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U.S. state government websites demonstrate better in terms of accessibility compared to federal government and commercial websites

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ABSTRACT

State government websites are a main information portal for people. The primary objective of this study is to examine 50 U.S. state government websites to evaluate the status of their accessibility in comparison with federal government and randomly selected commercial websites. The results show a significant difference among the three groups ($F(2, 101) = 11.81$, $p<0.001$) with respect to accessibility. In particular, the state and federal government websites provide more accessible service to their users than the commercial websites ($p<0.01$). The most frequent barriers to accessibility found on state government websites are also listed here for web designers and developers to enable them to improve their quality of service in the future.

Background

The World Wide Web (WWW) provides a widely accessible means to present, transfer and share information. The internet has been gaining in popularity over the past decade, with usage growing at a tremendous rate of 444.8% since 2000 (Miniwatts Marketing Group, 2010b). According to International Telecommunication Union's data, about 77.3% of the total population in the United States (nearly 240 million) is participating and interacting with the internet as of June 2010 (Miniwatts Marketing Group, 2010a). This number is expected to rise as more and more people are growing up with the internet.

However, a large number of people with disabilities in the United States have brought to the nation's attention their need for web accessibility. According to the U. S. Census (2006), about 12 million people suffer from long-lasting sensory disabilities including "[blindness], deafness, severe vision or hearing impairment" (U. S. Census, 2007). In addition, the number of those who are visually impaired has increased in recent years. According to the Centers for Disease Control and Prevention (2007), 9% of the adult population experienced vision trouble (even with glasses or contact lenses) in 2004, and this number rose to 10% by 2006. In addition, the most recent National Health Interview Survey showed that more than 25 million in U.S. experienced vision trouble (Pleis, Lucas, & Ward, 2009). Therefore, offering people with disabilities equal opportunities to "perceive, understand, navigate, and interact with the web" (Introduction to Web Accessibility, n.d.) has become an even more crucial issue in web development.

Several formal guidelines and standards have been established to enhance equal accessibility. Web Content Accessibility Guidelines 1.0 (WCAG 1.0), an official recommendation from the World Wide Web Consortium (W3C), was the first and the most influential guide in enhancing web accessibility. It primarily addressed the needs of the visually impaired user (Bartlett, 2003), explaining ways to make web content accessible to people with disabilities. In particular, it includes 14 guidelines with specific checkpoints to ensure accessibility (W3C, 1999). The 91 checkpoints from these guidelines are divided into three priority levels: Priority 1—*must* be followed to ensure basic accessibility; Priority 2—*recommended* to remove significant barriers; Priority 3—*suggested* to be followed to grant extensive accessibility to all users (Introduction to Web accessibility, n.d.). WCAG 1.0 has been considered a standard in developing web pages as well as a benchmark in establishing regulations and policies.

The checkpoints in Priority 1 of WCAG 1.0 were used as a basis for the Amendment to Section 508 of the Rehabilitation Act in 1998 (Section 508 Standards, n.d.). This is a policy that ensures the accessibility of federal government websites, including federally funded programs and services, to all users (The Rehabilitation Act Amendments (Section 508), 1973).

State governments have also made an effort to make government information accessible to all users. According to Golden and Buck (2003), every state has adopted an accessibility measurement, and the majority of them have utilized a policy approach to ensure the accessibility for their state agencies. In particular, 14 states have adopted Section 508; 18 states have adopted the WCAG 1.0 from W3C; four states have adopted a hybrid of WCAG 1.0 and Section 508; and another seven states have adopted "self-defined" standards or

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guidelines based on WCAG 1.0, Section 508, and other standards (Golden & Buck, 2003).

The issue of web accessibility has garnered the nation's attention for many years. Most studies on this issue have employed Bobby, a popular accessibility assessment tool, to assess the accessibility of websites. For example, using this tool one study showed that only 40 of the 100 main library web pages of the "100 Most Wired Colleges" were accessible (Lilly & Fleet, 1999) and another showed that 63 out of 80 academic home pages in the United States and Canada did not meet the standards for accessibility (Guthrie, 2000). In addition, West (2001) points out that only five percent of 1680 state and federal government websites were Bobby-approved and four percent were W3C (WCAG 1.0) or Section 508 compliant. A year later, Stowers (2002) found that 13.5% of the 148 federal websites were fully accessible with zero errors. Around the same time, a study focused on accessibility examined six types of sites (most popular, clothing, international, jobs, college and government); it revealed that 60% of government websites examined were accessible and recognized these as the most accessible sites when compared to the others (Jackson-Sanborn, Odess-Harnish, & Warren, 2002). Another study revealed that in 2002 only 11 out of 55 well-known agencies of the federal government had received the "508 Approved" icon on the Bobby report (Ellison, 2004). Three years later, West (2007) announced the number of accessible government websites in the U.S. that met the standards of WCAG 1.0 Priority 1 had increased from 33% in 2003 to 46% in 2007.

