

## **An Exploratory Analysis of WCAG 2.0 Conformance in Higher Education Websites**

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**Abstract:** Ensuring accessibility online for disabled individuals is of great concern. Legally and ethically, institutions must ensure that resources are accessible to disabled individuals, and failing to provide accommodations raise serious legal liability issues. To promote accessibility, a number of accessibility guidelines have been developed, including the Web Content Accessibility Guidelines (WCAG). Now in its second version, WCAG 2.0 has become the international standard for website accessibility as ISO/IEC 40500:2012. Despite the importance of complying with accessibility standards, it is not clear to what degree educational institutions conform to WCAG 2.0 standards. This research project performs an exploratory analysis of the websites of fifty American universities using the AChecker accessibility evaluation tool. The result of this analysis suggests that, though there are a number of universities working to minimize accessibility errors, accessibility is an area needing improvement.

### **Introduction**

The concern for ensuring access of disabled individuals to information predates the wide-spread rise of digital information with the passage of Rehabilitation Act of 1973. Along with the later Americans with Disabilities Act of 1990, these laws provide the basis for the legal requirement that educational institutions provide reasonable accommodation to disabled individuals for accessing information. Failing to provide these accommodations can result in serious legal liability issues as well as potential loss of Federal funding. In a time where more individuals are accessing information through the Internet (Perrin & Duggan, 2015), accessibility of that content to individuals with disabilities is a major concern. To address that concern, the World Wide Web Consortium (WC3) published the first version of the Web Content Accessibility Guidelines (WCAG) in 1999. Today, WCAG is in its second version (also known as ISO/IEC 40500:2012), and, with the explosion of hypermedia over the last decade, it has never been more critical for web content to follow accepted accessibility standards. Despite this importance, it is not entirely clear to what degree educational institutions meet WCAG 2.0 standards. This research project performs an exploratory analysis of the websites of fifty universities using the AChecker web accessibility evaluation tool to examine the number of potential accessibility errors. This data will be examined to determine the overall level of WCAG 2.0 conformance, as well as to identify potential conformance trends.

### **Literature Review**

Comeaux and Schmetzke (2013), in the opening of their article on library website accessibility, rightly pointed out that “disability is a social construct” (p. 8). Their purpose behind this remark is to point out that applying the label of disability does not contribute to assisting or empowering the disabled. They conjecture that if, instead, disability is understood in terms of what people are capable or not capable of given certain conditions, then those conditions “are at least as important to the overall picture” (Comeaux & Schmetzke, 2013, p. 9) as the bodily limitations themselves. The implication here is that by understanding what disabled individuals are capable of, we

can make design decisions that accommodate those disabilities. To have much of an effect, this effort must be widespread; hence why accessibility is a major theme in federal as well as state laws (Fulton, 2011), and where Comeaux and Schmetzke's (2013) point comes full circle. The accommodations we provide the disabled are only meaningful when provided consistently. This is why buildings have accessibility guidelines, and why you will find wheelchair access in every new building.

Online, the challenges are different. Rather than being able to walk, the Internet requires people to be able to see and hear. Just as we have developed ways to enhance the mobility of individuals with an inability to walk, there are ways to accommodate individuals online that cannot see or hear. For the hearing impaired, transcripts of audio can be made available to read. For those who are visually impaired, screen readers have been developed that facilitate the use of computer systems. Thus, there exist accommodations for disability in the electronic world.

The problem is that just as the physical world must be constructed to accommodate accessibility, so must the online world. Society has accepted the need to make buildings accessible, and so there exist government standards for accessible construction (Department of Justice, 2010) along with laws that compel compliance. Similarly, standards have been developed for online accessibility. One of the most prominent is the openly developed Web Content Accessibility Guidelines (WCAG), initially developed in 1999, revised as WCAG 2.0 in 2008, and adopted as ISO/IEC standard 40500 in 2012.

