ACCOMMODATION OR COMPLIANCE? A CONTENT ANALYSIS OF 47 TENNESSEE COLLEGE AND UNIVERSITY WEB SITE HOMEPAGES

GILLIAN RICHARDSON

To the Graduate Council:

I am submitting herewith a thesis written by Gillian Richardson entitled "Accommodation or Compliance? A Content Analysis of 47 Tennessee College and University Web Site Homepages." I have examined the final paper copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts with a major in Communication Arts.

Dr. Frank E. Parcells, Ph.D.
Major Professor

We have read this thesis
and recommend its acceptance:

Dr. Mike Gotcher
Second Committee Member

Dr. Ted Jones
Third Committee Member

Acceptance for the Graduate Council:

Dean of the Graduate School

STATEMENT OF PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for a Master of Arts degree at Austin Peay State University, I agree that Woodward Library shall make it available to borrowers under the rules of the Library. Brief quotations from this thesis are allowable without special permission, provided that accurate acknowledgement of the source is made.

Permission for extensive quotation from or reproduction of this thesis may be granted by my major professor, or in his absence, by the Head of Interlibrary Services when, in the opinion of either, the proposed use of the material is for scholarly purposes. Any copying or use of the material in this thesis for financial gain shall not be allowed without my permission.

Signature: Gillian Richards

Date: 5/2/2006

ACCOMMODATION OR COMPLIANCE?

A CONTENT ANALYSIS OF 47 TENNESSEE COLLEGE AND UNIVERSITY WEB SITE HOMEPAGES

A Thesis

Presented for the

Master of Arts Degree

Austin Peay State University

Gillian Richardson

May 2006

ACKNOWLEDGEMENTS

I express my sincere appreciation to my major professor, Dr. Frank Parcells, for his patience and guidance toward the completion of this thesis.

I also thank my other committee members, Dr. Mike Gotcher and Dr. Ted Jones. Each committee member has taken valuable time to read this thesis in order to offer their very generous comments, suggestions, and assistance; their invaluable input into this body of work is most greatly appreciated.

ABSTRACT

This content analysis evaluates the current accessibility of 47 of Tennessee's college and university Web site homepages for people with disabilities. This investigation used the Web accessibility evaluation tool WebXact 5.0 (formerly Bobby) to access these college and university Web sites. WebXact uses an automated program to review the HTML code of a Web page to look for common accessibility errors, based on 14 checkpoints derived from either the Web Content Accessibility Guidelines (WCAG) or from Section 508 depending on which option a user selects. For this analysis, I used the option to check for compliance with the Web Content Accessibility Guidelines (WCAG).

The homepages of 47 Tennessee college and university web sites were reviewed for accessibility based on the Web Content Accessibility Guidelines created by the World Wide Web Consortium. Findings of this content analysis establish that the 47 Tennessee college and university homepages reviewed currently do not meet those accessibility standards based on the WCAG's. While it is likely, to a high degree, that these 47 Tennessee college and university homepages do not reach their broader audience, these findings alone cannot claim that the 47 homepages evaluated are in-accessible to people with disabilities. However, based on these findings it is clear that the homepages do not effectively communicate with the sampled audience.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	Introduction	1
	Purpose of this Content Analysis	2
	Research Question	3
II.	Literature Review	6
	Section 508: An Overview	6
	Web Content Accessibility Guidelines 1.0: An Overview	8
	Web Site Credibility & Usability	10
	Web Site Accessibility	14
	Previous Studies in Web Site Accessibility	16
III.	Method	19
	Priority 1 Level of Accessibility	21
	Priority 2 Level of Accessibility	23
	Priority 3 Level of Accessibility	25
	Evaluation Tool	27
IV.	Results	29
V.	Discussion	38
	Limitations of this Content Analysis	39
	Ideas for Future Research	41
REFERENCES		44
APPENDIXES		
	A. Listing of Tennessee Colleges and Universities Evaluated	50
	B. Additional Accessibility Resources	53

LIST OF TABLES

TABLE		PAGE
3.1	W3C's Web Content Accessibility Guidelines 1.0.....	20
3.2	Priority 1 Level of Accessibility Checkpoints.....	22
3.3	Priority 2 Level of Accessibility Checkpoints.....	23
3.4	Priority 3 Level of Accessibility Checkpoints.....	26
4.1	Listing of Universities Satisfying or Not Satisfying Priority 1 Checkpoints	30
4.2	Listing of Universities Satisfying or Not Satisfying Priority 2 Checkpoints.....	32
4.3	Listing of Universities Satisfying or Not Satisfying Priority 3 Checkpoints.....	35

CHAPTER I

Introduction

Rhetoric, in the ancient Greek and Roman world, meant having the power to find, in any situation, the available means of persuasion: the power of using words effectively to influence the thoughts and actions of an audience (Crowley & Hawhee, 1998). Additionally, rhetoric can be further explained as the systematic study of the ways that people use language to persuade others to accept what they say as valid, trustworthy, and true. It is also an action founded in the belief that language has an effect within the world.

Kenneth Burke defined rhetoric as "equipment for living" and according to Burke, terms that dominate a text construct, shape, and create our reality, or the world in which we live (Crowley & Hawhee, 1998, p.245).

The definition of rhetoric has been expanded to encompass the study of effective communication. Most recently, the World Wide Web has created new forms, technologies, and principles for effective global communication. The idea being to reach a global audience and to do that Web content has to be accessible and effective for all users. Message design must be effective and it must be accessible by everyone (Bix, 2002). To communicate effectively, content developers, Web writers, and Web designers must adapt or possibly change their traditional communication practices in order to take advantage of new opportunities available for global communication.

Coombs (2002) indicates that in order to communicate effectively the message design or the design of the message affecting message analysis and communication has to be accessible for everyone so that it reaches the appropriate target audience. When a Web site is created and content is written for that Web site, the message design heightens the credibility of an

organization or person, and the authority or the authenticity of the organization is found in the acceptance of the site by the audience (Bix, 2002). The authority is not found in the actual Web site or content of the Web site, but in the acceptance of the Web site by a greater audience. It is imperative to design a Web site and Web content that can be accessible to all individuals. If Web content, especially content on a homepage of a postsecondary institution, is accessible to some but inaccessible to others, what message is being conveyed? If that happens, then effective communication cannot take place and the credibility of the institution suffers. That is why the World Wide Web Consortium (W3C's) Web Content Accessibility Guidelines (WCAG) and Section 508 of the Rehabilitation Act of 2005, are important concepts in and of themselves: they identify ways in which Web content can be designed so that the content of the message reaches everyone and eliminating the barriers to effective communication.

Purpose of this Content Analysis

Clearly, the goal of these accessibility standards is to help make the Web more accessible for people with disabilities. Both sets of standards work concurrently to make Web content accessible for people with disabilities identifying ways to make Web accessibility and Web usability easier for everyone especially people with disabilities.

The purpose of this content analysis is to provide current data on the accessibility of Tennessee's college and university Web sites. Web accessibility ensures that people can as easily access and use a Web site as effectively as people who do not have a disability. Usability is a concept that relates to design elements of a Web site that affect every person's ability to easily understand the content and organization of the Web site (Nielson, 2005). Web site accessibility and usability are two important concepts of Web site design because they speak directly to the

over all effectiveness of the communication of the message that is being presented as colleges and universities strain to reach and retain a more widespread audience (Wheaton & Granello, 2003).

While several studies have used the automated tool Watchfire® Bobby™ 5.0 (now WebXact) in evaluating the accessibility of postsecondary educational institutions' Web sites for people with disabilities, this content analysis evaluates the homepages of 47 colleges and universities in Tennessee in order to determine if these homepages meet the Web Content Accessibility Guidelines created by the World Wide Web Consortium (W3C) and to further determine if people with disabilities are able to effectively communicate and exchange information when they attempt to access the Web sites of colleges and universities in Tennessee.

Research Question

As previously suggested, the goal of accessibility standards is to help make the Web more accessible for people with disabilities. This includes individuals with visual disabilities, hearing disabilities, physical disabilities and cognitive or neurological disabilities. Accessibility standards help Web designers identify and address accessibility issues (Foley, 2003).

Section 508 of the Federal Rehabilitation Act of 2005, sets standards for Web pages designed or maintained by federal agencies. Section 508 requires that electronic and information technology that is developed or purchased by the federal government is accessible by people with disabilities. Although Section 508 does not directly apply to the private sector, it appears that many universities have adopted the standards outlined in Section 508 as part of their accessibility policy, even though, at present, they are not required to do so under the current law (Ellison, 2004).

The World Wide Web Consortium (WC3) leads what is perhaps the most comprehensive Web accessibility standards initiative (Chisholm, Vanderheiden, & Jacobs, 1999). The W3C's Web Content Accessibility Guidelines (WCAG) were the first major effort to establish guidelines for design. This standard consists of 14 guidelines, each with three levels of checkpoints. The WCAG is not a legal mandate, but rather a comprehensive set of guidelines to further ensure accessibility (Thatcher, 2005).

