Assessing the Accessibility for the Blind and Visually Impaired of Texas
State Agency Web Sites

By

Kelvin L. Spencer

An Applied Research Project Research Paper
Submitted to
The Department of Political Science
Southwest Texas State University
In partial fulfillment for the
Requirements for the
Degree of Master in Public Administration
(Summer 2001)

Faculty Approval

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**Chapter 1**

**Introduction**

**Internet Use and the Digital Divide**

The information age has created much advanced technology to perform office work and store great bodies of information, allowing blind and visually impaired citizens to participate in society on their own terms.  Ideally, impaired users can perform computer jobs through workplace accommodations. In addition, the personal computer (PC) revolution can improve their lives at home.  Users can access computerized knowledge inexpensively with interfaces, allowing unguided personal investigation and free roaming limited only by curiosity.  This is possible through screen readers, speech synthesizers, and Braille output devices that help impaired users communicate with character-based computer-based systems that are limited in their communication, just like the user.

Web sites are increasingly important as way to conduct business.  Using various web sites, citizens can look up information such as bus schedules, due dates and services provided as well as pay bills, invest money and fill out applications. They can also shop, receive commercial and public product information such as warnings, recalls, specifications, etc, and they can retrieve tax forms and file, pay and make inquiries about their taxes. (Smith, Fraser, McClure, & Charles, 2000, p. 274-81).  Unfortunately, many web sites are inaccessible to certain people such as the blind and visually impaired. Looking up information on a web site that is not accessible may be impossible for large

numbers of people. As Jim Allan of the Texas School for the Blind and Visually Impaired in Austin says, "13.5 million Americans consider themselves visually impaired to some degree.  Nearly 3 million Americans are colorblind. Dyslexia affects over 40 million Americans" (Hayes, 2000, p. 033).

Disabled individuals who are prevented from accessing the same kinds of information on web sites that the general population can access become victims of the Digital Divide.  They are effectively discriminated against because they do not have the same opportunities as those without disabilities who can access the huge amounts of information available on the Internet (Smith, Fraser, McClure, & Charles, 2000, p. 274-81). Because of the Digital Divide, disabled citizens are disproportionately  denied participation in the same quality of participatory, community lifestyles as their non disabled counterparts (New Statesman, 2000).

Bellm and Zelnick discuss the difficulties facing modern disabled users. The impact of the multimedia revolution has changed, however, as technology advances to tackle the communication obstacles.  Now computers are more than character-based, keyboard interactive communicators.  They have become multifaceted machines capable of two-way sound, voice, imagery, video, and more communicative touch beyond keyboards, such as joysticks and other devices.  Unfortunately, these advancements have resulted in developers adapting the technologies to make the systems easier to use and more visually appealing. As a result good technology and improved communication for the masses has hampered even more communication for the impaired (Bellm, 1998, p.48; Zelnick, 2000, p. 90).

The Clinton presidential administration inadvertently increased the digital divide

as it initiated the creation of the Information Superhighway. Although the administration intended to narrow the divide by improving accessibility to government agencies and information, technological advances have made it worse by moving from DOS operating systems that were easily accessible to the less-accessible click and drag types of systems. Already public places include Cyberspace environments such (e.g., White House Home Page, the U.S. Patent Office and Congress) make available an enormous collection of public information available in a click-and-drag visual format. These graphical interfaces are is inaccessible to the visually impaired (Rogers, 1999, p. 15-25).

The impact of the increased use of visual interfaces is felt today when a visually impaired user cannot see the same online image of the Rose Garden, let alone know it is there. Further, it will get worse when online video files carrying news of the current events spoken directly by Cabinet members is on the web page. This information is more than just entertainment; it is societal information all citizens should be able to access (Rogers, 1999, p. 15-25).

As Rogers indicates, not addressing the needs of the disabled population is to potentially neglect 30 to 40 million people in the United States, approximately 5,000,000 of whom are visually impaired. "One in ten citizens has a disability of some type" (source) in the United States. With the aging of the U.S. population, this number is expected to increase (Rogers, 1999, p. 15-25).

To address the needs of the disabled, web sites must be developed to interface with screen readers and other assistive equipment. If designed is accessible from the start of development, disabled-friendly web sites cost little or no extra money to develop. This is because disabled users make use of all the same programming components of a site;

they only need slightly different methods (Rogers, 1999, p. 15-25).

**Research Purpose**

Aside from federal web sites, state web sites should be accessible to the visually impaired. In the fall of 2000, Eddie Solis examined the accessibility of Texas State web sites for the citizens of Texas. He found that, overall Texas State agency web sites were in compliance with accessibility guidelines issued by the state. This applied research project builds on the Solis study. The accessibility of Texas state agency web sites among the visually impaired is studied.

The research has three purposes. The first purpose is to describe the ideal characteristics of an accessible governmental informational web site for the blind/visually impaired. The second purpose is to assess web sites of Texas State Agencies using the ideal categories. Finally, the purpose is to make recommendations for improving accessibility to the blind/visually impaired of the web sites of Texas State Agency Web sites.

