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Measuring the Accessibility of the U.S. State Government Web Sites

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ABSTRACT

Web accessibility has become an important issue since the dramatic rise in the use of the Web. Web accessibility deals with overcoming barriers users with disabilities face when trying to access information on Web sites. The U.S. has passed laws relating to Web accessibility to improve the usability of the Internet for disabled users. Technical advancements have improved assistive tools such as page readers for users with disabilities, but accessibility requires more than assistive tools. Web page design causes many accessibility problems. This study examines the accessibility of the home pages of the official government Web sites of the 50 states and the District of Columbia, based on the assumption that government Web sites should be an example for other organizations to follow regarding Web accessibility. However, nearly a third of the home pages tested did not meet the most fundamental requirements for Web accessibility. Fixes for many of these accessibility problems require rather minor adjustments to underlying page code.

Key words: accessibility, state government, web sites, Americans with Disabilities Act.

INTRODUCTION

The Internet provides information, entertainment, shopping, news, and communication services. "Now at the click of a mouse, the world can be 'at your fingertips' - - that is, if you can use a mouse...see the screen...and hear the audio - - if you don't have a disability of any kind" (Bohman, 2003). People with disabilities face multiple challenges accessing information from the Web. For example, in a study of Web sites run by disability organizations, over half of the sites failed to meet compulsory compliance levels (Sturgeon, 2004). In addition, only certain Web sites are required to comply with the Americans with Disabilities Act (McCullagh, 2004). Over half of university library Web sites are accessible by the disabled, but less than 20 percent of Fortune 100 Web sites are (Loiacono and McCoy, 2004). Older adults encounter usability barriers when they access e-government Web sites; the Web site of the Administration on Aging takes 71 seconds to download (Becker, 2005). However, when Web pages are designed to accommodate users with disabilities, the Internet offers significant opportunities to them. "Access (to the Web) by everyone, regardless of disability, is essential" (Comden and Burgstahler, 2004).

U.S. adults with disabilities spend twice as much time on the Internet as those without disabilities (Jackson-Sanborn, et al., 2002). Over 75 percent of people with disabilities use the Web for product searches and half make purchases online (Loiacono and McCoy, 2004). "Unfortunately, as more information is stored and transmitted through the Internet, this gap between the abled and disabled is widening again because of Web site design" (Jackson-Sanborn, et al., 2002). Thus, it is important for organizations to accommodate users with disabilities when designing Web pages. This type of design, called Web accessibility, means that "we do not place intentional barriers or hurdles, which impede or prevent full access" (Guenther, 2002). The quality of life for individuals with disabilities is improved by ensuring that all information on Web pages is accessible because they are able to participate in activities they normally would not be able to participate in (Maeda, et al., 2004). In addition, accessibility technologies open up new markets for products and services, as well as enable firms to tap a much larger talent pool (Sueltz, 2002).

Developers should have knowledge of Web accessibility because it is an important aspect of Web design. This paper reports on a Web accessibility study of the home pages of the 50 states and the District of Columbia. The objectives of the study were to determine if government agencies are making Web sites accessible to individuals with disabilities and if they are setting a standard to be followed by other public and private organizations. The following sections discuss common types of disabilities and the tools used to overcome those disabilities, laws concerning Americans with disabilities, steps taken to evaluate Web accessibility, and the study of the 51 home pages.

TOOLS, LAWS, AND ACCESSIBILITY

Studies have found that 20 percent of the U.S. population has some type of disability, but not all have a disability that impedes Internet use (Schmetzke, 2001). Of the 54 million Americans who suffer from a disability, 26 million are considered to have a severe disability (Schmetzke, 2001). There are several types of disabilities that impede Internet use, including: visual, hearing, motor, and cognitive limitations (Becker, 2005; Loiacono and McCoy, 2004; Williams and Rattray, 2003). Visual disabilities include blindness, low vision, and color-blindness. Low vision can include color blindness and age-weakened eyesight (Maeda, et al., 2004). A hearing disability includes deafness. A motor disability includes the inability to use a mouse, slow response time, and limited fine-motor control. There are a range of cognitive disabilities, including learning disabilities, distractibility, and the inability to remember or focus on large amounts of information. Tools to help with cognitive disabilities include word prediction, and grammar and spell checkers. "While computer modifications can compensate for some of these problems, improper site design can still be a detrimental factor for access" (Jackson-Sanborn, et al., 2002). Assistive tools address many of these disabilities.