Due in part to the passage of Section 508 and its resultant standards for technology accessibility, and to the WC3's Web Content Accessibility Guidelines, postsecondary institutions are becoming increasingly aware of their legal obligations to provide access to information, programs, and services offered through the Web (Foley, 2003; Thompson, Burgstahler, & Comden, 2003).

All indications from previous research is that many post secondary institutions are taking the initiative and developing their own IT standards some based on Section 508 while others are considering the WCAG the standard (Thompson, et al., 2003; Thatcher, 2005). At the present time, there is no direct legal mandate for university Web sites in the United States, but there is strong precedent (Thatcher, 2005).

From the perspective of people with disabilities, inaccessible Web content is an obstacle that prevents them from participating fully on the Internet. Henry & Grossnickle (2004) suggest that individuals with disabilities access the Web in several ways. They may use customized browser settings, such as font size, color and screen resolution. They may also rely on assistive devices such as screen readers, text readers and voice activated devices.

If the HTML code used to build the Web pages is not appropriately optimized, these assistive technologies can become ineffective, and the Web site can become inaccessible.

Many Web sites are created by bypassing Section 508 as well as the WACG's. Whether this is done on purpose or through inexperience, they exclude the segment of the population that in many ways have the potential to gain the most from the Internet (Waddell & Urban, 2000).

To conclude this somewhat lengthy introduction, based on my research question, "do the Web site homepages of 47 Tennessee college and university homepages meet the WC3's Web Content Accessibility Guidelines?" this thesis answers the question: "can people with disabilities effectively access important information on the homepages of Tennessee college and university Web sites?

CHAPTER II

Literature Review

Section 508: An Overview

The government of the United States of America has traditionally provided services, established standards for access to public and private services, and enforced laws affecting people with disabilities (Ellison, 2004). Two laws govern the rights of persons with disabilities: Section 504 of the Rehabilitation Act of 1973 and The Americans with Disabilities Act of 1990. The Rehabilitation Act of 1973 mandated accommodations (e.g., curb cuts, wheelchair ramps) to make government services more accessible to the disabled. The Americans with Disabilities Act (ADA) of 1990, "prohibits discrimination and ensures equal opportunity for persons with disabilities in employment, state and local government services, public accommodations, commercial facilities, and transportation" (U.S. DOJ, 2005, ¶2). This Act also mandated the establishment of TDD (Telecommunications Device for the Deaf) telephone relay services to provide public service for disabled citizens. The Assistive Technology Act of 1998, provides states with funding to promote assistive technology and to develop programs to provide disabled citizens with these technologies (OIT, 2005). Some, not all, have interpreted that this law may be a mandate for state and local governments to ensure Web accessibility (Henry & Grossnickle, 2004).

In 1998, Congress amended the Rehabilitation Act and strengthened provisions covering access to information in the Federal sector for people with disabilities. Section 508 of the Rehabilitation Act 2005, requires access to the Federal government's electronic and information technology. The law applies to all Federal agencies when they develop, procure, maintain, or

use electronic and information technology. Federal agencies must ensure that this technology is accessible to employees and the public (OIT, 2005).

As the Resna Technical Assistance Project indicates, the law directs the United States Access Board to develop access standards for the Federal procurement regulations (Resna, 2005). The guidelines are available from the Access Board's Web site and details about the application and practice of this law are available at the U.S. Department of Justice Section 508 homepage.

The scope of Section 508 is limited to the federal sector and does not apply to the private sector, nor does Section 508 impose requirements on the recipients of federal funds. However, the Department of Education interprets the Assistive Technology Act (AT Act), to require states receiving assistance under the AT Act State Grant program to comply with Section 508, including the Access Board's standards (USAB, 2005). The Department of Education is the agency responsible for administering the AT Act, and plans to issue guidance to explain how the proposed standards apply to the states for purposes of the AT Act. So, while Section 508 on its face is limited to the federal sector, recipients of federal funds under the AT Act must also comply with Section 508 (DOJ, 2005).

The best part of Section 508 is that it promotes accessibility over accommodation. "Accessibility is proactive, whereas accommodation is reactive" explains Baquis (2002, ¶ 3). For example, under theory of accommodation an agency might wait for hard of hearing people to assert their need for a telephone amplifier. However, under Section 508 accessibility requirements, a Federal agency that purchases a new phone system must provide telephone

amplification at each phone station (Barquis, 2002). Bix (2002) suggests the barrier is removed in advance, so that future employees or guests will have accommodations without making special requests.

Web Content Accessibility Guidelines 1.0: An Overview

The World Wide Web Consortium (W3C) leads what is perhaps the most comprehensive web accessibility standards initiative (Chisholm, et al., 1999). The Web Accessibility Initiative (WAI) was formed by the World Wide Web Consortium (W3C) in order to bring accessibility considerations into the technology development of the Web Consortium and to determine guidelines for accessible technology including web authoring and user agents (browsers). As Tim Berners-Lee, the inventor of the web, and the Director of the W3C put it, "the power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect"(Thatcher, 2005, ¶ 4). The first version of the authoring guidelines, the Web Content Accessibility Guidelines 1.0, became a W3C Recommendation on May 5, 1999 (WC3.org, 2005).

The W3C's Web Content Accessibility Guidelines (WCAG) were the first major effort to establish guidelines for design and to ensure accessibility. This standard consists of 14 guidelines, plus a total of 65 checkpoints that provide implementation details for the guidelines (Thatcher, 2005). The 65 checkpoints are assigned Priority levels 1 through 3, with Priority 1 checkpoints the most critical for accessibility (WC3.org, 2005). The Section 508 standards are based on the WCAG guidelines, but they are not identical to the WCAG Priority 1 checkpoints (Thompson, Burgstahler, & Comden, 2003).

Based in part on the WCAG guidelines as well as Section 508 and its resultant standards for technology accessibility, postsecondary institutions are becoming increasingly aware of their legal obligations to provide access to programs and services offered on the Internet. Consequently, this has led to an increased effort among higher education entities to address their web accessibility problems (Friend, Judy, & Reilly, 2002).

Although Section 508 directly applies to federal agencies, many questions and issues have been raised regarding its applicability to other entities, including public postsecondary institutions.

Thompson, et al., (2003) found the following:

> some public postsecondary institutions (e.g., California Community Colleges Chancellor's Office, 2005) consider the Section 508 regulations applicable to their institutions while other institutions do not. Some institutions have adopted the standard voluntarily. Regardless, the accessibility standards developed for the federal government can serve as one model as educational institutions develop their own guidelines for the design, purchase, and use of accessible websites and other information resources (¶ 9).

For example, some campuses are developing Web accessibility policies, which reside at various levels within the institutional policy structure. Several campuses are integrating web accessibility into existing mainstream web and or information technology (IT) policies (Wheaton & Granello, 2003).

Other institutions are providing specialized training on web accessibility to faculty and staff who design Web pages; some campuses are integrating accessibility training into their existing

mainstream training options; some are doing both (Hudson, Weakley, & Firminger, 2005). Still other institutions are using automated tools to evaluate the accessibility of Web content; some perform these tests only when requested by faculty, staff, or students; others are systematically doing so, using software that spiders their entire Web server (Thompson, et al., 2003). It is important to remember that Web sites are just one part of the accessibility question faced by individuals with disabilities (Ellison, 2004). Ellison argues, "web sites often serve as portals to additional information services such as databases and e-learning sites that provide Web formatted information. Making sure Web sites are accessible is an important step, but it is just a first step in ensuring access to digital information for all people" (Ellison, 2004, ¶ 5). Foley (2003) explains, "the effort to promote and create accessible web pages can also be seen as part of a larger trend within the university to move instruction to the web" (¶ 6).

Questions concerning library access, distance learning, web accessibility, and student operated and managed programs and services are generating complex substantive compliance questions for postsecondary institutions. As a result, institutions are finding it necessary to revisit the subject of general program accessibility and the attendant compliance issues (Heyward, 2001). For postsecondary institutions, "the obligation to provide program access is a continuing obligation and demands more than passive compliance" (Heyward, 2001, p. 136).

Web Site Credibility and Usability

Maintaining accurate, relevant, and error-free Web content is critical because the Web site is a direct reflection of either the individual or the organization. This is very important regardless of whether the site is a personal site a retail site or educational site.

When visiting Web site users enjoy being inundated with robust content and easy navigation. What is meant by robust content is content that is current, complete, and credible. This is especially important when research is involved. Users need to be able to use, or move within a Web site with ease and not to have to look for something or get lost linking off to some unknown and irrelevant site. Users expect all links within a site to work and be accurate; they want to be able to trust the site.