**<u>Barriers</u>**

Visually disabled users encounter barriers such as poorly designed web sites that use graphics, tables, frames, colors, no captions, no alt tags (alternative text: text to be viewed while an image or graphic is loading. Rolling a mouse over the image causes the text to be displayed (Searchchaser, online web site), poor font sizes and types, poor keyboard compatibility, point-and-click interfaces and no descriptions (Jobe, 1999, p. 45-

46). Other barriers include assistive software that does not interface with web sites and users who are not trained to use the software or hardware. In a time when the internet is becoming more useful and effective for most, more people than ever are affected by inadequate accessibility.  So many people are affected that more efforts must be made and important issues must be addressed.  Good web site design can provide huge digital opportunities and prevent the digital divide.  "In the wireless movement, displays for Web sites are going to have to be simplified," Curtis Chong, director of technology for the National Federation for the Blind, says.  "Why should I have to learn to type to have [Internet] access?  Why should I have to be able to see?" (InfoWorld Publications, Inc., 2000).

Perhaps the greatest challenge for disabled access is the terrific rate of change and coping with this change.  Although PCs are less than 20 years old, they have gone through several major evolutions.  Each time major change comes, such as the graphical user interface (GUI); the access tools need to be redesigned.  There is no way for third-party developers of access software and devices to keep up with this rate of change by working alone.  However, if mainstream developers, including hardware, software, and World Wide Web providers, consider accessibility problems when designing, systems will be much more adaptable and access tools will be much easier to create and implement (Rogers, 1999, p. 15-25).

Lazzaro (1996, p.66-67) discusses the difficulties he has a blind computer user. When he began using a computer, most programs were written in DOS, the text-based operating system that was easy for screen readers to read.  Now, however, Lazzaro's screen reader is often unable to read graphical user interfaces such as Window, OS/2 and

Macintosh. "These systems, which paint the screen pixel by pixel rather than character-by-character, display layers of windows, menus, icons, and dialogue boxes. Like the vast majority of computer users, I have migrated from DOS to Windows—and, like many other blind people, I am finding that operating a computer has become far more difficult" (1996, p. 66-7). Lazarro notes that providing full access to visually impaired users is held back by several factors. Developers seem to feel that the demands of providing disability access are too limiting and complicated and the demands mean standardization in several areas. Another area is the belief that full-access software must be expensive. Implementing accessibility in the design stage, however, does not increase the expense in the same way retro-fitting the accessibility after the program is developed.

After the visually impaired citizens access a web site, there are many problems that can occur. The problems in web site designs using DOS-based internet programs begin with the browser. If one does not have the upgraded software such as a browser or a screen reader, this creates a major barrier. "When the Internet was primarily text-based, electronic readers could follow the text easily. The World Wide Web, however, makes heavy use of graphics, and the visually impaired have been unable to take full advantage of the wealth of information stored electronically" (Kester, 1999, p. 144-117). For instance icons, task-bars, and pull-down menus make the browser software difficult to use. The most troublesome elements on the web page are frames, interactive forms, tables, videos, colorful backgrounds, and the use of too many graphics. These things clutter the screen reader. There are, however, helpful guidelines for users of the web sites. There are web site guidelines that help people that use mobile phones, hand-held computers, voice browsers, search engines, etc. (Hernandez, 1996, p. 15-17; Kester,

1999, p. 144-17).

**<u>Challenge</u>**

The technology industry faces important challenges in preventing a large section of the population from being locked out of integral services available online. Rogers says that the challenge for web site producers is to provide disabled users equal access to technology.  The courts have decided that web sites are not exempt from the mandates of the Americans with Disabilities Act (ADA), so developers are faced with illegal discrimination issues if they do not make their sites accessible (Zelnick, 2000, p. 2). Smith et. al., maintain that federal agency web sites must "aid citizens with meeting everyday problems, help them find appropriate avenues for needed government services, provide direct access to any desired public record, increase accountability of government, and assist all citizens to conduct business and interact effectively with government" (Smith, Fraser, McClure, & Charles, 2000, p. 5).  And since the web is one of the most challenging environments to be adapted to accessibility, web site managers must understand the difficulties facing disabled users (Rogers & Rajkumar, 1999, p. 2). The dilemma seems to be how to make the web more accessible without destroying or unduly constraining users and information.

Sager recognizes that the Internet could become the next gold mine for the "lawyers who have so thoroughly exploited ADA in the past" (Sager, 2000, p. 3.) As he says, "The transition from the Web we know today to one much friendlier to the disabled can be either a smooth or a painful ride" (Sager, 2000, p. 4).  Developments in technology will be the most influential in the changes for the disabled, but the courts will also be highly motivational.  "Flexibility from both will keep traffic moving; lawsuits and

harassment from government officials will force operators off the Web" (Sager, 2000, p. 4).

Since the Internet is still in relatively formative stages, many difficulties have yet to be ironed out. Lazzaro says that much of the difficulty and expense of making websites accessible would disappear if developers adhered to a standard set of guidelines in creating the graphical interfaces for their products, so that generally available assistive technology would work on any site (1996, p. 3). To decide what guidelines are appropriate, developers must be aware of what the disabled individuals' needs are as well as what assistive technology is available and what it can do. What technology is in use and how it works must be a significant part of making guidelines that meet the needs of both web page developers and web page users (American Foundation for the Blind, p. 1).

