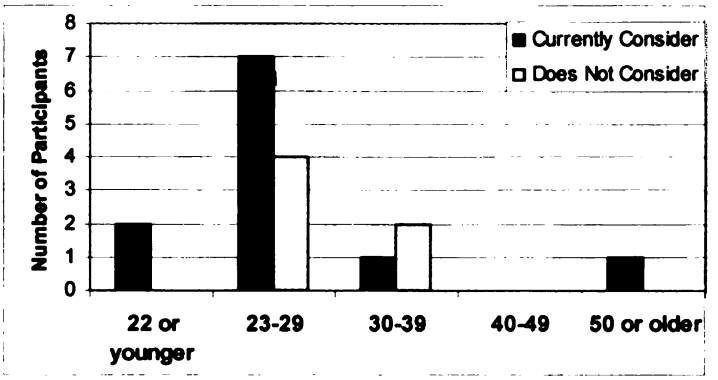

Figure 16. Currently Consider Web Accessibility (Age Groups)

For participants of the 23 – 29 age group, 73% "Agreed" and "Strongly agreed" that their interest increased. For all other age groups, 100% "Agreed" and "Strongly agreed" that their interest in creating accessible websites went up as a result of visiting the projectACCESS! website (Figure 17).

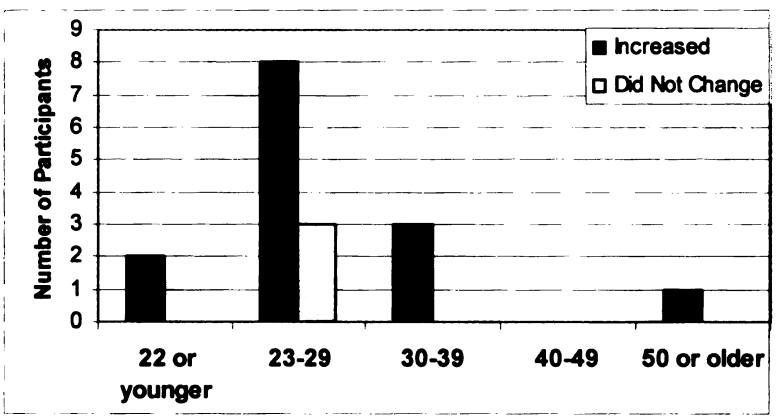

Figure 17. Change in Interest after Visiting projectACCESS! (Age Groups)

Background and Accessibility

All webmasters said they were "Somewhat", "Fairly" and "Very Familiar" with Web accessibility. Only one-third of the Web developers and half of the Web programmers said they were "Somewhat", "Fairly" and "Very Familiar". Eighty-eight percent of Web designers and sixty percent of those with other background said they were "Somewhat", "Fairly" and "Very Familiar" with Web accessibility (Figure 18).

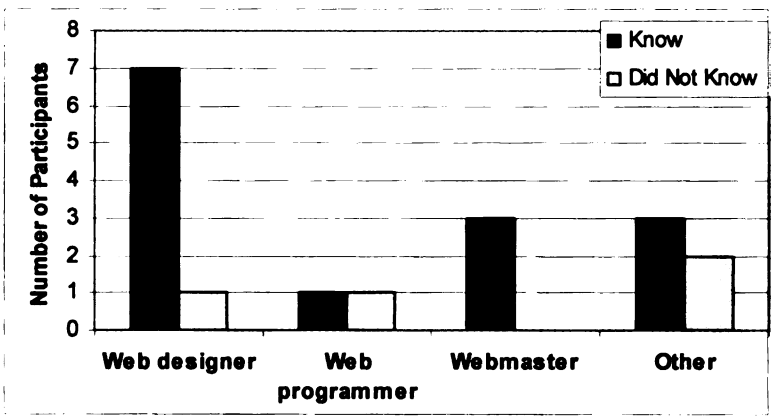

Figure 18. Familiarity with Web Accessibility Prior to Visiting projectACCESS! (Background)

Less than two-third of the Web developers, designers, programmers and Webmasters said they "Sometimes", "Often" and "Always" considered Web accessibility while creating Web pages (Figure 19).