Nielsen (1999a) reports that the Web is turning into a low-trust society, and as long as the main business models rely on advertising and eyeball herding, the situation will only get worse. The key finding is that trust is a long term proposition that builds slowly as people use a Web site, get good results, and do not feel let down or cheated (Opitz, Savenye, & Rowland, 2003). In other words, true trust comes from a company's actual behavior towards customers experienced over an extended set of encounters. It is hard to build and easy to lose. Nielsen (2001) explains "single violation of trust can destroy years of slowly accumulated credibility" (¶3). This is why it is important to have contingency plans in effect to immediately mitigate any trust reducing blunders or scandals (Nielsen, 1999b).

Fogg (2003b), from the Stanford University Web Credibility Project has developed a theory describing how people assess the credibility of Web sites. The theory is called Prominence Interpretation Theory. It grew out of quantitative research on Web credibility by Stanford's Persuasive Technology Lab. The research included over 6,500 participants in a variety of studies. This theory proposes that users notice and interpret various web site elements to arrive at an overall credibility assessment.

Prominence Interpretation Theory posits that two things happen when people assess credibility online 1) the user notices something (prominence), and, 2) the user makes a judgment about it (interpretation). If one or the other does not happen, then there is no credibility assessment (Fogg, 2003a).

According to Fogg (2003a) the first component in the theory is prominence. In this context, prominence is the likelihood that a Web site element will be noticed or perceived. At least five factors affect prominence:

1. Involvement of the user (e.g., the motivation and ability to scrutinize Web site content),
2. Topic of the Web site (e.g., news, entertainment),
3. Task of the user (e.g., seeking information, seeking amusement, making a transaction),
4. Experience of the user (e.g., novice vs. expert in regard to subject matter or Web conventions),
5. Individual differences (e.g., a person's need for cognition, learning style, or literacy level).

Fogg (2003a) explains "the most dominant factor affecting prominence may be user involvement" (¶5). Zarcadoolas, Blanco, Boyer, & Pleasant (2002) report that, for example, when a user goes to a Web site with a high level of motivation (e.g., seeking an answer to a critical health problem), he or she will "notice more things about the Web site" (¶ 3).

Furthermore, according to Fogg (2003a), the second component of the theory is interpretation. In this context interpretation "is a person's judgment about an element under examination" (¶ 4). In other words, the interpretation component is the user's evaluation of a

Web site element, good or bad. For example, a user may interpret a broken link on a web page as a sign that the site has been neglected, or that the site was not carefully created in the first place. In either case, the broken link will contribute to a lower credibility perception of the site. Various factors affect interpretation:

1. Assumptions in a user's mind (i.e., culture, past experiences, heuristics, and so on),
2. Skill/knowledge of a user (e.g., user's level of competency in the site's subject matter),
3. Context (e.g., the user's environment, user expectations, situational norms, and so on).

Users do not interpret identical Web site elements in the same way in the interpretation component. Finally, Prominence Interpretation Theory "breaks new theoretical ground and creates a foundation for enhanced understanding of online credibility" (Fogg, 2003a, ¶8).

There is no regulatory body monitoring the accuracy of information provided on the Internet so, the task of assessing the validity of web sites rests in the hands of consumers. The Stanford Guidelines for Web Credibility are a set of ten guidelines that are based on three years of research that included over 4,500 people. Armed with this information, users are equipped to evaluate a web site in a logical and critical manner.

Knowing your audience and knowing how to design a Web site according to the intended purpose of the user allows the site to accomplish its overall purpose. Accessible Web design provides benefits to those beyond the community using assistive technology. It provides benefit to those users with text-based browsers, low-end processors, slow modem connections, or users who do not have state-of-the-art computer equipment (Roberts, 2004). It also allows for easier access to the Internet via technologies such as internet enabled phones or personal digital assistants (Section 508 of the Rehabilitation Act, 2005). As Neilson (2005) points out in order to

improve a web site for users with disabilities, "remember the real goal: to help them better use the site" (¶3). Accessibility is a necessary, but not nearly a sufficient objective. Then main focus should be on the site's usability for disabled users, with an emphasis on how well the design helps them accomplish typical tasks (Neilson, 2005). Henry & Grossnickle (2004) report that "with current web design practices, users without disabilities experience three times higher usability than users who are blind or have low vision" (¶ 5).

Usability guidelines can substantially improve the matter by making Web sites and Intranets support task performance for users with disabilities (Friend et al., 2002). This is especially important for people with disabilities because, as Bohman (2003) suggests "usability evaluation techniques can assess usable accessibility to ensure that implementation of accessibility solutions are actually usable by people with disabilities" (¶ 5).

Web Site Accessibility

What makes a Web site accessible? Letourneau (2003) provides an excellent definition: "Anyone using any kind of Web browsing technology must be able to visit any site and get a full and complete understanding of the information contained there, as well as have the full and complete ability to interact with the site" (¶ 2).

Technology has presented many opportunities for users with and without disabilities to both learn about and interact with the rest of their world and accessibility to web content is key for the millions of individuals who experience some type of physical or mental disability. The World Health Organization estimates that around 600 million people in the world experience disabilities of various types and degrees. This means that 25% of the world's population is

affected, on a daily basis, by some type of disability, which affects entire families and not just the individual (WHO, 2005).

The U.S. Census Bureau (2000) has identified 54 million people live daily with some type of functional or physical limitation. Foley (2003) explains "the goal of accessibility standards is to help make the Web more accessible for people with disabilities (p. 25). This includes individuals with visual disabilities, hearing disabilities, physical disabilities and cognitive or neurological disabilities. Accessibility standards help Web designers identify and address accessibility issues (Thatcher, 2005).

Coombs (2002) notes that key issues in addressing the challenge of Web accessibility for people with disabilities, including tools for Web authoring, repairing, and accessibility validation, are found both in the Section 508 Standards from the Federal Access Board, and the World Wide Web Consortium's Web Accessibility Initiative Guidelines.

The WCAG guidelines explain how to make Web content accessible to people with disabilities. As previously stated, the guidelines are intended for all Web content developers and for developers of authoring tools. The primary goal of these guidelines is to promote accessibility (WC3, 2005). However, following them will also make Web content more available to all users, whatever user agent they are using (e.g., desktop browser, voice browser, mobile phone, automobile-based personal computer, etc.) or constraints they may be operating under (e.g., noisy surroundings, under or over illuminated rooms, or in a hands-free environment, etc.) (Ellison, 2004). Following these guidelines will also help people find information on the Web more quickly. These guidelines do not discourage content developers from using images,

video, etc., but rather explain how to make multimedia content more accessible to a wide audience (WC3, 2005).

Information technology, particularly the Internet plays an increasingly integral role in higher education for delivery of academic, administrative, and student services. Many of these services are delivered in a way that is inaccessible to people with disabilities (Schmetzke, 2002b). The inaccessibility of campus Web pages is especially significant because of the increasing importance of Web resources for college studies and the increasing numbers of people with disabilities who are attending postsecondary institutions (Guthrie, 2000; Friend et al., 2002; Schmetzke, 2001b).

Previous Studies in Web Site Accessibility

Many researchers have evaluated the accessibility of various types of Web sites. An excellent source for Web page accessibility studies and a listing of resources is available at the Web Accessibility Survey site maintained by Axel Schmetzke at the University of Wisconsin.

According to Thompson, et al., (2003) many published studies have compared the accessibility of select web pages at institutions of higher education. Axel Schmetzke has conducted several studies on the accessibility of web pages. In one of his earlier studies, "Web Accessibility at University Libraries and Library Schools," he evaluated the homepages of the 24 highest ranked schools of library and information science in the United States, based on rankings listed in *U.S. News and World Report,* as well as the main library page for universities associated with these ranked schools. Using Bobby, a web accessibility validator, Schmetzke determined

"only 23 percent of the library schools and 59 percent of the main library pages were accessible," (Schmetzke, 2001a, ¶ 4).

Jackson-Sandborn and Odess-Harnish (2001) evaluated the home pages of the 100 most visited sites in several categories, including colleges. Rowland (2000) reviewed a random sample of 400 U.S. prominent colleges, universities, and online learning institutions. A follow-up study by Walden, Rowland, & Bohman (2000) studied a similar sample of 518 U.S. institutions. Opitz, Savenye, & Rowland (2003) evaluated the Department of Education and corresponding special education home pages for each state in the United States.

Guthrie (2000) in her study, "Making the World Wide Web Accessible to All Students," examined the academic home pages of 80 colleges of communication and schools of journalism in the United States and Canada. Using Bobby to evaluate the sites, she found that "63 did not meet the criteria for accessibility" (Guthrie, 2000, p. 19).