The next chapter examines the legal initiatives that influence web site accessibility for the blind and visually impaired. Chapter three examines the technological environment of web site accessibility. The conceptual framework used to assess Texas state agency web sites is developed in chapter four. In addition the methodology (content analysis) is also explained. In chapter five the results are presented and chapter six includes both the conclusion and recommendations.

## Chapter 2

## Legal Initiatives

The purpose of this chapter is to examine the legislation that influences a disabled person's ability to access a web site. It moves chronologically, beginning with a discussion of the Freedom of Information Act and focusing on other pieces of legislation that have been most influential in providing greater access for disabled users.

**1966—Freedom of Information Act (FOIA)**

Citizens of the United States have a right to access and use information generated by federal agencies. Access to federal information gives citizens the opportunity to hold the federal government accountable for its actions and increases the citizens' belief that the individual can influence government, thus increasing their incentive to participate in government (Smith, Fraser, McClure, & Charles, 2000, p. 4).

**1973—Vocational Rehabilitation Act**

This law ensures access to federal programs and services for people with disabilities. The Vocational Rehabilitation Act of 1973 was essential because it was like a civil rights act for people with disabilities. Specifically, the act was a vehicle for blind citizens to gain social independence, education, vocational skills, independence living skills, employment opportunities, and economic advantages. Many amendments have been added to this act and have made the policy more effective and have expanded the rights of blind people in other areas of life. Importantly, the Rehabilitation Act reflects a power of a vision of economic independence and full citizenship of all people with disabilities. Moreover, the Rehabilitation Act describes the client-focused

service/delivery-structured funding mechanism adopted by Congress to create the public

vocational rehabilitation program and an array of other series, programs, and other

organizations that support the goal of gainful employment for people with disabilities.

Similarly, the Rehabilitation Act requires states' rehabilitation vocational agencies to seek

advice from individuals with disabilities, business leaders and service providers. The

purpose of this regulation is to make sure that policies and services are effective in

helping people with disabilities get jobs, and contribute to the community where they live

(New York Discrimination Law Bulletin, 2000).

**1990—Americans with Disabilities Act (ADA)**

The ADA requires businesses to make reasonable accommodation so employees

have equal access to public facilities.  It outlaws discrimination against individuals

because of their disabilities.  The Americans with Disabilities Act as applied to web

pages addresses the needs of the blind and visually impaired. The changes fostered by the

Rehabilitation Act of 1973 and the ADA can be seen in the form of accommodations

such as wheelchair ramps, curb cuts, and Braille menus (Kester, 1999; Kellough, 2000;

American Foundation for the Blind, p. 2).

**1994— The World Wide Web Federal Consortium (W3C)**

The National Science Foundation initiated the W3C in order to establish

guidelines that help federal agencies improve technological services to disabled

customers.  The guidelines assist agencies in designing web sites to allow better access to

government information (Smith, Fraser, McClure, & Charles, 2000, p. 5). Compliance

with W3C guidelines is not mandatory (Jobe, 1999, p. 45-6) (Peek, 1999, p. 48-9).

**1994—Amendment to Technology-Related Assistance for Individuals with Disabilities Act of 1988**

This amendment provides funding and programs to provide assistance to the disabled. This law, although designed to provide assistance to the disabled, makes special mention of the lack of access for those with disabilities to telecommunications and computer technologies.  The purposes of the law are:

(1) to provide financial assistance to the states to support systems change and advocacy activities designed to assist each state in developing and implementing a consumer responsive comprehensive statewide program of technology-related assistance, for individuals with disabilities of all ages;

(2) to identify Federal policies that facilitate payment for assistive technology devices and assistive technology services, to identify Federal policies that impede such payment, and to eliminate inappropriate barriers to such payment;

(3) to enhance the ability of the Federal government to provide states with (a) technical assistance, information, training, and public awareness programs relating to the provision of assistive technology devices and assistive technology services; and (b) funding for demonstration projects (Rogers & Rajkumar, 1999, p. 5).

**1996—Telecommunications Act**

This act mandates the requirement for the accessibility and usability of telecommunications hardware for individuals with disabilities.  The act primarily targets hardware and equipment, but could be interpreted to apply to web information in general and specifically to web sites that support telecommunications equipment.  (9) The Telecommunications Act is significant because it allows access to the Internet

community, an important part of our commerce landscape (American Foundation for the Blind, p. 2).

**1996—Electronic Freedom of Information Act (EFOIA)**

The EFOIA added electronically stored information, including computer database records, to the definition of a "record." Any material that an agency must have available for public inspection and copying, such as that found in agency reading rooms, must be available online, as well as in hard copy (Hernandez, 1996; Smith, Fraser, McClure & Charles, 2000, p 4).