In its guidance on understanding WCAG 2.0 conformance, W3C note that there are five requirements for WCAG conformity (W3C, n.d.). The first is that the content meets the requirements of one of the conformance levels: A, AA, or AAA. These levels establish increasingly rigorous success criteria for web design practices, against which conformance can be measured. The second requirement is that conformance cannot be claimed for excluded parts, thus a page cannot be partly conforming. Third, WCAG 2.0 establishes that conformity cannot be claimed for a process if any part of that process is nonconforming. Fourth, it requires that any content available in a non-accessible form must also be available in a form that works with assistive technologies. Finally, WCAG 2.0 conformity requires that any non-accessible technology used must not block access to content through assistive technologies.

Unlike buildings, which undergo review for adherence to code, websites are not so regulated. Moreover, jurisdictional issues and practicality make it difficult for governments to force universal compliance with accessibility standards. As a result, it is uncertain as to the degree to which accessibility standards are followed. Nevertheless, studies have attempted to ascertain the state of web accessibility. Lazar, Beere, Greenridge, and Nagappa (2003) examined a sample of 50 websites in a number of industrial sectors and concluded that web accessibility was poor – particularly among those, such as web development firms that should understand accessibility needs better. More recently, Comeaux and Schmetzke (2013) examined the accessibility of academic library web sites and, though accessibility was found to have improved in time, they still note “major concerns” (p. 29) regarding web accessibility. This mirrors findings on web accessibility, at approximately the same time, in the corporate sector that concluded “the websites of the [236] largest enterprises ... are decidedly low according to the WC3 WCAG 1.0, WCAG2.0 and Section 508 standards” (Gonçalves, Martins, Pereira, Oliveira, & Ferreira, 2013). One would expect, that higher education institutions would be a leader in adopting accessibility in online design. Unfortunately, there is limited information on web accessibility conformance among higher education institutions.

## **Methodology**

To address the literature gap and ascertain the WCAG 2.0 conformance of universities, the largest university by enrollment in each U.S. state was identified. These universities formed the sample for this study. To simulate user experience, universities' full names were entered into the Microsoft Bing search engine, and each university website's URL was extracted from search results. The extracted addresses were then analyzed for WCAG 2.0 Level A, AA, and AAA errors using the online AChecker evaluation tool over a 24-hour period on September 10, 2016. AChecker produced three sets of statistics for each WCAG 2.0 level. Known problems correspond to issues that are known to cause accessibility problems, and require remediation. Likely problems correspond to issues that are expected to cause accessibility issues, however require some human judgment to determine for certain. Potential problems correspond to issues that may present a possible accessibility issue, but that should be examined by a human for confirmation.

Results from AChecker evaluation were recorded in a Microsoft Excel spreadsheet for analysis.

## Results

Analysis demonstrated that of the websites analyzed ( $N = 50$ ) for WCAG 2.0 conformance, 11 were found to have no known problems at the A conformance level, three were found to have no problems at the AA level, and three were found to have no problems at the AAA level. This translates into a WCAG 2.0 conformance rate of 22% at the A level, 6% at the AA level, and 6% at the AAA level. Of the websites analyzed only one had no known, likely, or potential problems at the A, AA, and AAA levels. A summary of analysis is provided in Table 1.

	Level A			Level AA			Level AAA		
	Known	Likely	Potential	Known	Likely	Potential	Known	Likely	Potential
<i>M</i>	5.12	1.14	453.56	12.94	1.27	478.73	13.53	1.08	486.92
<i>SD</i>	6.76	2.85	269.22	25.31	2.99	284.77	25.51	2.74	286.16
Min	0	0	0	0	0	0	0	0	0
Max	33	17	1309	171	18	1395	171	16	1400

**Table 1.** Summary of WCAG 2.0 Results by Conformance Level

## Discussion

Though previous research has examined subsets of institutional pages, such as libraries (Comeaux & Schmetzke, 2013), no known research examines the accessibility of main, institutional pages. While Comeaux & Schmetzke (2013) expressed cautious optimism about accessibility in library websites, no more than a cursory examination of the data here is sufficient to see that accessibility remains a problem in institutional websites. Only one university in the sample, New York University, was found to have no accessibility issues. Only two other schools, The University of Illinois at Urbana-Champaign and the University of New Mexico, were found to have no known problems, as defined by AChecker.