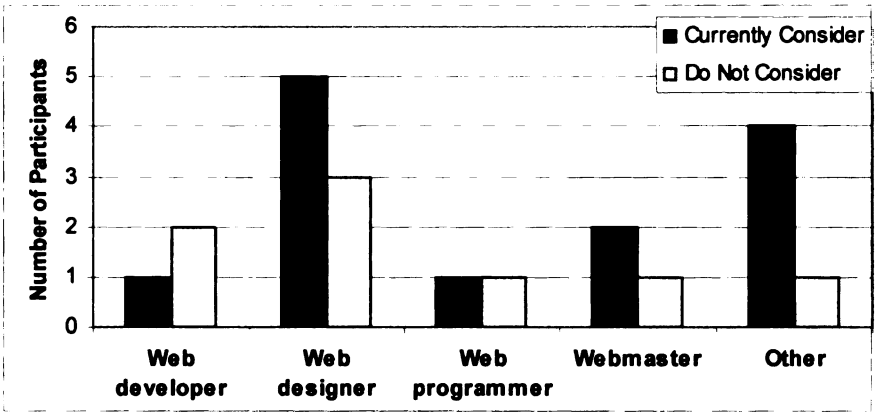

Figure 19. Currently Consider Web Accessibility (Background)

More than 50% of the participants said their interest increased as a result of visiting the projectACCESS! website. Web designers showed the greatest increase in interest.

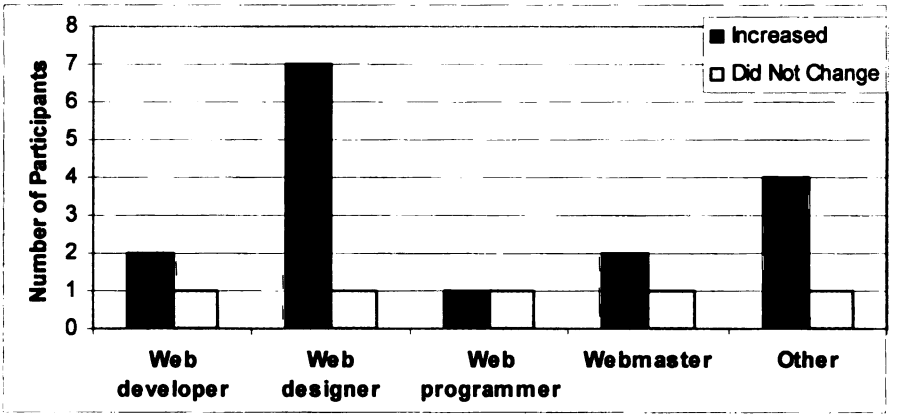

Figure 20. Change in Interest after Visiting projectACCESS! (Background)

Was this site effective?

Looking at the overall data about participants and accessibility, and also in terms of gender, age, and background, we can safely say the site was able to increase participants' interest in considering accessibility while creating websites.

The projectACCESS*! Website*

Participants were asked to rate the site on a scale of 1 to 7. One being "Very Informative", "Very Attractive", "Very Useful", "Very Inspiring" and 7 being "Not". On that note "Informative" and "Useful" got a high score. "Attractive" and "Inspiring" average scores (Table 11).

	Average
Informative	2.65
Attractive	3.12
Useful	2.53
Inspiring	3.47

Table 11. Participants Description of the Website

All participants "agreed" and "strongly agreed" that they could immediately tell what options (navigation/content) were available to them (Table 12).

	Number	*Percentage*
Strongly Disagree	0	0%
Disagree	0	0%
Neutral	0	0%
Agree	12	71%
Strongly Agree	5	29%

Table 12. Awareness of Available Options (Content/Navigation)

All participants "agreed" and "strongly agreed" that they could immediately understand the purpose of the website (Table 13).

	Number	*Percentage*
Strongly Disagree	0	0%
Disagree	0	0%
Neutral	0	0%
Agree	7	41%
Strongly Agree	10	59%

Table 13. Understanding the Purpose of the Website

Table 14 shows that respondents spent the most time in "Home" and "Tutorials." The second most time was spent in the "Multimedia" section. The table could be interpreted in different ways. First, users spent majority of their time in the sections of most interest to them. Second, they spend their time in sections that contained information they did not know much about. Third, users were not drawn into least visited sections with navigational and visual cues. And, fourth, users may have gone back and forth among the various tutorial topics and were not sure which of the tutorials they spent most time in and thus, decided to choose "Tutorials" in general.

Section	*Number*	*Percentage*
Home	5	29%
Testing	1	6%
Disabilities	0	0%
Resources	1	6%
Quick tips	1	6%
Accessibility Features	1	6%
Tutorials	5	29%
Layout tutorial	0	0%
Navigation tutorial	0	0%
Tables tutorial	0	0%
Forms tutorial	0	0%
Images tutorial	0	0%
Color tutorial	0	0%
Multimedia tutorial	3	18%

Table 14. Section Participants Spent Most Time In

Users were asked to rate their interest in the different content areas of the website. One being "Extremely Disinterested" and 7 being "Extremely Interested." Users displayed the most interest in the "Multimedia tutorial" (41%). The next highest percentage was 24 for a few other sections. The projectACCESS! website has to cater to these interests and also

improve the sections with lower scores to increase users' interest in those sections (Table 15).