**1998—Amendment to Section 508 of the ADA (Workforce Investment Act)**

This powerful federal mandate acts as a civil rights bill for people with disabilities. It is intended to provide electronic and information technology (I&IT) access such as framing, hardware and software for the huge numbers of disabled users who would not be able to receive the benefits otherwise. It requires federal agencies to make their technology efforts and resources more ADA-compliant, so that those with disabilities have the same access to information from federal departments or agencies as ordinary citizens. If accessibility is considered unduly burdensome or cost-prohibitive, some exceptions are allowed. The new regulations only affect products sold to governmental agencies, so the federal government does not regulate private compliance. Instead, the Workforce Investment Act provides incentives that would encourage the technology industry to provide more accessible products and services. Political leaders want to encourage the industry to include the accessibility improvements into its

mainstream production. Judy Brewer, director of the Web accessibility initiative international program office of the World Wide Web Consortium (W3Q), in Cambridge, Massachusetts, is hoping for more initiative on the part of the technology industry. "'The private sector is clearly not covered by 508,' she says. 'But market leaders of the leading authoring tools may begin realizing that they might as well make products accessible [to users with disabilities] so they won't miss out on the federal marketplace.'" Section 508 may have further implications for the industry when its effects are felt. "There may be increased awareness in the private sector of the need to make information technology accessible [to users with disabilities] and the potential benefits that accessibility may have to other users," she says (InfoWorld Publications, Inc., 2000; New York Discrimination Law Bulletin, 2000; Sager, 2000, p.34).

**1999—W3C released the Web Content Access Initiative (WCAI)**

These guidelines based on three principles specify that pages "transform gracefully across users and technologies; complex pages should provide context and orientation; and pages should follow good design practices to promote usability" (Peek, 1999, p. 48-9). According to Kester, the sixteen guidelines are as follows:

1) Provide text equivalents for visual information (images, applets, and image maps)

2) Provide descriptions of important visual information

3) Provide text equivalents for audio information

4) Don't rely on color alone

5) Use markup and style sheets properly

6) Supplement markup to aid interpretation of text

7) Create tables that transform gracefully

8) Ensure that pages featuring new technologies transform gracefully (no frames, alternative presentation)

9) Ensure user control of time-sensitive content changes. Kester's note: Ensure that moving, blinking, scrolling, or auto-updating objects or pages may be paused or stopped.

10) Ensure direct accessibility of embedded user interfaces.

11) Design for device-independence (not pointer dependent). Kester's note: Provide for the user to interact with a preferred input (or output) device--mouse, keyboard, voice, head want, or other. If, for example, a form control can only be activated with a mouse or other pointing device, the person who is using the page without sight, with voice input, or with a keyboard, or who is using some other nonpointing input device, will not be able to use the form.

12) Consider interim solutions

13) Use W3C technologies and guidelines

14) Supply context and orientation information. Author's note: Grouping elements and providing contextual information about the relationships between elements can be useful for all users. Complex relationships between parts of a page may be difficult to interpret for people with cognitive or visual disabilities.

15) Design clear navigation structures. Offer a site map or table of contents.

16) Design for consistency and simplicity (Kester 1999, p. 144-17; Peeks, 1999, p. 48-9).

**2000—The Architectural and Transportation Barriers Compliance Board**

The Access Board issued final standards to enforce the Workforce Investment Act (amendment to section 508 of the Rehabilitation Act), requiring that electronic and information technology be accessible to people with a wide range of disabilities. The standards are scheduled to become effective June 21, 2001 (Pacific Employment Law Letter, 2000).

**Commercial Efforts at Improving Accessibility**

Efforts have also been made in education and the private sector regarding improved Internet accessibility. In 2000, former President Clinton received a letter from the presidents of 25 of the top research universities in the country, such as the University of California, University of Michigan, and MIT. Each president "agreed to take a number of important steps to expand research and education on accessibility, including ensuring that computer scientists and engineers received training on accessibility; expanding the number of faculty who conduct research on accessibility; and ensuring that university online resources are accessible to people with disabilities. For example, the College of Engineering of the University of Wisconsin will create a new educational program on design and human disability that will involve the creation of additional tenure track faculty positions" (Regulatory Intelligence Data, 2000).

A lawsuit originally filed in 1999 against American Online (AOL) by the powerful consumer group the National Federation for the Blind (NFB) caused the company to develop products that were more suited for use by the blind and visually impaired. The suit argued that AOL was a public accommodation under Title III of the ADA. It charged that AOL's proprietary software was not compatible with screen access

software programs used by blind persons to translate computer text into synthesized speech or Braille. (Kaplan, 2000, p. 34) The lawsuit was dropped after AOL agreed to make their software more user-friendly for those with limited vision. Since then, Web developers have made use of NFB's technology center in Baltimore to learn how to make web sites accessible. "'Often, with one change to a Web site, you can knock out barriers to access for the blind,'" Curtis Chong, the NFB's director of technology and a blind Web user, says.  (InfoWorld Publications, Inc., 2000)

A "surprising by-product" of the AOL case is that computer users with many different disabilities have benefited greatly from NFB's efforts in working with the high-tech companies to make software disabled-friendly.  One major reason the AOL litigation garnered so much attention is that it coincided with the federal government's decision to convince technology suppliers to be more aware of computer users with disabilities. Because the federal government is the largest single buyer of industrial technology products, its status as a buyer of technology is valuable.  Since the government wants accessible products, companies are redesigning their products to fit government specifications in order to keep the government as a customer (InfoWorld Publications, Inc., p. 11).