Assistive Tools

Tools help people with visual disabilities understand the content of Web pages. There are at least 1.5 million Americans who are blind or visually impaired that use computers (Usability First). Color blindness affects more than eight percent of males and two percent of females, thus it is important to make sure color is not the only way of expressing ideas and facts on a Web page (Kaufman-Scarborough, 2001). The screen reader, which dates from the late 1990's, reads a computer display (Maeda, et al., 2004). "The screen reader can read text that appears in a standard way in dialog boxes, menus, icons, and text editing windows by attaching to the operating system components that are used to display the text" (Usability First). Screen readers are employed in accessibility studies (McCord, Frederiksen, and Campbell, 2002). Other tools for visually impaired users are text-to-speech software that speaks all written text using a speech synthesizer and screen-enlargement utilities that zoom in on parts of the screen to make screen content larger and easier to read.

Users with a hearing loss can use the Internet, but Web pages that include audio pose a problem. There are several ways to make a Website accessible to these users, including visual alerts that appear with audio alerts, closed captions for any audio on the Web page, and speech-to-text software that converts spoken language into text (Usability First).

Individuals with a motor disability have trouble controlling muscle functions and movements. They may also suffer from the loss of limbs that prevent them from using a keyboard and a mouse. Tools to help with motor disabilities include head-mounted input devices and eye-tracking systems. A tongue activated joystick is an input device placed in the mouth and maneuvered with the tongue (Usability First). A blow-suck tube is an input device used with the tongue-activated joystick to move the mouse pointer. "Sticky Keys" are used by people who have a hard time pressing more than one key at a time. The sticky keys include Shift, Control, Command, and Alt; these keys will "stick" down and apply to the next keystroke (Usability First). "Slow Keys" is a tool for people who have difficulty controlling the movements of their hands. A keystroke is not registered until it has been held down for a certain period of time in order to prevent an accidental key strike from registering (Usability First).
Individuals with cognitive disabilities have trouble focusing on information and are easily distracted. People with cognitive impairments have a limited ability to think, which causes an inability to perform certain activities or tasks. Therefore, "someone with a cognitive impairment requiring more time to process information that they read won't be greatly aided by a feature that flashes text for only 5 – 10 seconds" (Guenther, 2002). Animated and flashing text could cause seizures for some users who suffer from photosensitive epilepsy.

Disability Laws

"Accessibility" can be defined as "access to information for all - - focusing on people with disabilities and senior citizens" (Maeda, et al., 2004). The two federal civil rights statues that affect accessibility are the Americans with Disabilities Act (ADA) of 1990 and Section 508 Amendments from 1998 of the Rehabilitation Act (Loiacono and

McCoy, 2004). The ADA was signed into law to "establish a clear and comprehensive prohibition of discrimination on the basis of disability" (Jackson-Sanborn, et al., 2002). It was written to force public and commercial organizations to reduce barriers that prevent people with disabilities from using goods and services (Pike, 2003). The language of the act did not state whether Web pages had to follow the law because the ADA predated widespread adoption of the Web. The ADA requires public accommodations, such as hotels, restaurants, and shopping centers, to be compliant, but it does not mention the Internet (McCullagh, 2004).

In 1996, the Department of Justice determined that the ADA required Web pages of U.S. government programs and services (i.e., federal sites and sites funded by federal programs) to be accessible to disabled people (Loiacono and McCoy, 2004). This ruling was prompted by lawsuits filed against public and private Web sites that did not follow Title II and Title III of the ADA. Title II of the ADA "outlaws discrimination in the provision of public services by state and local governments and prohibits discrimination in the private sector in the provision of public goods, services, and accommodations" (Noble, 2002). Title III of the ADA states that the private sector must ensure people with disabilities are not discriminated against and provide equal access to the all goods, services and facilities they offer (Noble, 2002). Both Title II and Title III require an accessible alternative to all information provided through digital media.