Features	*Average Score*
Home (Accessibility Overview)	4.88
Testing	5.06
Disabilities	5.13
Resources	5.19
Quick tips	5.13
Accessibility Features	4.94
Tutorials	5.06
Layout tutorial	5.31
Navigation tutorial	5.31
Tables tutorial	5.38
Forms tutorial	5.13
Images tutorial	5.25
Color tutorial	5.25
Multimedia tutorial	5.50

Table 15. Interest in Different Sections

Users were asked to rate the persuading features of the website (1 = strongly disagree, 7 = strongly agree). The feature with the highest score was "The site showed that accessibility is important" (Table 16). "It's not far from what I already know" received the lowest score, indicating that the information on the site was quite different from users' current knowledge.

Features	*Average Score*
Hearing audio of screen readers	5.07
Going through the tutorials	5.47
The tutorials explained the steps very clearly	5.20
Reading the overview section	5.47
The site showed accessibility is easy to practice	5.47
It's not too far from what I already know	4.00
The site showed me that implementing accessibility will not be too different from what I already practice	5.13
The site showed that accessibility is important	5.93
The site showed how I can build better websites	5.87
Other	3.17

Table 16. Features of the Website that Persuaded Participants to Consider Web Accessibility

The majority of the users (94%) "agreed" and "strongly agreed" that they will return to the projectACCESS! site for help (Table 17). One user said, ""I think the site explained accessibility in very clear and simple terms. I have bookmarked the site for future reference."

	Number	*Percentage*
Strongly Disagree	0%	0
Disagree	6%	1
Neutral	0%	0
Agree	53%	9
Strongly Agree	41%	7

Table 17. Returning to ProjectACCESS! Website for Help

Was this site usable and useful?

In terms of usability, most users said they could immediately understand its purpose and could easily tell the navigation and contents available to them. The site also received high scores for informativeness and usefulness. Most users also agreed that they will return to this site for help. Participant comment: "The site is useful and to the point."

Participants' Comments

Some participant comments about what appeals to them about considering Web accessibility when they create websites:

"Appealing to a wider audience."

"It will make the site user friendly and be an useful utilization of their time."

"Since it will be accessible, few would leave the site and continue to browse with ease."

"It attracts more people."

"Broad audience"

"Till date nothing. But realizing its necessity and size of audience, I believe it is a must to consider at the stage of web-designing"

"Knowledge rich website. I have been a designer for 5 years. Unknowingly I have been taking some of the talked steps while designing pages. But after going through the website it adds structure and legitimacy to my thoughts"

"That the website would be acceptable to more people. That it will meet future standards. Mainly that it would widen my target audience."

Participant comments about what does not appeal to them about considering web accessibility when they create websites:

"Focusing too much on accessibility often makes the site drab looking which can act as a low visual appeal for users and take their interest away."

"It's more thinking to do."

"Lack of tools"

"There is a lot to learn and I think I will take a more developmental time"

"Lack of awareness"

"Color selection. Color tutorial mentions particular combinations of colors. This may restrict a designer's freedom."

Participant comments about the site affecting their opinion on web accessibility:

"It was a good attempt to educate web builders on accessibility. The site is useful and to the point."

"It has made me aware of its importance. I was aware of the importance to some extent and now I shall comply with utmost religiously"

"Great work! Information has been well gathered. And all aspects of web accessibility has been touched. From designing layout to multimedia and the most critical how and where to test."

"I appreciate the research work. It will save lots of my time and definitely add to my knowledge about web accessibility"

CHAPTER 7

Conclusion

The main purpose of this project was to create a website with basic information about building accessible websites, and also, to find out if people's interest in creating accessible websites changed once they learned more about it. The target audience was website designers and developers with little or no knowledge about accessibility. An online survey was conducted to evaluate the effectiveness of the website and to explore if participants' interest in Web accessibility would change. Since all participants voluntarily went to the website, there is a self-selection bias in the result.

Although results of the exploratory survey show that people's interest in creating accessible websites increased after visiting the projectACCESS! website, a more detailed study with a larger sample size needs to be conducted to statistically establish the results. In terms of site design and usability, the survey results indicated that the site was effective. But more can be done to hold the interests of the users and show that practicing Web accessibility is not that difficult. Most of the participants were interested in the tutorial about multimedia accessibility. This shows that the site can be broadened to attract multimedia designers. The content and look can be tweaked and more information about multimedia can be included. The Flash tutorial can also be expanded to include more than introductory techniques. There were sections where the participants did not spend much time in. Those sections can be made more attractive with graphics and

interactivity. Navigational cues from the most visited sections can be used to draw users to these sections.