High-tech companies also made a major promise to make their products more accessible.  In a September 2000 letter to former President Clinton, the CEOs of leading high-tech companies, including 3Com, Adobe, AOL, AT&T, Bell South, Compaq, eBay, Global Crossing, Handspring, Hewlett-Packard, Macromedia, Microsoft, NCR, PeoplePC, Qualcomm, Red Hat, and Sun Microsystems, committed to develop a corporate-wide policy on accessibility.  Currently, more high-tech companies have

become more sensitive to making their products easier to access electronically.  These

policies include "best practices" such as:

- Training their workers to develop accessible products and services;

- Giving their developers adequate resources to design accessible products and

  services;

- Identifying and fixing accessibility problems in new versions of their hardware and

  software; and

- Supporting research and development to improve the state-of-the-art of assistive

  technology (Regulatory Intelligence Data, 2000).

## Federal government as consumer of technology

The Federal government, in its role as a major employer and information

technology consumer, is using its "buying power in the marketplace to communicate to

industry its policy to acquire information technology products and services that are usable

by people with disabilities." The Federal government will use its power in the

marketplace as the largest user of information technology to provide incentives for the

private sector to make technology accessible to the handicapped (Rogers, & Rajkumar,

1999, p. 15-25).

The next chapter takes a close look at the technology of accessibility.

**Chapter 3**

**<u>The Technological Environment</u>**

This chapter discusses developments in assistive technology and illustrates the benefits of

the technology to both the general population and the disabled population.

The American Foundation for the Blind web site provides a comprehensive

discussion of assistive technology.  It describes assistive devices as devices that scan the

images on a screen and convert them into either voice or Braille or magnify them.  They

also provide alternatives to the use of the point and click system used with a handheld

mouse.  Usually, the alternatives are keys such as directional arrows or combinations of

command keys.  The web site continues:

> Access programs work much better if the software applications they are expected
>
> to work with are designed with accessibility in mind.  Because many applications
>
> are not designed in this manner, access for users who are blind or visually
>
> impaired remains extremely inconsistent.  Software developers often fail to
>
> incorporate key features such as text labels or descriptions for icons and controls.
>
> Some controls may be inaccessible because of their design.  For example, controls
>
> that are not accompanied by text labels (painted characters are not acceptable)
>
> cannot be "read" by specialized access software.  Similarly, applications that
>
> employ custom controls rather than standard controls are inaccessible because
>
> screen reading software cannot identify and expose the custom controls.  Thus,
>
> common and essential items such as buttons, edit boxes, and check boxes are not
>
> usable because there is nothing meaningful for the specialized software to detect

and report to users when they encounter these controls.  (American Foundation

for the Blind, p. 2)

There has been a revolution in software interfaces and design as tremendous

amounts of content are now available in multimedia environments.  Most software

developers today produce graphical user interface (GUI) systems, and very few are text-

based systems. Additionally, the computer has evolved from a business tool into a

household appliance assisting with day-to-day activities such as answering telephones.

The result of this trend is that many impaired users, traditionally niche markets, have

been placed into an era where they cannot make use of the day-to-day functions that

computers can perform.  This trend threatens a reversal of the independence and freedom

gained during recent decades by the visually disabled. Features such as video-scripting

toggles and screen magnification modes allow users to customize their screens without

additional programming by the developer.  For example, if a commerce site will provide

video clips of product demonstrations, then users can download them and play them with

scripting on or off (Rogers, & Rajkumar, 1999, p. 15-25).

Following is Rogers' listing and discussion of technological and commercial

advances that affect the blind and visually impaired:

- IBM provides an option in Operating System/2 Multimedia Presentation

  Manager (OS/2 MMPM) by allowing audio and video captioning, if it exists,

  to be turned on and off.  A captioning tool is also available in the IBM

  UIltimedia Tools series.  Additionally, IBM is a very active participant at the

  National Federation for the Blind conventions and was an early pioneer with

  the Screen Reader/2 product.

- Microsoft Windows 95 has a special set of configuration options to slow auditory icons and error messaging, screening magnification, and high contrast options for the visually impaired. Furthermore, Microsoft has developed an off-screen model that captures on-screen information so that special-purpose software can perform a text-to-speech conversation on it or drive a Braille-output device. Additional features are available for other handicaps. There is also an accessibility pack available for Windows 3.1 and DOS.

- Apple Computer was among the first few software companies to address disabled users by shipping "Easy Access" features as part of its standard operating system. Similar to Windows 95, users can select from numerous visual and audio options. Of particular note is the available of scripting tools for Apple QuickTime Video files.

- Silicon Graphics may cause the most harm or bring the most benefit to the fight for accessibility. With the advent of the virtual reality markup language (VRML), a multithreaded three-dimensional graphics language, World Wide Web sites will offer three-dimensional Cyberspace environments that do not rely on text at all. Although these will be absolutely nonnavigable by the blind in the near term, they present new possibilities of transmitting new types of three-dimensional tactile information.