Each of these studies used the web accessibility evaluation tool Bobby™, developed originally by the Center for Applied Special Technology (CAST) and now owned by Watchfire (Thompson, et al., 2003). Bobby automatically evaluates the accessibility of Web pages on a number of objective measures. However, many of the authors noted above report the shortcomings of this tool and of automated evaluation tools in general. As the World Wide Web Consortium (W3C) points out, "some of the Web content accessibility checkpoints cannot be checked successfully by software algorithms alone. There will still be a dependence on the user's ability to exercise human judgment to determine conformance to the guidelines" (¶ 5). Foley (2003) suggests, Bobby might well be able to check if an ALT attribute is provided for a graphic element, but it cannot tell if the text will be useful to a person who is blind and using

speech or Braille output technology. In addition, current automated tools were originally developed for HTML and are unable to handle the increasing variety of techniques currently used to develop Web pages.

Curb cuts were first instituted for accessibility when the Americans with Disabilities Act (ADA) in 1990 mandated that physical, public locations be accessible for any user (DOJ, 2005). City streets with curbs had to be cut in spots where wheelchair users could move along sidewalks without risking harm to themselves. Roberts (2004) uses the metaphor of the curb cut to explain inaccessible web design. He explains, "a common misapplication of the curb cut is one that leads diagonally to the opposite curb. Accessibility for Web sites and electronic media faces the same sorts of qualitative challenges: the mere presence of a curb cut does not mean we have made the content fully accessible" (¶ 4).

Cognitive disabilities present an altogether distinct problem for web content developers. Hudson, Weakley, and Firminger (2005) examine the types of problems visitors may encounter when using the Web, with insightful and practical suggestions on how to develop Web sites that are inclusive for people with cognitive impairments and learning difficulties.

Findings by Hudson, Weakley, and Firminger (2005) indicate that the "largest disability group in our community are those with cognitive disabilities and learning difficulties" (¶ 7). However, these individuals are most often the people who are forgotten about when it comes to website accessibility.

Moreover, the labels, cognitive disabilities and learning difficulties, appear to encompass such a broad range of conditions that Web developers often find it difficult to identify or address the specific needs of the individuals or groups they are used to describe (Hudson et al., 2005).

CHAPTER III

Method

This study includes a population of the private and public four year and graduate colleges and universities in the state of Tennessee. I selected 47 colleges and universities through a Google search to represent higher education as a category. Choosing higher educational institutions from Tennessee assured that the sample was of a group of institutions that were homogenous regarding key characteristics.

The goal of this analysis is to primarily gauge Web accessibility on one selected set of data. Since the colleges and universities in this sample host voluminous quantities of Web pages, this analysis covers only the homepages of Tennessee's colleges and universities and not any layer of pages linked directly to them. The importance of the homepages is that they function as pathways to the other Web-based resources of the institutions, and they also serve as a recruiting tool for prospective students.

The homepage for each of the 47 colleges and universities was evaluated to determine if it met the Web Content Accessibility Guidelines (WCAG) created by the World Wide Web Consortium. Although preliminary research was carried out prior to the evaluation of these homepages, the main evaluation was completed on Friday November 18, 2005, and can be verified by hard copy data saved from the evaluations.

These guidelines (Table 3.1) explain how to make Web content accessible to people with disabilities. The guidelines are intended for all Web content developers (page authors and site designers) and for developers of authoring tools. The primary goal of these guidelines is to promote accessibility.

Table 3.1
W3C Web Content Accessibility Guidelines 1.0

Guideline	Description
1	Provide equivalent alternatives to auditory and visual content.
2	Ensure that text and graphics are understandable when viewed without color.
3	Use markup and style sheets and do so properly.
4	Clarify natural language usage Use markup that facilitates pronunciation or interpretation of abbreviated or foreign text.
5	Create tables that transform gracefully. Ensure that tables have necessary markup to be transformed by accessible browsers and other user agents.
6	Ensure that pages featuring new technologies transform gracefully. Ensure that pages are accessible even when newer technologies are not supported or are turned off.
7	Ensure user control of time-sensitive content changes. Ensure that moving, blinking, scrolling, or auto-updating objects or pages may be paused or stopped.
8	Ensure direct accessibility of embedded user interfaces.
9	Design for device-independence.
10	Use interim solutions. Use interim accessibility solutions so that assistive technologies and older browsers will operate correctly.
11	Use W3C technologies (according to specification) and follow accessibility guidelines.
12	Provide context and orientation information

Source: Web Content Accessibility Guidelines 1.0. Retrieved September 16, 2005 from http://www.w3.org/TR/WCAG.

Table 3.1
W3C Web Content Accessibility Guidelines 1.0
(continued)

Guideline	Description
13	Provide clear and consistent navigation mechanisms.
14	Ensure that documents are clear and simple so they may be more easily understood.

Source: Web Content Accessibility Guidelines 1.0. Retrieved September 16, 2005 from http://www.w3.org/TR/WCAG.

In order to gauge the accessibility of these homepages, data were recovered based on the three levels of accessibility derived from the priority level checkpoints.

Priority 1 Level of Accessibility

Table 3.2
Priority 1 Level of Accessibility Checkpoints

Errors	Description
1.1	If an image conveys important information beyond what is in its alternative text, provide an extended description.
Warnings	**Description**
2.1	If you use color to convey information, make sure the information is also represented another way.
4.1	Identify any changes in the document's language.
5.1	If this is a data table (not used for layout only), identify headers for the table rows and columns.

Source: W3C: techniques for accessibility evaluation and repair tools. Retrieved September 19, 2005 from http://www.w3.org/TR/AERT.

Table 3.2
Priority 1 Level of Accessibility Checkpoints
(continued)

Warnings	Description
5.2	If a table has two or more rows or columns that serve as headers, use structural markup to identify their hierarchy and relationship.
6.1	If style sheets are ignored or unsupported, ensure that pages are still readable and usable.
6.3	Provide alternative content for each SCRIPT that conveys information or functionality.
6.3	Make sure pages are still usable if programmatic objects do not function.
7.1	Make sure that the page does not cause the screen to flicker rapidly.
8.1	Provide accessible alternatives to the information in scripts, applets, or objects.
14.1	Use the simplest and most straightforward language that is possible.

Source: W3C: techniques for accessibility evaluation and repair tools. Retrieved September 19, 2005 from http://www.w3.org/TR/AERT.

Based on the WCAG created by W3C, a Web content developer **must** satisfy guidelines at the Priority 1 Checkpoint. Otherwise, one or more groups will find it impossible to access information in the document.

Each checkpoint has a priority level assigned by the Working Group based on the checkpoint's impact on accessibility (Chisholm, Vanderheiden, & Jacobs, 1999). Satisfying the Priority 1 checkpoint is a basic requirement for some groups to be able to use Web documents.

Priority 2 Level of Accessibility

Satisfying the checkpoints of Priority 2 is not a requirement, but will significantly improve the ability of all users to view Web content. According to the WCAG created by W3C, a Web content developer **should** satisfy this checkpoint.

Satisfying this checkpoint will remove significant barriers to accessing Web documents. Otherwise, one or more groups will find it difficult to access information in the document (Chisholm, et, al., 1999).

Table 3.3
Priority 2 Checkpoints

Errors	Description
3.4	Use relative sizing and positioning, rather than absolute.
9.3	Make sure event handlers do not require use of a mouse.
12.4	Explicitly associate form controls and their labels with the LABEL element.
13.1	Create link phrases that make sense when read out of context.

Warnings	Description
2.2	Check that the foreground and background colors contrast sufficiently with each other.
3.1	Where it's possible to mark up content instead of using images, use a markup language.
3.2	Make sure your document validates to formal published grammars.

Source: W3C: techniques for accessibility evaluation and repair tools. Retrieved September 19, 2005 from http://www.w3.org/TR/AERT.

Table 3.3
Priority 2 Checkpoints
(continued)

Warnings	Description
3.7	Make sure BLOCKQUOTE is used only for quotations, not indentation.
5.3	Avoid using tables to format text documents in columns unless the table can be linearized.
5.5	If this is a data table (not used for layout only), provide a caption.

Errors	Description
6.4	If objects use event handlers, make sure they do not require use of a mouse.
7.2	If this .gif image is animated, make sure it does not contain fast or distracting motion.
9.2	Make sure that all elements that have their own interface are operable without a mouse.
10.1	If scripts create pop-up windows or change the active window, make sure that the user is aware this is happening.
10.2	Make sure that labels of all form controls are properly placed.
11.1	Use the latest technology specification available whenever possible.
11.2	Avoid use of obsolete language features if possible.
6.4	If objects use event handlers, make sure they do not require use of a mouse.
7.2	If this .gif image is animated, make sure it does not contain fast or distracting motion.
9.2	Make sure that all elements that have their own interface are operable without a mouse.
10.1	If scripts create pop-up windows or change the active window, make sure that the user is aware this is happening.

Source: W3C: techniques for accessibility evaluation and repair tools. Retrieved September 19, 2005 from http://www.w3.org/TR/AERT.