Section 508 of the Rehabilitation Act of 1973 prohibits anyone who receives federal funding from discriminating on the basis of disability. In 1998, the Rehabilitation Act of 1973 was amended because the language of the Act was not clear as to whether Web sites and Web pages had to follow the same laws. The amendment stated that all agencies receiving federal funding must have Web sites in compliance with Section 508 of the Rehabilitation Act of 1973, by June 21, 2001. "Section 508 requires that when federal agencies develop, procure, maintain, or use electronic and information technology, they must ensure that the electronic and information technology is accessible to people with disabilities, unless it would pose an undue burden to do so" (Noble, 2002).

Several law suits have been filed for failure to adhere to the ADA. A Georgia court ruled that Metropolitan Atlanta Rapid Transit Authority (MARTA) failed to have its Web site accessible to users who were visually impaired, which is a violation of the ADA (Pike, 2003). MARTA is considered a government agency. Therefore, its Web site must be accessible to all individuals with disabilities. Also in 2002, a suit was filed in Florida against Southwest Airlines for not having an accessible Web site for users with visual impairments, and for not providing other forms of communication for the visually impaired (Pike, 2003). The Florida court threw out the case after it decided Southwest Airlines' Web site did not have to comply with the ADA because it was not a government agency. In 1999, the National Federation of the Blind (NFB) used the ADA to file suit against America Online (AOL) because AOL's service was not compatible with assistive tools such as screen readers (Guenther, 2002). AOL settled the suit with NFB by releasing a new software version that accommodated users with disabilities. AOL is considered a public accommodation because it is an Internet service provider. Priceline.com and Ramada.com have been involved in similar settlements (Gilbert, 2004). The state of Connecticut was sued by the NFB for linking its tax Web site to inaccessible online tax filing services (Gilbert, 2004). Similar accessibility cases have appeared in the U.K. and Australia (Williams and Rattray, 2003).

Web accessibility should be a priority for organizations wishing to avoid legal problems. Organizations must insure that developers who are involved in Web design are aware of the laws concerning Web accessibility. Organizations should support the ADA by creating Web sites that are accessible to individuals with disabilities.

Accessibility Initiatives

The World Wide Web Consortium (W3C) develops specifications, guidelines, software, and tools for the Web. The Web Accessibility Initiative (WAI), a part of the W3C, has developed a set of fourteen guidelines - - the Web Content Accessibility Guidelines (WCAG) - - that Web developers should follow when designing Web pages to validate for accessibility (http://www.w3.org/TR/2004/WD-WCAG20-20040730/). Section 508 of the Rehabilitation Act is another source of accessibility guidelines (Loiacono and McCoy, 2004; Maeda, et al., 2004).

The W3C guidelines are divided into three priority levels, based upon impact on accessibility. The first level, Priority 1, includes items on a Web page that must be made accessible in order for users with disabilities to access any of the content on the page. Level 1 provides a minimal level of accessibility through markup, scripting, or other technologies. Priority Level 1 is a "basic requirement" for accessibility (Williams and Rattray, 2003). The second level, Priority 2, includes items on a Web page that should be made accessible so groups of users with disabilities will not have a hard time trying to access the information. The third level, Priority 3, includes items on a Web page that are designed so users with disabilities will not have any difficulty accessing information on the Web page. If

Priority 1 guidelines are not met some users will find it impossible to access a Web site. If Priority 2 guidelines are not met those users will find it difficult to access the site. Not meeting Priority 3 standards may make it somewhat difficult to access a Web site (Loiacono and McCoy, 2004).

Organizations should strive to have Web pages meet Priority 3 because this is the level where users with disabilities will be able to access information on the Web page with the least amount of trouble (Blair, 2004). Each guideline has an objective, broken into checkpoints, and those checkpoints are placed in each priority level accordingly. The objectives of the guidelines appear in Appendix 1.