- The Web browser is an area where positive changes have occurred Changes were made to the Mosaic Web browser to improve operation by people with disabilities. (1) Alt text tags on IMGs appear whenever auto-load images are

turned off.  (2) Font selection and size control for all HTML text types were added  (3) Navigation by means of left and right arrow keys to the next hyperlink were added. (4) A bidirectional interface between the Web browser and sibling processes was added to facilitate HTML-aware screen reader software programs on Mosaic. Most browser implementations follow this standard.

- GUI standards have been developed. Two projects, Mercator and Graphical User Interface for Blind People (GUIB), took different approaches to providing the nonvisual interface to the GUIs.  The GUIB is a European-based project that has developed prototypes for both Microsoft Windows and X windows. The GUIB design translates the screen contents into a tactile presentation, which is based on the spatial organization of the graphical interface.  The hardware includes two loudspeakers, a touch-sensitive tablet, and a new input/output device called GUIDE, which integrates vertical and horizontal Braille displays. The Mercator project replaces the spatial graphical display with an audio interface that is organized hierarchically, and the only additional hardware is a speech synthesis system.

- Although not a company, X Windows is an early GUI standard that may be encountered by Web developers This is an area of much study by the Disability Action Committee for X (DACX) directed by the Trace Research and Development Center in Madison, Wisconsin.  This committee represents computer manufacturers such as Sun, IBM, Digital, and others.  Additionally, Sun Microsystems, NASA, and Georgia Tech have pioneered the Mercator

project, which builds upon the work at DACX.

- Traditional online providers (Compuserve, Prodigy, America Online) have a mixed record of providing access to blind users. Early versions of Compuserve were character-based bulletin board systems that were accessible via screen readers. This, like early computers, was a rather easy environment for blind computer users to adapt to. Recently, however, with increased model speeds and a demand for more GUI-like online environments, three online providers started using much more graphic content and may abandon, in some cases, what today remain parallel ASCII text versions (Rogers & Rajkumar, 1999, p. 5-25).

For example, all three now make extensive use of visual icons and text-like graphics to convey information. Additionally, these firms are developing partnerships to provide a full array of commercial services such as home banking, bill payment, and airline ticket booking. These services also serve as links to other companies' online services and the Internet. This becomes a convoluted environment with standards that are ver difficult for the blind user to navigate.

- There are several assistive devices for the visually disabled. Screen readers are often of two parts: software and a speech synthesizer. The software allows user control and translation of screen text no matter the application running. More importantly, the text must be true ASCI text and not graphical text There are many brands, but the IBM Screen Reader/2 and OUTSPOKEN seem to be used widely.

The speech synthesizer is a device attached to a serial port that converts ASCII

text into voice. The output may be to a loud speaker or to headphones and can be very realistic. These systems can be set to read in different modes such as by pronouncing punctuation or changing pitches for capital letters. These systems work best with a screen design allowing one line of text to be read at a time.

- Large print screen displays are available  Some blind computer users are not completely blind and can therefore navigate through a traditional application with the aid of special displays, software, or video models.  Special displays are available that, in conjunction with software and a controller card, can allow the user to select the magnification or area of view. Software is available t work with regular monitors, and these features also can be gained through some operating systems such as Windows 95.  Windows 95 allows the user to select a magnification mode, larger fonts and icons, as well as higher color contrast modes.

- There are Braille systems available but they are exceedingly difficult to adapt to the current GUI environments.  Braille systems convert screen text into tactile Braille displays. Two main types are available:  tactile Braille readers and Braille translators. Braille readers translate one line of text at a time into Braille via a special pad designed for touch.  Braille translators are more suitable to information retrieval because they translate entire documents for printing on paper (Rogers & Rajkumar, 1999, p. 15-25).

**Improving technological uses for the general population**

All users benefit from easier-to-use designs. Every web site visitor, whether

impaired or not, will benefit from simplified web sites. This is an overlooked phenomenon in many debates surrounding pubic accessibility projects.  After all, the typewriter was developed for blind users, and Alexander Bell's work with the blind resulted in the development of the telephone (Rogers & Rajkumar, 1999 p. 15-25). Additionally, the curb cuts for wheelchair access are a blessing to bicyclists and people with shopping carts.  Furthermore, different from a general interest public relations home page, a commerce site will live or die by the user friendliness and not by its creative entertainment value (Gardner, 2000, p. 49).  When the American Federation for the Blind recently redesigned its web site, the improvements had implications for many other segments of the population including anyone selling products and services via Web-enabled devices such as next generation cell phones and personal digital assistants (PDAs).  The technology that makes web sites accessible to screen readers, for instance, also makes them accessible to web-enabled devices  (American Foundation for the Blind).

Providing improved accessibility improves computer usage for large numbers of people including the currently disabled but also for the growing numbers of aging baby-boomers who will be needing improved visual access to the internet services they are accustomed to (Lazzaro, 1996, p. 66-7). "Disabled users could prove to be the cause of technology improvements that affect computer users across the board," argues Brewer. Like curb cuts which benefit more people than they are intended to, including people pushing baby strollers or shopping carts, bicyclists, and roller skaters, curb cuts on the Web could benefit a broader section of the population as well.  "When you make a web site accessible to disabled users, you also make it accessible on mobile phones or in a

busy operating room where a doctor is using a voice-activated device," Brewer says

(Users with Disabilities Push High-Tech Limits, 2000).