Currently the projectACCESS! website only provides basic and early intermediate level tutorials. More advanced tutorials and information about accessibility can be added to make the site more comprehensive. Moreover, it may be safe to assume that with emerging and changing technology, means of making websites accessible will change too. Tutorials and content may have to be changed and updated to keep the site current. The site can also continue to have mini surveys to evaluate its effectiveness and people's interest in accessibility.

Development of new technologies for the Web, have brought new opportunities for those with disabilities. Along with these positive changes, there are disadvantages too. Many assistive technologies are expensive and they are not changing as fast as other technologies. Many website designers/developers do not consider accessibility issues in the early stages of development. There is a need for increased awareness about Web accessibility for website designers/developers/programmers to make sure their sites work with screen readers and other assistive technologies.

All participants in the survey indicated they look for information about a new topic on the Web. More resources about accessible websites need to be available on the Internet, so Web developers can find them and slowly start integrating the techniques into their sites.

People with disabilities are yet to enjoy the full benefits of rich media. Macromedia has recently made attempts to make Flash content more accessible, but the technology is still new and limited to only the Windows platform and one browser. Other platforms and browsers still provide no support for accessible Flash content.

It is likely that as the word gets around, demand for accessible content increase and website developers move towards accessibility, various companies will start to respond to these demands by providing new and easier ways of creating accessible content. It is my hope that projectACCESS! will keep up with new trends in technology; attract more people who are interested; continue to increase awareness of accessibility issues on the Web; and help Web designers, developers and programmers create accessible websites.

BIBLIOGRAPHY

BBC News. (2004, June 18). *Cheap broadband lures UK surfers*. Retrieved November 30, 2004, from http://news.bbc.co.uk/1/hi/technology/3818639.stm

Chong, C. (2003, May) America Online: Is it accessible now? *The Braille Monitor, 46* (5). Retrieved April 26, 2005, from http://www.nfb.org/bm/bm03/bm0305/bm030509.htm

Disability Rights Commission (2004). *The Web: Access and inclusion for disabled people,* [Report]. Retrieved November 28, 2004, from http://www.drc-gb.org/publicationsandreports/2.pdf

IEE. (2004). *Color vision defects: A health & safely fact sheet produced by the IEE,* (Issue 2.1). Retrieved November 29, 2004, from the Institution of Electrical Engineers Web site http://www.iee.org/policy/areas/health/colourvisiondefects.pdf

Lenhart, A., Horrigan, J., Rainie, L., Allen, K., Boyce, A., Madden, M., & O'Grady, E. (2003, April 16). *The ever-shifting Internet population: A new look at Internet access and the digital divide*, 30-31. Retreived December 3, 2004, from Pew Internet & American Life Project Web site http://www.pewinternet.org/pdfs/PIP_Shifting_Net_pop_report.pdf

MSDN. (n.d.) *Microsoft Active Accessibility start page*. Retrieved May 10, 2005, from http://msdn.microsoft.com/library/default.asp?url=/library/en-us/msaa/msaastart_9w2t.asp

National Organization on Disability. (n.d.). *Economic participation: Marketing to people with disabilities*. Retrieved November 30, 2004, from http://www.nod.org/index.cfm?fuseaction=Page.ViewPage&PageID=15&

National Organization on Disability. (2002, January 15). *Internet use among people with disabilities on the rise, but still trails online activity of those without disabilities.* Retrieved November 30, 2004, from http://www.nod.org/index.cfm?fuseaction=page.viewPage&pageID=1430&nodeID=1&FeatureID=550&redirected=1&CFID=2457539&CFTOKEN=51999067

Nielsen//NetRatings. (2004, August 18). *U.S. broadband connections reach critical mass, crossing 50 percent mark for web surfers, according to Nielsen//NetRatings*, [Press release]. Retrieved November 20, 2004, from http://www.nielsen-netratings.com/pr/pr_040818.pdf

Thatcher, J., Bohman, P., Burks, M., Henry, S. L., Regan, B., Swierenga, S. J., Urban, M. D., & Waddel, C. D. (2002). *Constructing Accessible Websites*. Berkeley: Glasshaus.

