# Are College Home Pages More Accessible? A Longitudinal Study of the Accessibility of United States College Home Pages

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## Abstract

The accessibility of college website homepages is important for ethical, legal and pedagogic reasons. For a website to be accessible, it must allow the disabled to access websites with web browsers and other tools that are available to disabled users. This has become increasingly important as more essential informational resources are online. In this longitudinal study, we examine 97% of U. S. college home pages using the automated tool WAAP which checks web page compliance with level 1 accessibility checkpoints adopted by the World Wide Web Consortium. In addition to these automated tests, images appearing on a sample of 261 home pages were examined to determine if their descriptions appearing as alternative text in the HTML tag was an accurate description of the image. A comparison of the 2009-2010 and 2012 version of these home pages indicated that some progress made but inaccurate descriptions of images remain the primary barrier to web accessibility. This article presents a longitudinal study of the accessibility of approximately 97% of U.S. College homepages. The methodology for assessing the websites and the measurement of accessibility is presented, including experimental results and data on over 3000 sites collected in 2009-2010 and 2012. Finally, these results are analyzed and some conclusions drawn.

**Keywords:** Accessibility, Universal Design, World Wide Web, WCAG

### 1. INTRODUCTION

The effort to make the World Wide Web universally accessible has been going on for over fifteen years. The first version of the Web Content and Accessibility Guidelines (WCAG) was released in May 1999 (W3C 1999) and version 2 was released in December 2008 (W3C 2008). The World Wide Web Consortium's website lists several automated tools that have been developed, but the web page has not been updated since 2006 (W3C 2006). And the movement to make more of the Web accessible is not all driven by altruism. Several court cases, both in the United States and elsewhere, have raised the question of whether Web sites are public accommodations. The National Federation of the Blind settled their lawsuit against Target over its website (http://target.com) (Sliwa 2006; Parker 2006) and Priceline and Ramada Hotels improved the accessibility of their websites

(http://priceline.com and http://ramada.com, respectively) as a result of a settlement with the State of New York (Meyers 2006). More recently, Netflix settled with the National Association of the Deaf, requiring Netflix to have 100% of their content captioned by 2014 (Kerr 2014). However, Southwest Airlines was able to avoid litigation when U. S. District Court Judge Patricia Seitz ruled that the Americans with Disabilities Act only applied to physical places and not to the Internet (McCullagh 2002). Internationally, there is has been some clear signs of support for requiring web sites to be accessible. The Australian Human Rights and Equal Opportunities Commission (HREOC) found that the Sydney Organizing Committee for the Olympic Games (SOCOG) had discriminated against the blind and had to pay $20,000 AUD to the plaintiff (W3C 2009).

The accessibility of the Web is important because research suggests that disabled people rely on the World Wide Web more than the mainstream population. Bonner (2002) states that many people with disabilities find that the Web "makes a difference between living and just existing." Gristock (2003) suggested that "often, a computer is a link to the outside world where a disabled person can perform as an equal to a non-disabled person". Thus, there is a clear need for websites to be accessible, even if the legal obligation is far from not certain.

The accessibility of college and university websites is important for several reasons. In the United States, the Individuals with Disabilities Education Act (IDEA) requires that disabled students must be granted access to educational resources, which has been interpreted to include online resources (IDEA 1997) such as websites, which has become particularly important because of the greater use of the websites by institutions of higher education. University websites typically will include college catalogs, class schedules and other notices as well as class materials that various members of the faculty will post. Many colleges use services such as BlackBoard and Moodle to support or even replace in-class activities. Erickson et al. (2007) found that a majority of community colleges in the United States have important student services online, with many other schools planning to follow suit. College students tend to be technologically savvy, using computers and the World Wide Web as much as any other demographic group.

Accessibility has become a more pressing concern over the past decade for all types of information systems professionals, including web designers and even video game designers. But for accessible design to succeed, it must be taught on the college and university level. This requires that it will be introduced to undergraduates in computer science and information systems curricula and that colleges and universities practice it as well as teach it. For this reason, as well as to satisfy legal obligations under IDEA, it becomes important that college and university websites be accessible to the disabled.

This is the third study of home pages for colleges and universities in the United States. The goal is to determine if these pages meet the essential requirements to consider a web page accessible and if there was any significant change in the accessibility of college home pages between 2009-2010 and 2012. The original study examined the homepages of all 200 of the homepages of the colleges and universities in New York State (DiLallo and Siegfried 2009). The development of WAAP (Web Accessibility Audit Program) was discussed and it was used to determine that most of the homepages failed to meet the criteria appearing in the World Wide Web Consortium's "10 Quick Tips." While passing these tests alone did not indicate that the pages were accessible, failing them did indicate that the pages failed to meet Priority Level 1 checkpoint in WCAG version1, all of which must be met for a web page to meet minimum requirements for accessibility. A follow-up study was performed where WAAP was used to evaluate the accessibility of the homepages for all 3117 United States college and university homepages. Because automated testing cannot determine all of the requirements for Priority Level 1 checkpoints, a manual examination was performed of a random sample of 261 college homepages. It was found that most images appearing on these pages were responsible for the largest part of accessibility failures, in many cases because the alternative text failed to provide an accurate description of the images to which the image tags referred (Siegfried et al. 2010).