Table 3.3
Priority 2 Checkpoints
(continued)

Errors	Description
10.2	Make sure that labels of all form controls are properly placed.
11.1	Use the latest technology specification available whenever possible.
11.2	Avoid use of obsolete language features if possible.
12.3	Consider grouping long lists of selections into a hierarchy.
12.3	Group related elements when possible.
13.1	Make sure that all link phrases make sense when read out of context.
13.1	Add a descriptive title to links when needed.
13.3	Provide the user with a site map or table of contents, a description of the general layout of the site, the access features used, and instructions on how to use them.
13.4	Provide a clear, consistent navigation structure.

Source: W3C: Techniques for accessibility evaluation and repair tools. Retrieved September 19, 2005, from http://www.w3.org/TR/AERT.

Priority 3 Level of Accessibility

On this level of accessibility Web, content developers **may** address this checkpoint; otherwise, one or more groups will find it somewhat difficult to access information in the document (Chisholm, et, al., 1999). Level 3 will improve accessibility.

Table 3.4
Priority 3 Checkpoints

Errors	Description
4.3	Identify the language of the text.
5.5	Provide a summary for tables.
10.5	Separate adjacent links with more than white space.
Warnings	**Description**
4.2	Use the ABBR and ACRONYM elements to denote and expand any abbreviations and acronyms that are present.
9.4	Consider specifying a logical tab order among form controls, links, and objects.
9.5	Consider adding keyboard shortcuts to frequently used links.
9.5	Consider furnishing keyboard shortcuts for form elements.
11.3	Allow users to customize their experience of the web page.
13.5	Provide navigation bars for easy access to the navigation structure.
13.7	If there is a search feature, provide different types of searches for different skill levels and preferences.
13.8	Provide distinguishing information at the beginning of headings, paragraphs, lists, etc.
13.9	If this document is part of a collection, provide metadata that identifies this document's location in the collection.
14.3	Use a consistent style of presentation between pages.

Source: W3C: techniques for accessibility evaluation and repair tools. Retrieved September 19, 2005 from http://www.w3.org/TR/AERT.

These W3C guidelines and specifications for Web accessibility are developed in an open, industry consensus process and include built-in accessibility features and specifications that undergo early review to ensure that accessibility issues are considered during the design phase and move toward conformance (Chisholm, et al., 1999).

Conformance being defined by the W3C as Conformance Level A: all Priority 1 checkpoints are satisfied; Conformance Level Double-A: all Priority 1 and 2 checkpoints are satisfied; Conformance Level Triple-A: all Priority 1, 2, and 3 checkpoints are satisfied (W3C, 2005).

Implementation of these guidelines helps content developers on the front end of design instead of designing for accessibility issues on the back end of project completion.

Evaluation Tool

Based on these three levels of accessibility, the Web accessibility of each institution's homepage was evaluated using the free version of WebXact 5.0, formerly Bobby™ and now owned by Watchfire®.

WebXact is a web accessibility desktop testing tool designed to help expose barriers to accessibility and encourage compliance with existing accessibility guidelines, including Section 508 of the US Rehabilitation Act and the W3C's Web Content Accessibility Guidelines (WCAG). WebXact can be accessed at http://webxact.watchfire.com. The downloadable version of WebXact 5.0, which runs as an application on a personal computer, is capable of testing larger sets of Web pages and even an entire site.

WebXact uses an automated program to review the HTML code of a Web page to look for common accessibility errors, based on 16 checkpoints derived from Section 508 or WCAG guidelines depending on which option the user selects (Ellison, 2004). For each page checked, WebXact provides information pertaining to the type, number, and location of accessibility errors, both minor and major ones. It also issues a summary report for each set of Web pages. Web pages that contain any major (high-priority) error do not receive WebXact's approval (Schmetzke, 2002a).

If the automated check does not find errors based on these 16 areas, a Bobby Approved icon is displayed. If the automated program does find an error, a not approved icon is displayed and the report lists the lines of HTML code with associated errors and links to descriptions of the errors.

Findings suggest that if the homepages of the educational institutions have not achieved WebXact approval, then one may consider it unlikely that information is being communicated effectively to people with disabilities who try to access these educational Web sites to retrieve important information. Additionally, since accessibility data derived from the homepages can be used to gauge the level of awareness in these organizations, if it turns out that the institutions that provide leadership in secondary education do not put up accessible Web sites, one must assume that there is either a lack of awareness about the issue or a lack of recognition concerning its importance.

CHAPTER IV

Results

The results of this content analysis reveal major accessibility problems (referred to as Priority 1 errors by WebXact) associated with access to the 47 Tennessee college and university homepages that were evaluated.

Of the 47 homepages evaluated, WebXact found 17.02% of the homepages evaluated to be free of major accessibility errors and in compliance with the WCAG guidelines outlined in the checkpoints of Priority 1. As stated earlier, if this priority level is not achieved then one or more groups will find it impossible to access information on the web. Satisfying this checkpoint is a basic requirement for some groups to be able to use Web documents.

The average number of Priority 1 accessibility errors per page was very similar for all of the homepages evaluated. The homepages contained 1.4 major accessibility problems per page; with the majority of accessibility errors detected by the automated WebXact evaluation tool being images without alternative text.

This being the case, of the barriers found in these homepages results from the designers' neglect to provide alternative text for images. This finding is relevant because this type of error is easily fixed. It certainly would not require a major re-design of Web pages, or an advanced skill level in html, to insert the alternative text tags.

As demonstrated in Table 4.1, eight of the 47 institutions evaluated managed to design their Web site homepages to meet the accessibility guidelines of Priority Level 1 thereby achieving Conformance Level A: where all Priority 1 checkpoints are satisfied.

Table 4.1: Listing of Colleges and Universities Satisfying or Not Satisfying Priority 1 Checkpoints

University Homepage	Satisfied Priority 1	Not Satisfied Priority 1
Aquinas College http://www.aquinas-tn.edu		X
Austin Peay State University http://www.apsu.edu		X
Baptist Memorial College of Health Sciences http://www. bchs.edu		X
Belmont University http://www. belmont.edu	X	
Bethel College http://www.bethel-college.edu		X
Bryan College http://www.bryan.edu		X
Carson-Newman College http://www.cn.edu	X	
Christian Brothers University http://www.cbu.edu		X
Church of God Theological Seminary http://www.cogts.edu		X
Crichton College http://www.crichton.edu		X
Cumberland University http://www.cumberland.edu		X
East Tennessee State University http://www.etsu.edu		X
Fisk University http://www.fisk.edu		X
Freed-Hardeman University http://www.fhu.edu	X	
Johnson Bible College http://www.jbc.edu		X
King College http://www.king.edu		X
Knoxville College http://www.knoxvillecollege.edu		X
Lambuth University http://www.lambuth.edu		X
Lane College http://www.lanecollege.edu		X
Lee University http://www.leeuniversity.edu		X
LeMoyne-Owen College http://www.loc.edu		X
Lincoln Memorial University http://www.lmunet.edu		X

Table 4.1: Listing of Colleges and Universities Satisfying or Not Satisfying Priority 1 Checkpoints (continued)

University Homepage	Satisfied Priority 1	Not Satisfied Priority 1
Lipscomb University http://www.lipscomb.edu		X
Martin Methodist College http://www.martinmethodist.edu		X
Maryville College http://www.maryvillecollege.edu		X
Meharry Medical College http://www.mmc.edu		X
Memphis College of Art http://www.mca.edu		X
Middle Tennessee State University http://www.mtsu.edu		X
Milligan College http://www.milligan.edu		X
Rhodes College http://www.rhodes.edu		X
South College http://www.southcollegetn.edu		X
Southern Adventist University http://www.southern.edu		X
Southern College of Optometry http://www.sco.edu		X
Tennessee State University http://www.tnstate.edu		X
Tennessee Technological University http://www.tntech.edu	X	
Tennessee Temple University http://www.tntemple.edu		X
Tennessee Wesleyan College http://www.twcnet.edu		X
Trevecca Nazarene University http://www.trevecca.edu		X
Tusculum College http://www.tusculum.edu		X
Union University http://www.uu.edu		X
University of Memphis http://www.memphis.edu	X	
University of Tennessee at Chattanooga http://www.utc.edu		X
University of Tennessee at Knoxville http://www.utk.edu	X	

Table 4.1: Listing of Colleges and Universities Satisfying or Not Satisfying Priority 1 Checkpoints (continued)

University Homepage	Satisfied Priority 1	Not Satisfied Priority 1
University of Tennessee at Martin http://www.utm.edu		X
University of Tennessee at Memphis http://www.utmem.edu	X	
University of the South http://www.sewanee.edu		X
Vanderbilt University http://www.vanderbilt.edu	X	

This analysis found 4.26% of Tennessee's college and university homepages to have satisfied the checkpoints listed under Priority 2. The checkpoints under Priority 2 clearly indicate that a Web content developer should satisfy this checkpoint. If not satisfied, then one or more groups will find it difficult to access information in the document (Chisholm, et, al., 1999).