TheCounter.com. (2005, April 27). *JavaScript Stats*. Retrieved April 27, 2005, from http://www.thecounter.com/stats/2005/April/javas.php

Waddell, C. D. (2000). The National Federation of the Blind sues AOL. *Human Rights Magazine.* Retrieved April 26, 2005, from the American Bar Association Web site http://www.abanet.org/irr/hr/winter00humanrights/waddell2.html

Waldrop, J., & Stern, S. M. (2003, March). Disability status: 2000. *Census 2000 Brief.* Retrieved November 29, 2004, from U.S. Census Bureau Web site http://www.census.gov/prod/2003pubs/c2kbr-17.pdf

World Bank. (n.d.). *Disability Statistics*. Retrieved November 30, 2004, from the World Bank Web site http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALPROTECTION/EXTDISABILITY/0,,contentMDK:20192597~menuPK:417619~pagePK:148956~piPK:216618~theSitePK:282699,00.html

Worthington, T. (2003, November 1). *Making an Accessible and Functional Website for the 2008 Beijing Olympics*. Retrieved April 26, 2005, from http://www.tomw.net.au/2003/bws.html

GENERAL REFERENCES

BBC News. (2002, March 12). *Olympic website targets disabled.* Retrieved April 26, 2005, from http://news.bbc.co.uk/1/hi/world/europe/1868566.stm

Clark, J. (2002). *Building accessible websites.* Retrieved November 15, 2004, from http://joeclark.org/book/sashay/serialization/

Clark, J. (2001, October 30 & 2004, April 9*). Reader's guide to Sydney Olympics accessibility complaint*, [Weblog]. Retrieved April 26, 2005, from http://www.contenu.nu/socog.html

Macromedia. (n.d.). *Accessibility and Macromedia Flash MX 2004.* Retrieved November 16, 2004, from http://www.macromedia.com/macromedia/accessibility/features/flash/

Moss, T. (2004, April 6). *How to sell accessibility.* Retrieved November 28, 2004, from http://www.sitepoint.com/article/sell-web-accessibility

Pilgrim, Mark (2002). *Dive into accessibility.* Retrieved December 4, 2004, from http://diveintoaccessibility.org

APPENDIX A: CRUCIAL PROBLEMS

ENCOUNTERED BY PEOPLE WITH DISABILITIES

Key problems experienced by blind users

- Incompatibility between screen reading software and web pages, e.g., the assistive technology not detecting some links, or it proving impossible to highlight text using text-to-speech software (26)
- Incorrect or non-existent labelling of links, form elements and frames (24)
- Cluttered and complex page structures (23)
- ALT tags on images non-existent or unhelpful (16)
- Confusing and disorienting navigation mechanisms (16)

Key problems experienced by partially sighted users

- Inappropriate use of colours and poor contrast between content and background (20)
- Incompatibility between accessibility software (e.g., for magnification) and web pages (19)
- Unclear and confusing layout of pages (18)
- Confusing and disorienting navigation mechanisms (16)
- Graphics and text size too small (10)

Key problems experienced by physically impaired users

- Confusing and disorienting navigation mechanisms (20)
- Unclear and confusing layout of pages (19)
- Graphics and text size too small (11)
- Inappropriate use of colours and poor contrast between content and background (10)

Key problems experienced by hearing impaired users

- Unclear and confusing layout of pages (23)
- Confusing and disorienting navigation mechanisms (12)
- Lack of alternative media for audio-based information and complex terms/language (10)
- Inappropriate use of colours and poor contrast between content and background (9)
- Graphics and text too small (9)

Key problems experienced by dyslexic users

- Unclear and confusing layout of pages (41)
- Confusing and disorienting navigation mechanisms (32)
- Inappropriate use of colours and poor contrast between content and background (20)
- Graphics and text too small (14)
- Complicated language or terminology (7)

Source: Disability Rights Commission[5] (2004)

[5] The study by Disability Rights Commission tested the homepages of 1000 websites using commercial software; 10% of these sites were evaluated by a group of 50 users with the following disabilities: blindness, poor sightedness, deaf/hard of hearing, learning disabilities and motion impairment.

APPENDIX B: RECRUITING ADVERTISEMENT

Participate in the projectACCESS*!* **Survey!**

projectACCESS*!* is a thesis project of Adina Huda, M.A. student in the department of Telecommunication, Information Studies and Media at Michigan State University.

It is a website about web accessibility, and discusses how to design for people with physical disabilities like blindness and motion impairment and also, for those with situational disabilities like using mouse-free devices—handhelds, PDAs, etc.

The purpose of this survey is to conduct usability testing of the website, to explore how this production can help users learn about web accessibility, and to evaluate the effectiveness of this project. The survey will take around 15 – 30 minutes to complete.