The current study seeks to determine if there have been changes in the accessibility of college homepages in the two years between the second study and the current one. There are several reasons for expecting change: there is a greater awareness that companies and institutions have a legal obligation to make their web sites

accessible, ATAG guidelines (W3C 2013) have led to the development of web authoring tools that simplify the process of making web sites accessible and there is an awareness of this. Adobe Dreamweaver is one example of this (Adobe Systems Incorporated 2014). There have also been changes in the technologies used in web pages development, including HTML5 and a plethora of rich Internet applications, which can lead web pages that dazzle some users of the Web but can complicate and prevent a web page from being accessible (Fernandes et al. 2012).

## 2. PRIOR WORK

Sullivan and Matson (2000) examined 50 popular websites, checking for accessibility and usability. They found that there is a spectrum of accessibility and a weak connection between usability and accessibility. Stowers (2002) found that a majority of the 148 federal web pages examined violated accessibility standards. Fagan and Fagan (2004) examined state legislature websites and found results similar to Stowers' results while also finding an effort to improve compliance.

Lazar et al. (2003) analyzed 50 mid-Atlantic homepages and found that IT firms and web designers had the largest number of accessibility issues on their homepages. Jackson-Sanborn et al. (2002) looked at education, governmental and shopping sites and found about half of education and governmental sites and none of the shopping sites were accessible. Jaeger (2006) evaluated 10 governmental sites to determine their compliance with Section 508 web accessibility requirements. He found that there was a large variation in compliance among the agencies whose websites he examined and that the agencies' perception of their accessibility of their sites was not always accurate.

Schmetzke (2001) found that only 29% of community college websites examined were free of major barriers. Diaper and Worman (2003) found that British university homepages were largely free of accessibility barriers. However, Dey Alexander (2003) studied the accessibility of Australian university websites, examining four different web pages on each site in 2003, and found that 97% of the sites failed to comply with Priority Level 1 checkpoints. A follow-up study in 2007 found that all the sites failed to comply, although 7 % of the pages examined did pass these checkpoints. This represents a worsening of accessibility on Australian university homepages over the four year period between studies. Kane et al. examined the homepages of the top 100 international universities. The Australian universities had the fewest accessibility errors and the Asian universities had the largest number of such problems (Kane et al. 2007).

Fernandes et al. (2012) found that the presence of rich Internet applications affects the accessibility of web pages and that it is impossible to evaluate their accessibility correctly without considering their dynamic components, which were more likely to cause a web page to fail accessibility tests than to allow them to pass these tests. Andrés et al. (2009) studied factors that might influence the accessibility of European banks and found that neither operational factors nor the size of the bank influenced the accessibility of its web site. Thompson et al. (2013) reported that over 8 % of American colleges and universities have policies mandating web accessibility and that doctorate-granting universities were more likely to have high accessibility ratings for their web pages, even though PDF files linked to their web sites were more likely to have lower accessibility ratings.

## 3. METHODOLOGY

This study involved two different surveys, one conducted in 2009-2010 and the other in 2012. Both surveys involved the collection and analysis of college and university home pages in two distinct stages: one stage involved automated testing of 98% of all U. S. college home pages and the other stage involved manual tests performed on a random sample of 261 home pages.

The automated testing was performed using a tool called WAAP (Web Accessibility Audit Program), whose development is described in DiLallo and Siegfried (2009). WAAP reads the URL and the names of the colleges or university owning the web page and downloads the HTML document. It performs a series of tests to determine if the page meets Priority 1 checkpoint that web pages MUST meet if they are to be meet Conformance Level A (the lowest level of accessibility under WCAG version 1). It also provides a summary of the data for all the

pages examined. There were 19 automated tests that determined compliance with 5 checkpoints of WCAP version 1. Version 1 of WCAG was used in this study because version 2 was not adopted formally until after the study had started.

The automated tests were performed on the home pages of 3117 home pages, representing 98% of all U. S. college and university web sites. The names and URLs of all 3144 colleges and universities were taken from the University of Texas website, the most complete list of American colleges that was available in June 2009, when WAAP was run on U. S. college home pages. The site contained 27 sites that did not respond to WAAP; their results were excluded from the study. There were 72 URLs that were no longer valid in 2012; these schools were not used in the longitudinal study.