Evaluating Accessibility

Evaluating Web site accessibility consists of several activities performed on every page of a Website (Smith, 2004).

- First - validate the HTML on each Web page. HTML validators insure a standardized version of HTML is used in the Web page. Assistive tools rely on proper HTML to display the appropriate information.
- Second - validate for accessibility. Accessibility tools determine if there are any other accessibility issues in the Web page after the HTML has been corrected. Accessibility tools cannot find all accessibility errors. Thus, more than one tool may be needed to determine accessibility issues because one software package may recognize a problem that another package does not.
- Third - check for keyboard accessibility by using the Tab key to navigate through the entire Web page. Disabled users should be able to access every link and fill out forms by using the Tab key.
- Fourth - use a screen reader to read the computer display. The screen reader should read all of the content on the page, including any alternative text or captions for images and visual aids, and form labels.
- Fifth - insure all Web pages comply with WCAG guidelines. Each page should meet Priority 1 and Priority 2 guidelines and should strive to meet Priority 3. Accessibility tools give feedback if any of the guidelines are not met.
- Sixth - allow users with disabilities to test the Web pages and give feedback. Developers should use the feedback to improve the site and make it more user friendly for users with disabilities. Once the feedback has been incorporated, developers should allow the same users to test the Web pages again. Web developers should continue to re-evaluate Web pages. Pages should be re-evaluated each time an update is made.

Open source accessibility tools available online to assist with compliance checking include: Accessibility Valet Demonstrator (WebThing), AccMonitor Online (HiSoftware), Bobby Online Service (Watchfire), Cynthia Says (HiSoftware), Torquemada (WebxTutti), Wave 3.5 (WebAIM), and WebXact (Watchfire). There are also tools to evaluate non-English Web sites, such as tools for Italian and French sites (Loiacono and McCoy, 2004).

ACCESSIBILITY STUDIES

Several recent studies have evaluated the accessibility of Web sites. Some studies, including Becker (2005), Loiacono and McCoy (2004), and Maeda et al. (2004) have identified usability barriers. Becker (2005) examined 50 state and 50 federal e-government home pages for usability barriers to older adults. The Becker study targeted the home page of each site because it is the "gateway to accessing all content on the site." Becker (2005) identified usability barriers such as slow download times for pages (the median time was 20 seconds), page clutter (which reduces navigability), mouseovers (a barrier to users with unsteady hands), small font size, page length (which negatively impacts memory recall), and visited links that did not change color.

Accessibility studies at IBM have determined that, over time, Web pages have become more complex (e.g., adding more images or dynamically generating pages) and thus more inaccessible for tools such as a page reader (Maeda, et al., 2004). These increases in Web page complexity "make it more difficult to improve the accessibility of pages using conventional accessibility tools" (Maeda, 2004).

McCord, Frederiksen, and Campbell (2002) performed an accessibility assessment of Web-based health resources relative to navigability with adaptive technologies. This study identified navigation problems when using a page reader, such as opening a full-text article in PDF format, which is unreadable with the page reader. (Some newer readers can now handle PDF format.) None of the databases in the McCord study were completely accessible using adaptive tools. Both the McCord and IBM studies find that even though a Web page complies with standard accessibility guidelines, it may still be difficult to read using an accessibility tool.

Klein, et al. (2003) tested the accessibility of 157 public high school Web site home pages. Only 7.6 percent of the home pages passed the most basic level of accessibility as defined by the W3C. The most common error was the failure to provide equivalent alternatives for images. Schmetzke (2001) evaluated the home pages of Web sites of 24 schools of library and information science. Over half (59%) of those Web sites passed the basic level of W3C accessibility. Universities and libraries are required by Title III of the ADA to make their services available to people with disabilities (Loiacono and McCoy, 2004). Two other studies of library Web pages found 40 percent to be accessible under W3C guidelines (Lilly and Van Fleet, 1999; Schmetzke, 2000).