The 47 remaining schools surveyed had a varying number of accessibility issues. Accessibility data at WCAG 2.0 Level A seems to send a mixed message. On one hand, the statistics seem low and suggest (assuming a standard normal distribution of errors) that 68% of institutional websites should have no more than about 12 accessibility errors and 95% should have no more than about 19 errors. This is problematic when we recall that these statistics were gathered not from a sample of pages, but from a single page from each institution. The problem is further compounded at stricter WCAG 2.0 conformance levels, where we see a mean of 12.94 errors at the AA Level and a mean of 13.53 at the AAA Level (with standard deviations of 25.31 and 25.51, respectively). These error rates could render a university website difficult to use.

A second piece of the puzzle comes from a critical treatment of our previous assumption of normality. A website cannot have a negative number of errors; thus the mean should be approximately three standard deviations from zero. In this data, the mean number of errors is less than one standard deviation from zero, suggesting some degree of skewness of the collected data. Indeed, a more detailed look at the data confirms skewness, as we observe many institutions having no or a relatively small number of accessibility errors, while a minority have a large number of errors. These few institutions with high error counts skew the data towards a higher central tendency. Thus, the findings here are mixed. On the one hand, the many institutions with a small number of errors presents some evidence that Comeaux and Schmetzke (2013) are justified in their optimism for accessibility standards conformance. On the other hand, these results simultaneously suggest that some institutions may not be working proactively to minimize accessibility error rates.

## Limitations

There are two limitations of this study that stem from the use of AChecker as means of examining compliance. The first, relates to the software tool itself as a potential limitation. There are a number of software tools that check for accessibility problems, and many of them use different approaches to displaying accessibility information. AChecker was chosen because it was fairly straightforward to generate statistics for all three WCAG 2.0 conformance levels, however the accuracy and validity of this tool at all of those levels is not known to be

empirically proven. Moreover, as a software tool, there could be unknown issues affecting error counts. Empirical testing of tools intended for accessibility conformance is a future area of worthwhile work.

The second limitation of this study related to the use of AChecker is that it can only test one of the five identified requirements of WCAG 2.0 (W3C, n.d.) – whether the site conforms to Level A, AA, or AAA criteria. The additional four requirements necessitate some degree of human judgment to determine if the conformity requirements are met. AChecker data, particularly the “likely” and “potential” issue counts may suggest the degree to which these requirements are met, but they cannot say conclusively. As a result, since errors at the A, AA, or AAA levels demonstrate nonconformance with WCAG standards, all the data can tell us with certainty is when websites are not conforming. Data from this study should not be used to imply WCAG 2.0 conformity, and future studies should be cognizant of this limitation.

An additional limitation of this study is that it only samples the institutional homepage of each university. Homepages are often a place for special features such as slideshows, videos, news feeds, and other atypical features intended to add aesthetic appeal and interest in the university as a brand. By sampling only this page, it is possible that the results are capturing more errors than the institution might otherwise have on informational pages. For the purpose of this study, this was deemed an acceptable limitation given the time available and the research goal of getting a quick view of WCAG conformance rates. Future research in this area should expand to ultimately examine not a single page, but a corpus of institutional pages such that overall error rates can be determined. Additionally, future research should examine potential predictors of WCAG 2.0 conformance such as institutional size, funding, and web team staffing.

A final limitation of this study is its general focus on accessibility at the university level. This is a logical starting place, as university webpages are often maintained by a team of professionals and so accessibility statistics should be more indicative of a willingness to adopt accessible design practices than it is a function of ability to utilize them; however, this focus does not capture the full picture of accessibility in education. Future work is needed and intended to examine accessibility at the primary and secondary levels of education and compare with higher education findings.

## **Conclusion**

This short study has examined WCAG 2.0 conformance at fifty American universities. While the results suggest promise for web accessibility, it also demonstrates a number of institutions are still failing to conform to WCAG 2.0 standards. Given the many ADA-related lawsuits that occur due to inaccessible content, these institutions ignore accessibility guidelines and conformance auditing at their own peril. The author hopes that this article will bring some awareness to the issue of web accessibility, and will encourage both research into accessibility in educational institutions and the pursuit of accessible web design.

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