Random sample of homepages were performed, selecting 261 homepages at random. This was done by listing all the URLs and college names in an Excel spreadsheet, and each page was then assigned a random number using Excel's RAND() function. The colleges were then sorted based on the random number and every twelfth college was chosen for the sample.

Two manual tests were performed on this random sample of homepages. These pages were downloaded and saved. In the first test, every image on these pages was labeled and the alternate text in the image tags' alt attribute was examined to see if it was an accurate description of the image. A four-point scale was used and is described in table 1. Each page was examined and rated on this scale by two examiners. Where they did not agree, a third examiner served as an arbitrator, choosing which of the two ratings was more correct. The first download of pages to be checked manually was done in February 2010; the second download was done in July 2012.

While WAAP checked to see if the pages used a style sheet, determining whether the page was readable without the style sheet required manual inspection. In both cases, this was done offline after the pages had been saved.

The tests that were described above were all performed to determine whether the homepages conformed to various WCAG checkpoints. But frequently, design concerns can be a large source of frustration. One example of this is when there is a large number of navigation links at the top of the page. This can be extremely frustrating for blind users who may need to have their screen readers work their way through all these links before finding the text that they seek (Lazar et al. 2007). For this reason, the selected pages were viewed using the text-oriented web browser Lynx on the University's Linux-based system using a standard terminal window using the terminal emulator software PuTTY. The goal was to determine how many screens of titles and navigation links had to be read before the text on that page appeared. This test was not repeated in 2012.

The results of the first earlier survey appear in Siegfried et al. (2010).

## 4. RESULTS

The results from WAAP's evaluation appear in Table 2. The most common failures were in Checkpoint 1 and were caused by a failure to have alternative text in the image's tag that described the image. 51% of the images did not have an ALT attribute, although there was a slight decline from 2009 to 2012. There was actually a slight increase – from 43.3% to 44.9% - of empty ALT attributes. In all, this meant that over 70% of the images on a college's homepage had no meaningful text to identify it.

There were virtually no FRAME tags with missing or empty NAME attributes. There were almost no FRAMESET tags without a title, and the number of such tags decreases from 0.32% to 0.10%. This is probably due to the declining use of frames, a feature that is generally regarded as making a web page inaccessible.

In 2009, almost 7% of the pages had no style sheets; in 2012, declined to just 4.3%. The lack of a style sheet is a cause for concern because it may indicate that these pages contain formatting within the HTML tags, which a user's browser may not be able to change. Having the browser change the formatting is commonly done by the blind or visually impaired to make the page easier to read. This is why checkpoint 6.1 requires that a page can be read without the style sheet. Of the 261 pages manually evaluated in 2010, 22.3% were not readable without the style sheet, in many cases because of text superimposed on other text. This test was not performed in 2012.

Of the pictures manually evaluated in 2010, only 37% had ALT attributes that were an accurate description of the image, in 2012 this increased to 42%. The images with an accurate

description of the images adjacent to the image increased from 5.4 to 11.3%. The images that had an ALT attribute that was a somewhat accurate description of the images increased from 5 to 7%, while those with text that was an inaccurate description declined from 52 to 39%.enhancements to information systems education is identified or repeated here. DO NOT repeat the abstract or portions of it.

## 5. DISCUSSION

It seems rather obvious that some errors are much more prevalent than others. The most common error is the lack of alternative text or the lack of an accurate description for the images that appear on a home page. And what is most disturbing is that it was almost exactly as common in 2012 as it had been three years earlier and that empty alternative text is almost as common as having no alternative text. This suggests that the attribute was placed in the tag either to fool the accessibility checker or was placed by the web authoring tool and then left blank. Those familiar with the literature will not be surprised by these findings: this concur with findings by Lazar (2003) and Alexander and Rippon (2007).

Objects that lacked alternative text were quite common in the 2009 survey, accounting for more than one fifth of the homepages; however, this dropped by more than half in 2012. It is entirely possible that either web designers or web authoring tools may be responsible for this.

WAAP evaluated compliance with only five of the 17 Priority Level One checkpoints. Many of these checkpoints cannot be evaluated properly without human intervention. There is a fair amount of evidence that indicates that automated testing has severe limitations. Jackson-Sanborn et al. (2002) found it the least reliable of six different genres of accessibility testing. Jaeger (2006) considered it unreliable enough that he dismissed its use out of hand. Ivory (2002) evaluated several tools and found that while they were less effective than skilled web designers in spotting accessibility problems, they picked up errors that humans missed. Yet without the use of an automated tool, it would be difficult to collect data from as large a collection of web pages. When we developed WAAP, such tools could be a helpful tool for teaching novice web designers and that may still be the case, but many of the tools that they are currently using will generate web pages that are designed to meet accessibility requirements as well as others.