Participation is entirely voluntary. There is a short consent form at the beginning of the survey. You will not be asked for your name and confidentiality of data will be maintained.

The study will be conducted from **[start date]** to **[end date].**

Please follow the link below to go to projectACCESS*!*
http://projectaccess.tc.msu.edu

If you have any questions about this project, please contact one of the investigators:

Principal Investigator
Brian Winn
winnb@msu.edu

Secondary Investigator
Adina Huda
hudaadin@msu.edu

If you have any questions about your rights as a study participant, you may contact Peter Vasilenko, Ph.D., Chair of the University Committee on Research Involving Human Subjects (UCRIHS) by phone: (517) 355-2180; fax: (517) 432-4503; e-mail: ucrihs@msu.edu; or regular mail: 202 Olds Hall, Michigan State University, East Lansing, MI 48824.

APPENDIX C: CONSENT FORM

Instructions
This survey is part of a production thesis called, projectACCESS! – Information and Techniques for Creating Accessible Websites. You are being asked to explore the website, and answer questions in the survey.

If you agree to participate, you can begin the survey by clicking the "I Agree" button at the bottom of this page. Please read the consent form carefully.

Survey Procedure
The survey will take around 15 – 30 minutes to complete. The purpose of this survey is to conduct usability testing of the website, to explore how this production can help users learn about web accessibility, and to evaluate the effectiveness of this project. Participation in the survey is entirely voluntary. The survey will not start unless you click the "I Agree" button. You may stop participating at any time for any reasons. You do not have to answer any questions you do not want to.

Confidentiality
Your privacy will be protected to the maximum extent permissible by law. All responses will be anonymous. Your name will not be asked for. The results of this survey will be used only by the investigators.

Contact Information
If you have any questions about this project, please contact one of the investigators:

Principal Investigator	Secondary Investigator
Brian Winn (517) 353-5497 winnb@msu.edu	Adina Huda hudaadin@msu.edu

If you have any questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact—anonymously, if you wish—Peter Vasilenko, Ph.D., Chair of the University Committee on Research Involving Human Subjects (UCRIHS) by phone: (517) 355-2180; fax: (517) 432-4503; e-mail: ucrihs@msu.edu; or regular mail: 202 Olds Hall, Michigan State University, East Lansing, MI 48824.

Consent

I voluntarily agree to participate in this survey

I Do Not Agree. Exit

(Clicking this button will close this window.)

I Agree

(Clicking this button will take you to the survey. By clicking this button you are voluntarily agreeing to participate in the survey.)

APPENDIX D: SURVEY INSTRUMENT

Gender:

- ☐ Male
- ☐ Female

Age range:

- ☐ 22 or younger
- ☐ 23 to 29
- ☐ 30 to 39
- ☐ 40 to 49
- ☐ 50 or older

How many years have you been involved in creating websites?

- ☐ I do not create websites
- ☐ Less than 1year
- ☐ 1 – 2 years
- ☐ 2 – 3 years
- ☐ 3 – 4 years
- ☐ 5 or more years

Do you have any **disabilities or impairments**? (Please check all that apply)

- ☐ No/not impaired
- ☐ Rather not say
- ☐ Color blind
- ☐ Vision impaired
- ☐ Blind
- ☐ Hearing impaired
- ☐ Deaf
- ☐ Motion impaired
- ☐ Cognitively impaired
- ☐ Other _____

---

1. What **operating system** did you use to view the project ACCESS*!* website?

- ☐ Windows 2000
- ☐ Windows XP
- ☐ MAC OS X
- ☐ MAC OS 9
- ☐ LINUX
- ☐ Other _____
- ☐ Don't know

2. Which **browse**r did you use to view this website?

- ☐ Firefox
- ☐ Internet Explorer
- ☐ Safari
- ☐ Mozilla
- ☐ Netscape
- ☐ I-Cab
- ☐ Other_____
- ☐ Don't know

3. Do you know the **version** of your browser?

   ☐ Yes, version _____
   ☐ No

4. How would you **describe** yourself?

   ☐ Web developer
   ☐ Web designer
   ☐ Web programmer
   ☐ Webmaster
   ☐ Other _____

5. Please indicate your **skill level** for the following:

	Novice	Somewhat Novice	Intermediate	Somewhat Expert	Expert
HTML	☐	☐	☐	☐	☐
XHTML	☐	☐	☐	☐	☐
CSS	☐	☐	☐	☐	☐
JavaScript	☐	☐	☐	☐	☐