For the developer of World Wide Web commerce sites, this means development

work should consider the same access issues that businesses employing disabled workers

consider, as well as the considerations of software application developers. For example,

businesses commonly use online networks, internal processes, and application developers

have to consider that businesses will employ disabled users to use their products. So,

equal access World Wide Web page design is not just to make money from a narrow

segment of disabled users but for the accommodation of all possible users, the

organizations that employ them, and a requirement for application development.

### Recommendations for web site development

There is a recommended development methodology regarding objectives for good

interfaces. After the basic problems of HTML designs are understood, developers should

consider the fundamental objectives of accessible commerce site design. There are five

major objectives to be considered, and they should be built in from the start:

(1) Everyone Interface--The ultimate goal of commercial web site developers

should be to create a modality-independent site usable by everyone. These everyone

interfaces should avoid the pitfalls of limiting computer technology.

(2) Modality Independence--Every interface should be modality-independent.

That is, from the start of development, commercial sites should be built to accommodate

both users that want cutting-edge interaction and those that have a basic need for

communication without full multimedia, such as blind users.

(3) Navigability--Navigation is a required element in a commercial site, and simple navigation should be a goal. Without easy navigation, commercial users performing a transaction with or without a disability will become frustrated quickly and may fail to get what they need in the form of a service or product.

(4) Learnability--Learnability is another key element for successful use of accessible commercial systems. It is not enough for each developer to attempt accommodation in a new and unique way. Now it is necessary to create standards that users can count on and learn to use. Little would be gained if impaired users had to relearn how to use each different web site.  A good existing example is ATMs that do not require user training despite the numerous designs and manufacturers.

(5) Customer Support--The unique needs of disabled users for customer support have to be addressed. This area is also not addressed by current World Wide Web site offerings for unimpaired users. There is no good mechanism to guide transitions when questions arise, nor is their any way to ensure that transactions are performed and transmitted correctly without error. This situation presents new challenges for commerce site providers because disabled users will need support (Rogers & Rajkumar, 1999, p. 15-25).

Web site technology will change dramatically over the next few years because standards have not been established firmly. Not only will the basic two-dimensional interface change, but also new modes of communication will become a part of the blend. What were static icons and image maps will become dynamic imagery with sound and virtual reality.  With planning and foresight, developers have many opportunities to improve accessibility for disabled users as well as the general public.

# Chapter 4
## Conceptual Framework and Methodology

**Introduction**

This chapter describes the ideal characteristics of an accessible governmental informational web site for the blind/visually impaired. The ideal characteristics are used as the foundation for the content analysis of Texas State agency web sites. Content analysis and other methodological issues are also discussed in this chapter.

**The Digital Divide**

*****Information will be inserted here about the digital divide.

**Conceptual Framework**

The conceptual framework demonstrates the essential categories or guidelines needed to assess the accessibility of the design of the homepages of 25 Texas State agencies. Four standards are used to assess the web sites.

**(1) technology in place**

**(2) human contacts necessary for assistance in navigation,**

**(3) physical characteristics of the site**

**(4) presentation of data tables should be clear.**

These elements were primarily extracted from the accessibility guidelines established by the National Federation for the Blind

**Standard 1: Assistive Software Technology**

In order to access the internet blind/visually impaired individuals must have a web browser that works well with a screen reader. A screen reader is a piece of assistive technology that translates information on the screen into synthesized speech or Braille. Of the browsers currently available, Internet Explorer is the most user friendly for the blind citizenry, since it works well a variety of screen readers. Netscape, on the other hand, is not compatible for use with screen readers. It is also important to note that there are also several self-voicing browser packages on the market that can be used without the assistance of a screen reader.  These self-voicing browsers are capable of speech, large print, zoom text, and other special enhancement for people who are blind/ visually impaired.

The browser used to conduct this study was Internet Explorer, since it is currently the browser most commonly used by blind individuals.   JAWS screen reader was the assistive technology used in conjunction to Internet Explorer. JAWS is the screen reader that is highly recommended for use in Texas by the Texas Commission for the Blind. JAWS is also recommended for use in the Vocational Rehabilitation Act. However, other states recommend different screen reader such as, One-Eyes, Super Nova, and Outspoken.

Several factors can interfere with JAWS' ability to work well with Internet explorer, including the lack technical proficiency on the part of the user. However, most of the accessibility problems on the World Wide Web have to do with the browser and the web sites, not with the screen reader. The most frequently encountered problem resides in the graphics and how they are written.

In this study the use of "alt tags" on the Web sites of the 25 Texas State agencies was analyzed. Images are labeled with "alt tags," (alternative representations) that textually describe the vital information conveyed by a graphic. For example, if a Web page contained a photo of a black Labrador retriever, the Web site's author should provide an alt tag that effectively conveys the content of the image to the blind/ visually impaired population. If the author does not provide descriptive alternative text, such as, "black Labrador retriever catching frisbee" the screen reader will provide no information about the image at all.