Jackson-Sanborn et al. (2002) evaluated 549 Web sites in six categories (federal government, college, clothing, international, job, and "popular" sites). The majority (66.1%) failed Priority 1 testing using Bobby. Within the six categories tested, government sites had the highest rate of Priority 1 success (60% passed), while "popular" sites (as evaluated by number of site visitors reported on the 100hot Web site) had the lowest pass rate (15%). The most commonly found error was "not providing alternative text for images."

Loiacono and McCoy (2004) assessed retail Web site home pages regarding their accessibility. Less than 10 percent of the sites analyzed were free from Section 508 barriers; less than 20 percent met Priority 1 requirements, and no sites were free from Priority 2 or 3 barriers. The study identified common accessibility barriers for well-known Web sites such as Yahoo, MSN, Goole, AOL, eBay, Dell, and Apple. Failure to provide alternative text for images was a common problem. There were no significant differences in accessibility between different sectors, such as search engines, automotive, travel, and apparel.

A recent report from the U.K. provides some of the most surprising findings among these accessibility studies. The study of 50 leading U.K. disability Web sites found that 58 percent failed the W3C compulsory guideline (Priority Level 1) for Web accessibility (Ethical Media, 2004). In addition, 86% failed Level 2 and 92% failed Level 3. Thus, a number of key organizations in the U.K. that cater to disabled clients have Web sites that are not easily accessible by those clients.

In summary, recent accessibility studies have employed accessibility tools to identify usability barriers, and evaluate compliance with common standards such as W3C, for both commercial (e.g., retail) and public (e.g., university) Web sites. In general, a low percentage of the sites tested comply with basic accessibility guidelines. Most prior studies have focused on commercial and library Web sites; few studies to date have examined the accessibility of state government Web sites or systematically visited all of the official state Web sites in the U.S.

METHODOLOGY

This study employed Bobby by Watchfire, an accessibility tool for desktop computers, which insures Web pages are accessible to users with disabilities. It checks page accessibility under Section 508 of the Rehabilitation Act of 1973 and the W3C - WCAG. A free trial of Bobby can be downloaded from www.watchfire.com for Webmasters to evaluate the accessibility of their Web pages. It evaluates HTML code, ensures that pages can be read by screen readers, and that there is alternative text for images, animated objects, video, and audio on a page. Bobby performs about 90 percent of the accessibility checks required by Section 508 and the WCAG (Watchfire). Bobby produces a summary report showing the guideline number that is not met, the number of times the problem has occurred, and the line number of the error in the HTML code. The report notes if the Web page conforms to each priority level. It provides a detail of each guideline in order to help developers with possible solutions.

Bobby was chosen for this study, in part, because it is a very widely used tool in accessibility studies. It has been used in a number of Web accessibility studies, including: Coonin (2002), Craven (2000), Guthrie (2000), Jackson-Sanborn, et al. (2002), Klein, et al. (2003), Lilly and VanFleet (1999), Loiacono and McCoy (2004), McCord, et al., (2002), Schmetzke (2000 and 2001), and Williams and Rattray (2003). The use of Bobby in this study enables an elementary level of cross comparison of results between these studies of a large variety of Web sites.

The lead researcher for this study purchased copy of Bobby to evaluate the Web accessibility of the official government Web sites of the 50 states and the District of Columbia. It is important for these pages to meet these guidelines because of government mandates. The home page of each Web site was evaluated by Bobby to determine if the page complies with the W3C - WCAG. Home page evaluation is common in accessibility studies, including studies by Becker (2005), Klein, et al. (2003), Loiacono and McCoy (2004), and Schmetzke (2001). In addition, the home page is an excellent indicator of the overall accessibility of a Web site when multiple levels of Web pages are evaluated with Bobby (Williams and Rattray, 2003).

Each state's Web address was obtained from a Web search using MSN's search engine. The keywords used to search for the Web addresses were "official government Web site of (state name)." Each address was examined to verify it was the official government Web site of the state. The home page of each state was used for two reasons. First, it was assumed that Web developers would enhance home pages to make them presentable to the public. Second, if a home page is not accessible, the rest of the site may not be accessible to the disabled (Klein, et al., 2003). A sampling of home pages was tested more than once using Bobby, but the results were always the same for the multiple tests, so it was decided to test each home page only once for each of the three W3C priority levels. The results across all the sites tested were tabulated to provide descriptive data. The home pages of Texas and Oregon were not tested because each uses Java servlet pages that Bobby had problems testing.