More specific, the online access to state websites and their documents has been an issue of growing concern to citizens over the past several years (Fagan & Fagan, 2004). A study on the home pages of 50 states and the District of Columbia found about 70% meet WCAG conformance level A, only one state meets level AA, and no state meets level AAA (Goette, Collier, & White, 2006). Another study on the state legislative websites found only four states had no Priority 1 errors (meet conformance level A) on either their House, Senate, or main legislative pages (Fagan & Fagan, 2004).

Quantitative assessment has also been utilized in evaluating web accessibility. Rather than the absolute measure of Bobby, web pages beside the homepage were also included to better determine the overall status of the accessibility of the entire site. Hackett, Parmanto, and Zeng (2004), using quantity assessment of accessibility, indicated that, from 1997 to 2002, randomly selected commercial websites have become progressively inaccessible, with more barriers to accessibility than federal government websites. In addition, Parmanto and Zeng (2005) discovered that only 8.81% of websites considering themselves to be at an "AAA" conformance level truly qualified for this rating.

Web technology has dramatically changed the way that the American government serves the public (Rubaii-Barrett & Wise, 2008; Stowers, 2002). With the development of technologies, web pages are becoming more and more attractive and interactive. Their complex structure and increasing capability for multimedia technologies are now presenting even more challenges for web developers in terms of accessibility.

State government websites establishing a communication channel with local official services and agencies is essential to be accessible for everyone, especially for people with disabilities. As can be seen from the literature review above, studies on state government level have mainly focused on the selected homepages. It is not clear; however, whether state government websites, overall, provide equal access to their users when web pages behind the homepage are included.

The primary objective in this study is to understand the barriers in state government websites, an understanding which is essential for helping web designers and developers to improve their service with respect to accessibility. This study is also a variation on and partially updated study of Hackett's studies in 2004 and 2007. The groups of federal government and randomly commercial website lists that Hackett used in her previous studies are included for the purpose of comparison and benchmarking.

Methods

This section provides an overview of the methods used for our study, including the selection of websites, the evaluation tool, measurement of accessibility, evaluations of website complexity, and finally, statistical analysis and data storage.

Selection of websites

This nationwide study covers all 50 U.S. states, including the forty-eight continental states, the state of Alaska, and the state of Hawaii. Twenty-one federal government websites from Hackett's study in 2004 (Hackett et al., 2004) were re-evaluated to reflect the most current accessibility status of federal government websites. In addition, the evaluation data of selected commercial websites from (Hackett, 2007) were utilized to represent the accessibility status of commercial websites; these websites included 33 out of the top 50 websites from Alexa.com on April 10, 2007.

Evaluation tool

We employed a quantitative accessibility metric called Web Accessibility Barriers (WAB), developed by researchers at the University of Pittsburgh, to assess the accessibility of the state, federal, and commercial websites. The WAB metric uses 25 checkpoints from WCAG 1.0 that could be automatically tested by computer programs to assess web accessibility (Parmanto & Zeng, 2005). Kelvin, the tool that implements this metric, is capable of evaluating the web pages beyond the homepages.

However, as dynamic web pages remain a challenge for this automatic evaluation tool, only the static HTML pages of the tested websites were evaluated and analyzed in this study. Any pages that did not respond within five seconds were automatically removed from our list to avoid any problems with connection.

In order to obtain the most complete coverage of the websites and determine the most accurate web accessibility status for a website, the homepage and three levels below the homepage were included in this study. As shown in Fig. 1, Level 1 indicates the links one level away from the homepage, and Level 2 and Level 3 refer to all the web pages extending from the previous level, respectively.

While the tested websites mainly contain information about the state government they are representing, they may also link to outsider websites, such as consultants, companies and organizations. To eliminate the effect of these "outsiders" on the evaluation of the selected websites, only the referenced links in the same domain as the homepage were included in this study.

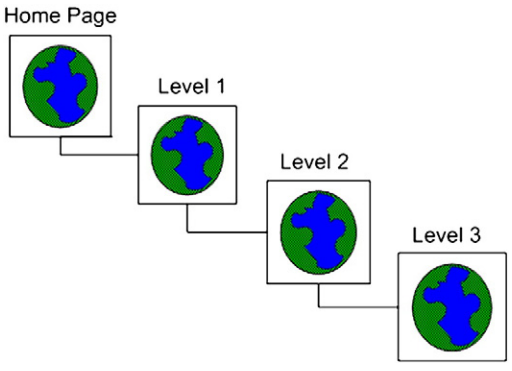

Fig. 1. Level of evaluation.