Table 4.2: Listing of Colleges and Universities Satisfying or Not Satisfying Priority 2 Checkpoints

University Homepage	Satisfied Priority 2	Not Satisfied Priority 2
Aquinas College http://www.aquinas-tn.edu		X
Austin Peay State University http://www.apsu.edu		X
Baptist Memorial College of Health Sciences http://www. bchs.edu		X
Belmont University http://www. belmont.edu		X
Bethel College http://www.bethel-college.edu		X
Bryan College http://www.bryan.edu		X
Carson-Newman College http://www.cn.edu	X	
Christian Brothers University http://www.cbu.edu		X

Table 4.2: Listing of Colleges and Universities Satisfying or Not Satisfying Priority 2 Checkpoints (continued)

University Homepage	Satisfied Priority 2	Not Satisfied Priority 2
Christian Brothers University http://www.cbu.edu		X
Church of God Theological Seminary http://www.cogts.edu	X	
Crichton College http://www.crichton.edu		X
Cumberland University http://www.cumberland.edu		X
East Tennessee State University http://www.etsu.edu		X
Fisk University http://www.fisk.edu		X
Freed-Hardeman University http://www.fhu.edu		X
Johnson Bible College http://www.jbc.edu		X
King College http://www.king.edu		X
Knoxville College http://www.knoxvillecollege.edu		X
Lambuth University http://www.lambuth.edu		X
Lane College http://www.lanecollege.edu		X
Lee University http://www.leeuniversity.edu		X
LeMoyne-Owen College http://www.loc.edu		X
Lincoln Memorial University http://www.lmunet.edu		X
Lipscomb University http://www.lipscomb.edu		X
Martin Methodist College http://www.martinmethodist.edu		X
Maryville College http://www.maryvillecollege.edu		X
Meharry Medical College http://www.mmc.edu		X
Memphis College of Art http://www.mca.edu		X
Middle Tennessee State University http://www.mtsu.edu		X

Table 4.2: Listing of Colleges and Universities Satisfying or Not Satisfying Priority 2 Checkpoints (continued)

University Homepage	Satisfied Priority 2	Not Satisfied Priority 2
Milligan College http://www.milligan.edu		X
Rhodes College http://www.rhodes.edu		X
South College http://www.southcollegetn.edu		X
Southern Adventist University http://www.southern.edu		X
Southern College of Optometry http://www.sco.edu		X
Tennessee State University http://www.tnstate.edu		X
Tennessee Technological University http://www.tntech.edu		X
Tennessee Temple University http://www.tntemple.edu		X
Tennessee Wesleyan College http://www.twcnet.edu		X
Trevecca Nazarene University http://www.trevecca.edu		X
Tusculum College http://www.tusculum.edu		X
Union University http://www.uu.edu		X
University of Memphis http://www.memphis.edu		X
University of Tennessee at Chattanooga http://www.utc.edu		X
University of Tennessee at Knoxville http://www.utk.edu		X
University of Tennessee at Martin http://www.utm.edu		X
University of Tennessee at Memphis http://www.utmem.edu		X
University of the South http://www.sewanee.edu		X
Vanderbilt University http://www.vanderbilt.edu		X

Finally, as Table 4.3 indicates, 100% of the 47 Tennessee colleges and university homepages evaluated did not meet the Priority Level 3 guidelines.

Table 4.3: Listing of Colleges and Universities Satisfying or Not Satisfying Priority 3 Checkpoints

University Homepage	Satisfied Priority 3	Not Satisfied Priority 3
Aquinas College http://www.aquinas-tn.edu		X
Austin Peay State University http://www.apsu.edu		X
Baptist Memorial College of Health Sciences http://www. bchs.edu		X
Belmont University http://www. belmont.edu		X
Bethel College http://www.bethel-college.edu		X
Bryan College http://www.bryan.edu		X
Carson-Newman College http://www.cn.edu		X
Christian Brothers University http://www.cbu.edu		X
Church of God Theological Seminary http://www.cogts.edu		X
Crichton College http://www.crichton.edu		X
Cumberland University http://www.cumberland.edu		X
East Tennessee State University http://www.etsu.edu		X
Fisk University http://www.fisk.edu		X
Freed-Hardeman University http://www.fhu.edu		X
Johnson Bible College http://www.jbc.edu		X
King College http://www.king.edu		X
Knoxville College http://www.knoxvillecollege.edu		X
Lambuth University http://www.lambuth.edu		X

Table 4.3: Listing of Colleges and Universities Satisfying or Not Satisfying Priority 3 Checkpoints (continued)

University Homepage	Satisfied Priority 3	Not Satisfied Priority 3
Lane College http://www.lanecollege.edu		X
Lee University http://www.leeuniversity.edu		X
LeMoyne-Owen College http://www.loc.edu		X
Lincoln Memorial University http://www.lmunet.edu		X
Lipscomb University http://www.lipscomb.edu		X
Martin Methodist College http://www.martinmethodist.edu		X
Maryville College http://www.maryvillecollege.edu		X
Meharry Medical College http://www.mmc.edu		X
Memphis College of Art http://www.mca.edu		X
Middle Tennessee State University http://www.mtsu.edu		X
Milligan College http://www.milligan.edu		X
Rhodes College http://www.rhodes.edu		X
South College http://www.southcollegetn.edu		X
Southern Adventist University http://www.southern.edu		X
Southern College of Optometry http://www.sco.edu		X
Tennessee State University http://www.tnstate.edu		X
Tennessee Technological University http://www.tntech.edu		X
Tennessee Temple University http://www.tntemple.edu		X

Table 4.3: Listing of Colleges and Universities Satisfying or Not Satisfying Priority 3 Checkpoints (continued)

University Homepage	Satisfied Priority 3	Not Satisfied Priority 3
Tennessee Wesleyan College http://www.twcnet.edu		X
Trevecca Nazarene University http://www.trevecca.edu		X
Tusculum College http://www.tusculum.edu		X
Union University http://www.uu.edu		X
University of Memphis http://www.memphis.edu		X
University of Tennessee at Chattanooga http://www.utc.edu		X
University of Tennessee at Knoxville http://www.utk.edu		X
University of Tennessee at Martin http://www.utm.edu		X
University of Tennessee at Memphis http://www.utmem.edu		X
University of the South http://www.sewanee.edu		X
Vanderbilt University http://www.vanderbilt.edu		X

This analysis suggests one reason why there is such a high degree of inaccessibility of Tennessee college and university homepages: unawareness about the issue among those institutions who assume a leadership function. When higher education institutions, across the state of Tennessee, put up a Web site homepage that is blatantly non-compliant with the W3C/WAI's Web Content Accessibility Guidelines by failing to provide alternative text for graphical elements (a Priority 1 guideline), it is difficult to take this as anything but an indication that the leaders and trainers in the field are unaware of the need for universal design.

CHAPTER V

Discussion

This content analysis focuses only on the 47 college and university Web site homepages that were evaluated for this analysis. While the use of an automated assessment tool is a good place to begin evaluation it should not be the only tool involved in an in-depth accessibility evaluation. WebXact can identify if there is a problem with the page, or if there is something in the place that there should be something there, such as an Alt tag, but it cannot report on the quality of that Alt tag. For example, there is a graphic with the alt tag graphic that is accessible according to WebXact, but not according to a blind user with a screen reader.

Admittedly, most of the emphasis was placed on the technical compliance issues and not on the cognitive compliance issues that plague Web accessibility. We understand that people with some type of cognitive disability make up the largest population of users who access information through the Internet. Accordingly, additional research and analysis could be done to address important issues in this area. Can we find strategies that cut across the tools for accessibility to guide us in contextual accessibility design? What are the nature and characteristics of cognitively accessible design? How can we address the affective content in the message as well through these strategies? And finally, what can we do to improve cognitive accessibility for all users?

There is no substitute for the human component in an analysis. This study focused only on one level of analysis (the institutions' homepages) and three sets of criteria (the three levels of accessibility). While this is a good place to begin, additional analysis and evaluation should include surveys taken from people who experience a disability so that adequate information could be gathered in areas that are important to accessibility.

Findings of this content analysis establish that the 47 Tennessee colleges and universities reviewed currently do not meet those accessibility standards based on the WCAG's. While it is likely, to a high degree, that these 47 Tennessee college and university homepages do not reach their broader audience, these findings alone cannot claim that the 47 homepages evaluated are inaccessible to people with disabilities. However, based on these findings it is clear that the homepages do not effectively communicate with their intended audience.

Perhaps a combination of education (e.g., awareness raising articles), involvement of all academic departments and administration toward advocacy for inclusive IT policies on all levels of departmental participation, as well as research pertaining to the accessibility of Web resources will gradually shift the chaos into compliance. More education on the front end of Web design will certainly make content more accessible on the user end of the design. Hopefully, for ethical as well as economic reasons everyone will be able to experience the joy of effective communication.