FINDINGS

Bobby was used to test the home pages for compliance with Priority 1; 30.6 percent (15) of 49 sites tested did not meet all of the Priority 1 guidelines (Table 1). Among these fifteen sites, none met WCAG Guideline 1 (Web pages must provide equivalent alternatives to auditory and visual content). Web developers should add an alternate way to convey image content, by adding an ALT tag to the image's HTML code. The lack of alternative text for images was also the most prevalent error in the Williams and Rattray (2003) study, and a very common error identified in Loiacono and McCoy (2004). The Guideline 1 error was the only error common to all states. One state failed to provide alternative text for image-type buttons in forms.

Percentage of State Web Sites with Accessibility Errors	
Priority	Error Rate
Priority 1:	30.6%
Priority 2:	97.96%
Priority 3:	100%

Table 1: Accessibility Error Results.

Only one state complied with the Priority 2 level. Priority 2 includes items on a Web page that should be made accessible so one or more group of users with disabilities will not have a hard time trying to access the information on the Web page. Most (89.6%) sites failed to use proper markup and style sheets. This checkpoint refers to using relative units rather than absolute units in the markup language and in cascading style sheets. This error can be overcome by using a percentage length in a cascading style sheet rather than using an absolute length such as centimeters. If an absolute length is used then users with disabilities will not be able to enlarge the Web page because the elements will stay the absolute size, but if a percentage is used then the elements can be proportionately enlarged.

Of the sites with Priority 2 errors, 62.5 percent had an error where the target of all links was not clearly identified. The text of all links should be meaningful, even if they are read out of context. This error is corrected by having a link title for all links instead of a link saying "click here." It is also helpful to add a title attribute that describes the target of each link. Over half (56.3%) of the states with Priority 2 errors included an error that requires specific logical event handlers rather than device-dependent event handlers for scripts. The mouse should not be the only way to trigger an event. Events should be triggered by both the mouse and a keystroke, or a series of keystrokes. Logical event handlers ensure usability for individuals who have a disability that prevents them from using a mouse.

No site complied with Priority 3. The natural language of the HTML document must be identified by specifying the language (the version of HTML or XML) used to write the page (77.6% did not comply). A summary of tables is required so screen readers can read that summary for visually impaired users (81.4% did not comply); the error can

be corrected by writing a paragraph that explains the purpose and results of the table. Elements on the page must be accessible by assistive technology tools (61.2% did not comply) as well as older versions of Web browsers (85.7% did not comply).

DISCUSSION

The findings of this study are similar to Klein et al. (2003). Common errors in the Klein study were the most common errors found in this study. However, the percentage of sites with Priority 1 errors in the study reported in this report (30.6%) is actually much lower than:

- The percentage (41%) of library sites with Priority1 errors (Schmetzke, 2001)
- The percentage (40%) of U.S. federal government Web sites with Priority 1 errors (Jackson-Sanborn, et al., 2002)
- The percentage (66.1%) of sites - - various classifications - - with Priority 1 errors (Jackson-Sanborn, et al., 2002)
- The percentage of U.K. accounting firm sites (82%) with Priority 1 errors (Williams and Rattray, 2003)
- The percentage of retail sites (84.1%) with Priority 1 errors (Loiacono and McCoy, 2004)
- The percentage of electronic journal search pages (90.9%) with at least one Priority 1 error out of eleven different full-text databases tested (Coonin, 2002)
- The percentage of high school home pages with Priority 1 errors (92.4%) reported in Klein, et al. (2003). Note: that all seven of these studies used Bobby to evaluate accessibility.

The Jackson-Sanborn et al. (2002) study included visits to 100 U.S. federal government Web sites; 40 percent of those sites failed a Priority 1 check using Bobby. Thus, in general, sites with mandated accessibility - - government and library Web sites - - conform to Priority 1 at much higher rates than commercial sites. However, accessibility problems are still significant when 30-40 percent of federal and state Web sites fail fundamental accessibility tests.