6. What is your most common method of **obtaining information** on a new topic?

   ☐ Web ☐ Books ☐ Courses ☐ Other_____

7. Do you use **handheld devices to browse the web**?

Never	Rarely	Sometimes	Often	Always
☐	☐	☐	☐	☐

8. Did you know about web accessibility **before** visiting the projectACCESS! website?

Not at all familiar	Hardly familiar	Somewhat familiar	Fairly familiar	Very familiar
☐	☐	☐	☐	☐

9. Do you **currently consider web accessibility** when you create websites?

Never	Rarely	Sometimes	Often	Always
☐	☐	☐	☐	☐

10. If you do not currently consider web accessibility when you create websites, what are your **reasons**?

- ❑ Do not create websites
- ❑ Don't know what web accessibility is
- ❑ Did not think about it
- ❑ Did not need to do it
- ❑ Too complicated to implement
- ❑ Don't know how to implement it
- ❑ Other

_____

11. How would you **describe** this website?

Very Informative	1	2	3	4	5	6	7	Not Informative
Very Attractive	1	2	3	4	5	6	7	Not Attractive
Very Useful	1	2	2	4	5	6	7	Not Useful
Very Inspiring	1	2	2	4	5	6	7	Not Inspiring

12. I could immediately tell what **options** (navigation/content) were available to me.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
☐	☐	☐	☐	☐

13. I could immediately **understand the purpose** of the projectACCESS! website.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
☐	☐	☐	☐	☐

14. Which section did you **spend the most time** in?

☐ Home	☐ Accessibility Features	☐ Forms
☐ Testing	☐ Tutorials	☐ Images
☐ Disabilities	☐ Layout	☐ Color
☐ Resources	☐ Navigation	☐ Multimedia
☐ Quick tips	☐ Tables	

15. Please rate your **interest** in the following content areas. (**1**-extremely disinterested, **7**-extremely interested).

	Extremely Disinterested						Extremely Interested
Home (Accessibility Overview)	1	2	3	4	5	6	7
Testing	1	2	3	4	5	6	7
Disabilities	1	2	3	4	5	6	7
Resources	1	2	3	4	5	6	7
Quick tips	1	2	3	4	5	6	7
Accessibility Features	1	2	3	4	5	6	7
Tutorials	1	2	3	4	5	6	7
Layout tutorial	1	2	3	4	5	6	7
Navigation tutorial	1	2	3	4	5	6	7
Forms tutorial	1	2	3	4	5	6	7
Tables tutorial	1	2	3	4	5	6	7
Images tutorial	1	2	3	4	5	6	7
Color tutorial	1	2	3	4	5	6	7
Multimedia tutorial	1	2	3	4	5	6	7

16. I am interested in **creating** an accessible website.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
☐	☐	☐	☐	☐

17. My **interest in creating accessible websites changed** as a result of visiting the projectACCESS! website.

Decreased a lot	Decreased a little	Did not change	Increased a little	Increased a lot
☐	☐	☐	☐	☐

18. The following **features of the website persuaded me** to consider web accessibility when I create websites. (**1**-strongly disagree, **7**-strongly agree).

	Strongly Disagree						Strongly Agree
Hearing audio of screen readers	1	2	3	4	5	6	7
Going through the tutorials	1	2	3	4	5	6	7
The tutorials explained the steps very clearly	1	2	3	4	5	6	7
Reading the overview section	1	2	3	4	5	6	7
The site showed accessibility is easy to practice	1	2	3	4	5	6	7
It's not too far from what I already know	1	2	3	4	5	6	7
The site showed me that implementing accessibility will not be too different from what I already practice	1	2	3	4	5	6	7
The site showed that accessibility is important	1	2	3	4	5	6	7
The site showed how I can build better websites	1	2	3	4	5	6	7
Other	1	2	3	4	5	6	7

Please Explain:

19. I **will return to projectACCESS! for help**, if I build an accessible website in the future.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
☐	☐	☐	☐	☐

20. What **appeals** to you about considering web accessibility when you create websites?

21. What **does not appeal** to you about considering web accessibility when you create websites?

22. Do you have any **other comments** about whether this site affected your opinion on web accessibility?

Thank you for completing the **projectACCESS*! Survey.***

APPENDIX E: RESPONSES OF PARTICIPANTS WHO DO NOT CREATE WEBSITES

Six of the 23 participants checked "Do not create websites." Five of them described themselves: Web browser, information security consultant, counselor, system administrator, and trainer on Web design. The following tables show a summary of their responses.