Limitations of this Content Analysis

This content analysis has only evaluated the accessibility of each institutions homepage and not any additional office or departmental pages making this analysis extremely limited in its scope of investigation. While the importance of being able to easily access the homepage of an academic institution simply cannot be overstated, the fact remains that people access sites differently and perhaps could access the same Web site through another page. For example, someone with a disability could access the same university Web site through another department (e.g., Office of Disability Services) and that department could have provided users the option of

text version on their page allowing someone with a disability increased access to, ideally, the same information that is displayed on that institutions homepage.

As for relying solely on an automatic evaluation tool in order to check for accessibility compliance, understandably, this too could prove to be problematic. Since WebXact is automated it is limited in its scope and cannot guarantee that WebXact has located all errors. WebXact also lists items in the page that would require a manual check to determine if the HTML code in question may cause an accessibility problem. Sometimes these items do not represent an accessibility issue, but only an individual looking specifically at the HTML in question can determine this (Ellison, 2004).

Additionally, pages may receive false positive or false negative ratings simply because the automated tool has ignored or misinterpreted the code. Another shortcoming of automated tools is their inability to take into account the severity of an error. For example, if Site A is missing ALT tags on its spacer images and Site B is missing ALT tags on its menu buttons, both sites are rated identically, when in fact Site B clearly has the more serious accessibility problem (Thompson, et al., 2003). Consequently, as Henry and Grossnickle (2004) argue, accessibility evaluation is often limited to assessing conformance to accessibility standards. When the focus is on the technical aspects of accessibility, the human interaction aspect can be lost. For example, the focus of much of the recent accessibility work in the United States has been on meeting Section 508 standards. However, in some cases where the standard was technically met by providing an alternative, some of the products were awkward to use and some were totally unusable by people with disabilities.

While automated evaluation tools save time, nothing can replace the human factor in evaluation. As Henry (2003) points out, Web accessibility evaluation tools can increase the efficiency of evaluation by saving time and effort; however, "they cannot replace knowledgeable human evaluators; instead than thinking of tools as a substitute for human evaluation, think of tools as an aid to human evaluation" (¶3).

Message design is both explicit and subtle. Web designs send both explicit and implicit messages to the user. Some techniques, such as descriptions of graphics, make the content or message explicit; other characteristics like consistent layout send more subtle cues to the user. Cognitive accessibility focuses on making sure all users have access to the subtle message as well as the explicit and automated evaluation tools focus only on the technical aspects of the Web site and not on the cognitive aspect of the site.

Despite all of the shortcomings of this study, the use of the evaluation tool WebXact is a good evaluation tool to use: it saves time and provides a rough measure of accessibility. Furthermore, in other studies where hundreds of individual Web pages were examined and also in this analysis where only 47 individual web pages were evaluated, and a rough measure of accessibility is adequate.

Ideas for Future Research

All indications are that many, if not most institutions of higher education have developed Web policies for their campuses. However, little is known about how many of these include accessible Web guidelines. If previous research is any indication, accessible Web design guidelines or policies are, at the present, the exception rather than the rule; and those that do exist deal almost exclusively with Web pages, not online, Web-based resources in general.

If college and university Web site design is called to accountability, why not call other Web based resources into accountability as well? For example, why not evaluate the effectiveness of communication when it comes to distance education? Perhaps a great deal more research is needed evaluating the Web-based resources of college and university campuses especially the Web based instruction resources, more specifically the instructional design practices of Tennessee college and universities. Often times, a student with a disability experiencing some problem accessing learning information in an online class, and once it is discovered that the student has a disability, they are forwarded directly to the instructor. This is a classic example of not solving a problem but passing it along to someone else in another department to solve, hopefully.

More research needs to be directed to the Web-based learning environment of online degree programs in Tennessee. With the exponential growth of online learning that Tennessee has experienced, one might conclude that a great deal of the online curriculum of many Tennessee colleges and universities is lacking in various respects. Perhaps, not the depth of instruction, but the instructional design practices and accessibility issues within any given online curriculum are possibly seriously out of step with what is going on within the student body. Certain departments should work together in order to facilitate the advancement of instructional design techniques and accessibility issues. Instead, it seems as if each department works independently and totally self absorbed in its own issues. Research should be conducted to uncover why it is that certain academic departments seem to operate so segregated and isolated from one another and then some type of policy developed in order to facilitate the accessibility of Internet based resources and instruction and make recommendations

or improving the accessibility to the online environment. With the capabilities of the Internet always transforming and the imagination of educators always increasing, the idea of true and complete Web accessibility will continue to evolve into acceptance.

References

Baquis, D. (2002). Why is section 508 important? In Jack M. Winters, Charles J. Robinson, Richard C. Simpson, & Gregg C. Vanderheiden (Eds.), *Emerging and accessible telecommunications, information and healthcare technologies.* Arlington, VA: Resna Press.

Bix, L. (2002). The elements of text and message design and their impact on message legibility: A literature review. *Journal of Design Communication.* Retrieved September 25, 2005, from http://scholar.lib.vt.edu/ejournals/JDC/Spring-2002/bix.html

Bohman, P. (2003). Introduction to web accessibility. Retrieved September 25, 2005, from http://www.webaim.org/intro/

Brajnik, G. (2001). Toward valid quality models for websites. Paper presented at 7th Conference on Human Factors and the Web, Madison, WI. Retrieved November 5, 2005, from http://www.dimi.uniud.it/~giorgio/papers/hfweb01.html

California Community Colleges Chancellor's Office. (2005). New federal regulations implementing section 508 of the Rehabilitation Act of 1973. Retrieved November 26, 2005, from http://www.htctu.net/publications/guidelines/distance_ed/disted.htm

Cavanaugh, T. (2002). The need for assistive technology in educational technology. *Educational Technology Review*, 10 (1). Retrieved September 25, 2005, from http://www.aace.org/pubs/etr/issue2/cavanaugh.cfm.

Friend, J. G., Judy, B., & Reilly, V. (2002). *ADA coordinator's guide to campus compliance.* Horsham, PA: LRP Publications.

Garfinkel, S., & Cranor, L. F. (2002). P3P: Privacy primer. Retrieved November 18, 2005, from http://www.oreillynet.com/pub/a/network/excerpt/p3p.html

Guthrie, S. A. (2000). Making the world wide web accessible to all students. *Journal of Mass Communication Educator*, *55*, 14-23.

Henry, S. L., & Grossnickle, M. (2004). *Accessibility in the user-centered design process.* Georgia Tech Research Corporation. Retrieved November 16, 2005, from http://www.UIAccess.com/AccessUCD/

Heyward, S. (2001). *Graduate schools and the ADA: Developing a systemic approach to disability compliance.* Horsham, PA: LRP Publications.

Hudson, R., Weakley, R., & Firminger, P. (2005). An accessibility frontier: Cognitive disabilities and learning difficulties. Retrieved November 11, 2005, from http://www.usability.com.au/resources/cognitive.cfm

Jackson-Sandborn, E., & Odess-Harnish, K. (2001). Web site accessibility: A study of ADA compliance. Retrieved September 19, 2005, from http://www.washington.edu/accessit/articles?199

Kaye, H. S. (2000). Computer and internet use among people with disabilities. Disability statistics report (No. 13). Washington DC: U.S. Department of Education, National Institute on Disability and Rehabilitation Research (NIDRR).

Letourneau, C. (2003). Accessible web design: A definition. Retrieved November 2, 2005, from http://www.starlingweb.com/webac.htm

Nielsen, J. (2005). Accessibility is not enough. Retrieved November 21, 2005, from http://www.useit.com/alertbox/accessibility.html

Nielsen, J. (2001). Beyond accessibility: Treating users with disabilities as people. Retrieved November 15, 2005, from http://www.useit.com/alertbox/20011111.html

Nielsen, J. (1999a). Trust or bust: Communicating trustworthiness in web design. Retrieved August 1, 2005, from http://www.useit.com/alertbox/990307.html

Nielsen, J. (1999b). Usability 101: Introduction to usability. Retrieved August 2, 2005, from http://www.useit.com/alertbox/20030825.html

Office of Information Technology. (2005). *Federal IT accessibility initiative*. Retrieved November 1, 2005, from http://www.section508.gov

Opitz, C., Savenye, W., & Rowland, C. (2003). Accessibility of State Department of Education home pages and special education pages. *Journal of Special Education Technology, 18*, 17-27.