A few states have taken steps to make their Web sites comply with Priority 1 and one state's site complies with Priority 2. Priority 1 includes items on a Web page that must be made accessible for users with disabilities to access the content of the page at all. Priority 1 is the only priority level that is a requirement, but if Web pages met the other priority levels then they would be even more user friendly to individuals with disabilities. The states that have Web pages that do not comply with the priority levels are in danger of having suits filed against them. These sites must adhere to ADA and Section 508 because they are government funded. In addition, low bandwidth or limited display size devices, such as PDA's and cellular telephones, can benefit from accessible sites (Loiacono and McCoy, 2004). Lack of knowledge of requirements may be a reason some of the sites do not comply with the priority levels. Managers need to insure Web developers are educated about ADA, Section 508, and WCAG.

Compliance falls to the IT department, although it is important for upper-level management to stress the importance of Web accessibility. Accessibility impacts IT development in several ways. Accessibility can pose a challenge to Web developers because they have to take an extra step to insure users with disabilities can access all information provided on a Web page. This extra step may improve the usability of the Web page, which could increase sales for firms that offer products on the Internet, and may lessen the risk of lawsuits. Organizations can improve their product/service image by supporting accessibility. In addition, accessibility accommodations can help when an organization hires, since it is against the law to discriminate against people with disabilities. An accessible Web-based IT system may reduce discrimination during the hiring process.

LIMITATIONS

The results of this study cannot be generalized to commercial Web sites because of its focus on state government Web sites. However, the use of such a widely used accessibility assessment tool strengthens the findings for the specific sector studied. As with any Web site study, this is a point-in-time snapshot; the accessibility of these sites should change in a follow-up study as Web masters address specific accessibility issues on the individual sites.

CONCLUSION

The Web is a very useful tool for individuals with disabilities. Therefore, it is important for organizations to design Web sites that are accessible by all individuals. The Internet helps improve the life of individuals with disabilities, and Web accessibility can improve the potential base of customers and employees for private/governmental and commercial Web sites.

In order to create accessible Web sites, Web developers need to follow the guidelines set forth by the W3C. However, Web developers cannot follow these guidelines unless they know that these guidelines exist. Organizations need to be sure their Webmasters are aware of the ADA and its application to Web sites. It is important that Web site design classes include information on Web site accessibility and the tools that may be used to pinpoint accessibility issues. If students are taught to design accessible Web pages, then more organizations will have accessible sites. It does not cost more in time or money to develop accessible Web sites from scratch once a Web developer knows and understands the accessibility guidelines. However, correcting accessibility problems with existing Web pages require time and effort. The easiest alternative to correct existing pages may be to create text only pages that are accessible by individuals with disabilities.

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APPENDIX

WEB CONTENT ACCESSIBILITY GUIDELINES

#	Guideline Content
1	Web pages must provide equivalent alternatives to auditory & visual content.
2	Web pages do not rely on color alone; text and graphics must be understandable when viewed without color.
3	Style sheets should be used rather than elements and attributes to control presentation.
4	Use markup that facilitates pronunciation or interpretation of abbreviated or foreign text.
5	Tables must have necessary markup to be transformed by accessible browsers and other user agents.
6	Pages must be accessible even when newer technologies are not supported or are turned off.
7	Moving, blinking, scrolling, or auto-updating objects or pages may be paused or stopped.
8	User interfaces should follow the principle of accessible design such as keyboard operability.
9	Use features that enable activation of page elements via a variety of input devices.
10	Use interim accessibility solutions so that assistive technologies and older browsers will operate correctly.
11	Use W3C technologies (according to specification) and the following of accessibility guidelines.
12	Providing context and orientation information to help users understand complex pages or elements.
13	Clear and consistent navigation mechanisms, such as navigation bars and site maps, should be provided to increase the likelihood that a person will find what they are looking for at a site.
14	Documents should be clear and simple so they are easily understood.