General Information about Participants

	Number	*Percentage*
22 or younger	0	0%
23-29	3	50%
30-39	1	17%
40-49	0	0%
50 or older	2	33%

Table E1. Age Range of Participants

	Numbers			
	HTML	*XHTML*	*CSS*	*JavaScript*
Novice	2	3	3	3
Somewhat Novice	1	1	1	0
Intermediate	0	2	1	3
Somewhat Expert	3	0	1	0
Expert	0	0	0	0

Table E2. Skill Levels for HTML, XHTML, CSS and JavaScript

	Number	*Percentage*
Never	4	67%
Rarely	0	0%
Sometimes	2	33%
Often	0	0%
Always	0	0%

Table E3. Using Handheld Devices to Browse the Web

Participants and Accessibility

	Number	*Percentage*
Not at all familiar	0	0%
Hardly familiar	1	17%
Somewhat familiar	2	33%
Fairly familiar	2	33%
Very Familiar	1	17%

Table E4. Knowledge of Web Accessibility Prior to Visiting projectACCESS!

	Number	*Percentage*
Never	3	50%
Rarely	0	0%
Sometimes	1	17%
Often	1	17%
Always	1	17%

Table E5. Currently Consider Web Accessibility

	Number	*Percentage*
Do not create websites	3	50%
Don't know what accessibility is	0	0%
Did not think about it	0	0%
Did not need to do it	1	17%
Too Complicated to implement	0	0%
Don't know how to implement	0	0%
Other	2	33%
One participant responded "I inform others of this need"		

Table E6. Reasons for Not Considering Accessibility

	Number	*Percentage*
Strongly Disagree	3	50%
Disagree	0	0%
Neutral	1	17%
Agree	1	17%
Strongly Agree	1	17%

Table E7. Interest in Creating an Accessible Website

	Number	*Percentage*
Decreased	0	0%
Slightly Decreased	0	0%
Did not Change	2	33%
Slightly Increased	3	50%
Increased	1	17%

Table E8. Change in Interest in Creating Accessible Websites as a result of Visiting projectACCESS!

The projectACCESS! *Website*

	Average
Informative	2.20
Attractive	2.60
Useful	2.20
Inspiring	3.60

Table E9. Participants Description of the Website

	Number	Percentage
Strongly Disagree	1	17%
Disagree	0	0%
Neutral	2	33%
Agree	3	50%
Strongly Agree	0	0%

Table E10. Awareness of Available Options (Content/Navigation)

	Number	Percentage
Strongly Disagree	Strongly Disagree	1
Disagree	Disagree	0
Neutral	Neutral	0
Agree	Agree	5
Strongly Agree	Strongly Agree	0

Table E11. Understanding the Purpose of the Website

Web Page	Number	Percentage
Home	3	50%
Testing	0	0%
Disabilities	0	0%
Resources	0	0%
Quick tips	0	0%
Accessibility Features	0	0%
Tutorials	1	17%
Layout tutorial	0	0%
Navigation tutorial	1	17%
Tables tutorial	0	0%
Forms tutorial	0	0%
Images tutorial	0	0%
Color tutorial	0	0%
Multimedia tutorial	1	17%

Table E12. Section Participants Spent Most Time In

Features	Average Score
Home (Accessibility Overview)	5.67
Testing	4.33
Disabilities	4.67
Resources	5.00
Quick tips	5.33
Accessibility Features	4.83
Tutorials	5.33
Layout tutorial	4.83
Navigation tutorial	4.83
Tables tutorial	4.83
Forms tutorial	4.83
Images tutorial	5.00
Color tutorial	5.17
Multimedia tutorial	5.00

Table E13. Interest in Different Sections

Features	Average Score
Hearing audio of screen readers	4.33
Going through the tutorials	5.00
The tutorials explained the steps very clearly	5.50
Reading the overview section	4.83
The site showed accessibility is easy to practice	5.33
It's not too far from what I already know	5.00
The site showed me that implementing accessibility will not be too different from what I already practice	5.17
The site showed that accessibility is important	5.33
The site showed how I can build better websites	5.67
Other	4.50

Table E14. Features of the Website that Persuaded Participants to Consider Web Accessibility

	Number	Percentage
Strongly Disagree	0	0%
Disagree	0	0%
Neutral	1	17%
Agree	2	33%
Strongly Agree	3	50%

Table E15. Returning to projectACCESS! website for help

Participants' comments about what appeals to them about considering Web accessibility:

"attractiveness and information"

"saving time, new ideas."

"The fact that Web developers need to think about it at the very beginning stages, not as an after thought because by then, it may be too late to spend the time to fix a Website or pages."

Participants' comments about what does not appeals to them about considering Web accessibility:

"1. my lack of knowledge on this 2. lack of perceived need"

"different methods to create websites"

"Although it can be a little more time consuming during the creation phase, the benefits at the end pay off greatly."