The decision to use the check points for WCAG 1.0 was made before the introduction of WCAG 2.0. It was decided to stick with the requirements of WCAG 1.0 for several reasons: web designers were – or should have been – more familiar with version 1, which had been around for close to a decade than with version 2, which had just been formally adopted; we could compare the results to those that we had found for New York State colleges; and there was a perception that it was easier to evaluate compliance with WCAG 1.0 than WCAG 2.0. This is supported by Brajnik (2009), who found that evaluations based on WCAG 1.0 were more reliable than those based on WCAG 2.0.

One would expect that web pages would be more accessible due to the use of web authoring tools that are designed to create accessible pages, greater regulation of web accessibility and there seems to be the case. But some elements of a web page remain stubbornly less than completely accessible. One test that was not repeated in 2012 involved the use of the text-based browser Lynx, which is commonly used by the blind. Many web pages have a very large number of links that must be traversed before the reader reaches the page's text. Many web designers include a link that allows readers to skip past the menus. A manual check was made on the random sample of 261 home pages and it was determined that on average, a reader needed to skip through 4 screens on a standard terminal emulator window before reaching the page's text. The first author performed a similar on a college home page that required a reader to sift through 4 screens in the 2010 study; it currently takes more than 10 screens before reaching the page's text. While this most likely is not representative of the entire sample, it suggests that there may be accessibility criteria that are not measured by current standards.

Are home pages representative of a web site? It is difficult to say, but there are valid reasons for examining them. In many instances, they are indicative of a website's "look and feel" and may provide a reasonable representation of how accessible the site is. Even if this is not the case, Lazar points out, correctly, that it remains the gateway through most people enter a web site. If one cannot navigate through the home page because of its barriers to accessibility, it may be doubtful that they can find their way through the rest of the site.

There is one remaining question that this study did not address: are mobile versions of the web sites more or less likely to be accessible? While earlier versions of mobile websites were more likely to be text-based and therefore more likely to be accessible, that is not necessarily the case anymore. This question will be addressed by a future study.

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# Appendices

**Table 1. The Rating Scale For Accuracy Of Image Descriptions**

| Score | Descriptions | Images in this category, 2010 | Images in this category, 2012 |
|---|---|---|---|
| 1 | Text in the ALT attribute is an accurate description | 37.6% | 42.3% |
| 2 | Text adjacent to the image is an accurate description | 5.4% | 11.3% |
| 3 | Text in the ALT attribute is a somewhat accurate description | 5.0% | 7.1% |
| 4 | Text in the ALT attribute is not an accurate description. | 52.1% | 39.3% |

**Table 2. Results of WAAP's Evaluations**

| Checkpoint | Description of Test | % Test Failures, 2009 | % Test Failures, 2012 |
|---|---|---|---|
| 1.1 | ***Provide a text equivalent for every non-text element*** | | |
| | Img Tag – Empty Alt | 43.31% | 44.91% |
| | Img Tag - No Alt | 51.84% | 51.02% |
| | Img Tag - Empty Alt & No Alt | 71.80% | 71.60% |
| | Frame Tag - Empty Name | 0.03% | 0.00% |
| | Frame Tag - No Name | 0.00% | 0.03% |
| | Frameset Tag - Empty Title | 0.00% | 0.00% |
| | Frameset Tag - No Title | 0.32% | 0.10% |
| | Img Map Area Tags - Empty Alt | 1.48% | 0.66% |
| | Img Map Area Tags - No Alt | 7.44% | 3.45% |
| | Object Tag - No Alt Text | 22.14% | 8.93% |
| | | | |
| 5.1 | ***For data tables, identify row and column headers*** | | |
| | Table Header Tags - Empty ID | 0.83% | 0.36% |
| | Table Header Tags - No ID | 2.97% | 3.02% |
| | Table Data Tags - Empty Headers | 0.00% | 0.00% |
| | Table Data Tags - No Headers | 1.32% | 1.97% |
| | Tables - Missing Headers | 0.00% | 0.00% |
| | | | |
| 6.1 | ***Organize documents so they may be read without style sheets*** | | |
| | No Style Sheets | 6.64% | 4.33% |
| | | | |
| 9.1 | ***Provide client-side image maps instead of server-side image maps except where the regions cannot be defined with an available geometric shape*** | | |
| | Server-side image map | 0.26% | 0.03% |
| | | | |
| 12.1 | ***Title each frame to facilitate frame identification and navigation*** | | |
| | Frameset Tag - Empty Title | 0.00% | 0.00% |
| | Frameset Tag - No Title | 0.32% | 0.10% |