Resna Technical Assistance Project. (2005). Retrieved November 11, 2005, from http://www.resna.org/taproject/goals/telecom/508.html

Roberts, S. (2004). Instructional design and accessibility: Cognitive curb cuts. Unpublished doctoral dissertation, University of Northern Colorado. Retrieved November 11, 2005, from http://www.aect.org/Divisions/roberts.htm

Rowland, C. (2000). Accessibility of the internet in postsecondary education: Meeting the challenge. Retrieved November 5, 2005, from http://www.webaim.org/articles/meetchallenge

Schmetzke, A. (2002a). Web page accessibility on University of Wisconsin campuses: 2002 survey data. Retrieved October 10, 2005, from http://library.uwsp.edu/aschmetz/Accessible/UW-Campuses/Survey2002/contents2002.htm

Schmetzke, A. (2002b). Web site accessibility at 56 North American universities: 2002 survey data on libraries and library schools. Retrieved October 10, 2005, from http://library.uwsp.edu/aschmetz/Accessible/nationwide/Survey2002/contents2002.htm

Section 508 of the Rehabilitation Act. (2005). Retrieved November 2, 2005, from http://www.webaim.org/coordination/law/us/508

Section 508: Summary of Section 508 Standards. (2005). Retrieved September 19, 2005, from http://www.section508.gov/index.cfm?FuseAction=Content&ID=11

Thatcher, J. (2005). Side by side WCAG vs. 508. Retrieved November 25, 2005, from http://www.jimthatcher.com/sidebyside.htm

The United States Access Board. (2005). *Section 508 of the Rehabilitation Act of 1973 (1998, amended).* Retrieved September 19, 2005, from http://www.access-board.gov/sec508/guide/act.htm

Thompson, T., Burgstahler, S., & Comden, D. (2003). Research on web accessibility in higher education. *Information Technology and Disabilities.* Retrieved October 21,

2005, from http://www.rit.edu/~easi/itd/itdv09n2/thompson.htm

U.S. Department of Justice. (DOJ). (2005). *Americans with disabilities act*. Retrieved November 1, 2005, from http://www.usdoj.gov/crt/ada/adahom1.htm

Waddell, C., & Urban, M. (2000). An overview of law and policy for IT accessibility. Retrieved November 10, 2005, from http://www.icdri.org/CynthiaW/SL508overview.html

Walden, B., Rowland, C., & Bohman, P. (2000). Year one report: Learning anytime anywhere for anyone. Unpublished report to the U.S. Department of Education, FIPSE/LAAP.

Watchfire: Bobby Worldwide. (n.d.) Retrieved November 18, 2005 from http://bobby.watchfire.com

Wheaton, J. E., & Granello, P. F. (2003). Designing web pages that are usable and accessible to all. In John W. Bloom & Garry Richard Walz (Eds.), *Cybercounseling and cyberlearning: An encore* (pp. 660-777). NC: Caps Press.

World Wide Web Consortium. Web content accessibility guidelines 1.0. Retrieved May 16, 2005, from http://www.w3.org/TR/WCAG

World Wide Web Consortium. Techniques for accessibility evaluation and repair tools. Retrieved September 19, 2005, from http://www.w3.org/TR/AERT

Zarcadoolas, C., Blanco, M., Boyer, J. F., & Pleasant, A. (2002). Unweaving the web: An exploratory study of low-literate adults' navigation skills on the world wide web. *Journal of Health Communication, 7*, 309-324.

Appendix A

The Tennessee Colleges and Universities Evaluated in this Analysis

College or University	Web Address
Aquinas College	http://www.aquinas-tn.edu
Austin Peay State University	http://www.apsu.edu
Baptist Memorial College of Health Sciences	http://www. bchs.edu
Belmont University	http://www. belmont.edu
Bethel College	http://www.bethel-college.edu
Bryan College	http://www.bryan.edu
Carson-Newman College	http://www.cn.edu
Christian Brothers University	http://www.cbu.edu
Church of God Theological Seminary	http://www.cogts.edu
Crichton College	http://www.crichton.edu
Cumberland University	http://www.cumberland.edu
East Tennessee State University	http://www.etsu.edu
Fisk University	http://www.fisk.edu
Freed-Hardeman University	http://www.fhu.edu
Johnson Bible College	http://www.jbc.edu
King College	http://www.king.edu
Knoxville College	http://www.knoxvillecollege.edu
Lambuth University	http://www.lambuth.edu

Appendix A
(continued)

College or University	Web Address
Lane College	http://www.lanecollege.edu
Lee University	http://www.leeuniversity.edu
LeMoyne-Owen College	http://www.loc.edu
Lincoln Memorial University	http://www.lmunet.edu
Lipscomb University	http://www.lipscomb.edu
Martin Methodist College	http://www.martinmethodist.edu
Maryville College	http://www.maryvillecollege.edu
Meharry Medical College	http://www.mmc.edu
Memphis College of Art	http://www.mca.edu
Middle Tennessee State University	http://www.mtsu.edu
Milligan College	http://www.milligan.edu
Rhodes College	http://www.rhodes.edu
South College	http://www.southcollegetn.edu
Southern Adventist University	http://www.southern.edu
Southern College of Optometry	http://www.sco.edu
Tennessee State University	http://www.tnstate.edu
Tennessee Technological University	http://www.tntech.edu
Tennessee Temple University	http://www.tntemple.edu

Appendix A
(continued)

College or University	Web Address
Tennessee Wesleyan College	http://www.twcnet.edu
Trevecca Nazarene University	http://www.trevecca.edu
Tusculum College	http://www.tusculum.edu
Union University	http://www.uu.edu
University of Memphis	http://www.memphis.edu
University of Tennessee at Knoxville	http://www.utk.edu
University of Tennessee at Martin	http://www.utm.edu
University of Tennessee at Memphis	http://www.utmem.edu
University of the South	http://www.sewanee.edu
Vanderbilt University	http://www.vanderbilt.edu

Appendix B

Additional Accessibility Resources

AccessIT http://www.washington.edu/accessit/index.php

AccessIT promotes the use of electronic and information technology (E&IT) for students and employees with disabilities in educational institutions at all academic levels. Their Web site features the AccessIT Knowledge Base, a searchable, growing database of questions and answers regarding accessible E&IT. It is designed for educators, policy makers, librarians, technical support staff, and students and employees with disabilities and their advocates.

Designing More Usable Web Sites http://trace.wisc.edu/world/web/

The Trace Research & Development Center is a part of the College of Engineering, University of Wisconsin-Madison. Founded in 1971, Trace has been a pioneer in the field of technology and disability.

Doctor HTML http://www2.imagiware.com/RxHTML/

Doctor HTML is a Web page analysis tool which retrieves an HTML page and reports on any problems that it finds. The primary focus of this tool is to provide a clear, easy-to-use report of information that is relevant for improving a Web page.

DO-IT at the University of Washington http://www.washington.edu/doit/

Disabilities, Opportunities, Internetworking, and Technology. DO-IT (Disabilities, Opportunities, Internetworking, and Technology) serves to increase the participation of individuals with disabilities in challenging academic programs and careers. It promotes

the use of computer and networking technologies to increase independence, productivity, and participation in education and employment.

Evaluating for Accessibility http://www.uiaccess.com/accessucd/evaluate.html

Accessibility in the User-Centered Design Process is an online book developed to assist usability professionals in incorporating accessible design practices into the user-centered design process. It is designed primarily for usability professionals who know User-Centered Design (UCD) processes and techniques, including the principles of usability testing, and have a basic understanding of accessibility. Design team managers, ergonomists, human factors professionals, advocates for product accessibility, accessibility practitioners, and marketers also benefit from the information in this book.

HTML/XHTML Accessibility Best Practices http://cita.rehab.uiuc.edu/html-best-practices/index.php.The University of Illinois at Urbana/Champaign is using a best practices model for improving the accessibility of web resources.

National Center for the Dissemination of Disability Research

http://www.ncddr.org/. Established in 1995, the NCDDR performs research, technical assistance and demonstration activities focusing on the dissemination and utilization of disability research funded by the National Institute on Disability and Rehabilitation Research (NIDRR).

National Center on Low-Incidence Disabilities http://vision.unco.edu/AccessibleDesign/

NCLID has taken the lead in developing academic courses in the area of blindness and visual impairment, deafness, and severe disabilities that can be delivered online. In so

doing, they have discovered ways to make a web site accessible without making an alternative text-only site and without making the site unattractive. This tutorial is a compilation of the techniques they have learned and used to ensure effective, efficient, appealing and accessible web pages.

The Alliance for Technology Access http://www.ataccess.org/

The Alliance for Technology Access (ATA) is a network of community-based Resource Centers, Developers, Vendors and Associates dedicated to providing information and support services to children and adults with disabilities, and increasing their use of standard, assistive, and information technologies.

Usable Information Technology: Jakob Nielsen's Website useit.com: http://www.useit.com/

Web Content Accessibility Guidelines 2.0 http://www.w3.org/TR/WCAG20/

Web Content Accessibility Guidelines 2.0 (WCAG 2.0) covers a wide range of issues and recommendations for making Web content more accessible.

Web Accessibility Initiative (WAI): Strategies, guidelines, resources to make the Web accessible to people with disabilities. http://www.w3.org/WAI/ER/existingtools.html.This is a collection of information about evaluation, repair, and transformation tools useful for Web content developers and Web users who wish to make the Web more accessible.

WebXACT http://webxact.watchfire.com/

WebXACT, formerly Bobby, is a free online service that tests single pages of web content for quality, accessibility, and privacy issues.