In order to determine whether a Web site is accessible, a regulator is needed to assist Web page authors in identifying and repairing areas of their design which may not be accessible to those who use screen reader's when using the Internet. One such tool commonly used by Web page designers is Bobby 3.2. Bobby is based on the standards set forth in Section 508 mandating that:

1. The Web page will be accessible

2. The pictures are labeled with alt tags

   3. The pictures must convey some type of vital information

According to Bobby, if a Web page does not comply with the Web Content Accessibility Guidelines it contains an Priority 1 Accessibility Errors. However, some errors that Bobby detects require human evaluation to determine whether they encroach upon accessibility. In this analysis any indication of a Priority 1 Error was considered grounds for deeming the site "not certified."

The final element assessed in this category was whether JAVA Applet or plug-in must be used to access the page, since Java applets, JavaScript, and plug-ins such as

Macromedia's Flash 4.0 can create problems for the blind/visually impaired if they are using an older version of a screen reader. However, with updated assistive software JAVA is no longer a hindrance because the newer screen readers are able to disable JAVA automatically.

**Standard 2: Human Support**

This category consists of elements that make human contact a possible. Human contact by telephone and e-mail is necessary for individuals to receive orientation to a Web site, to communicate with the webmaster, and to obtain information beyond the scope of the Web site.

While this is an issue that effects both the blind and sighted population, it should be noted that Web site navigation conducted by a blind/visually impaired individual requires a greater amount of time an training than it does when conducted by those with sight. The blind/visually impaired must have the ability to talk with the webmaster. Blind citizens must get training on how to use JAWS and Internet Explorer, as well as training on accessing individual Web sites. It should be kept in mind that there are many different skill levels on which the blind/visually impaired can operate browsers, screen readers, modems, etc.

**Standard 3: Presentation**

The presentation category consists of the elements that cover the major Web page design issues that can affect accessibility. The encoding of hyperlinks needs to include enough words so that the link can stand alone, making it possible for blind persons using

the internet to tab from link to link in order to determine the meaning and purpose of the links on the page. It is important for these links to be labeled with text that conveys a specific meaning, since labels such as "click here" or "more" provide no information as to the content of the link. There should always be a separation between adjacent links, so that blind/visually impaired users can distinguish one link from the next.

Again, short text descriptions should be included for all images either by labeling each graphic with an HTML "alt tag" or by naming the file representing the graphic so the graphic can be identified.  Using images as hypertext should be avoided, because screen readers are not able to identify these graphics. (NFB)

Frames are a coding technique used to present information on a Web page. Frames establish more than one screen at a time, and this can be confusing for some blind/visually impaired individuals. If a page is designed using HTML frames it is suggested that an alternative layout within NPFRAMES layout exists. However, it should be noted that some blind/visually impaired persons feel that frames work well with screen readers and aid in navigation of a Web sites, making them more user friendly. (McDowell and Associates)

**Standard Four: Table Presentation**

This category covers the topic of extensive multi-column data tables.  The inclusion of extensive multi-column data table. While it is possible for up-to-date screen readers to translate this data, columns are read horizontally and not vertically, and so, the

more column headings a data table contains, the more difficult it becomes for

blind/visually impaired users to mentally organize the information presented.

. Table 4.1 illustrates the conceptual framework as linked to the literature review.

Conceptual Framework Linked to Literature

| Ideal category/ Standards | Literature |
|---|---|
| **Assisted Software Technology: Standard 1**<br>　1. Bobbie Certified<br>　2. Jaws Screen reader<br>　3. JAVA<br>　4. Alt Tabs | Texas School for the Blind<br><br> NFB  #10<br><br> NFB   #5 |
| **Human Support: Standard 2**<br>Phone<br>E-mail | NFB  #9 |
| **Presentation: Standard 3**<br>1. encoding of hypertext links- enough words so that link can stand alone<br><br>2.  Adjacent links separated?<br><br>3. short text description included for all images<br><br>4. Avoid using images as hypertext<br><br>5. If page is designed using HTMl frames, alternative layout within  a NPFRAMES Layout exists<br><br>6. ensure documents are clear and simple | Earl, Krista<br>NFB #2<br><br>NFB#3<br><br><br>NFB # 4<br><br>NFB #6<br><br>NFB #11<br><br>W3C    14 |
| **Table Presentation: Standard 4**<br>1. Avoid use of multi-column tables<br><br>2. Row and column headers should be identified for data tables<br><br>3. Create Tables that transform gracefully | NFB  #1<br><br>Access Board<br>(www.access-board.gov/sec<br><br>W3C    5 |

## Methodology:  Content Analysis

This report uses content analysis to assess Texas State agency web sites.

According to Earl Babbie (1998,p. 313) content analysis is " a coding operation.

Communications- oral, written or other- are coded or classified according to some

conceptual framework." In this study the "communication" is the state agency web site

and the conceptual framework is outlined in Table 4.1. It should be noted that since the author is blind, he is uniquely suited to determine whether a web site is accessible to the blind. The carefully constructed conceptual framework and the author's perspective gives this research effort enhanced validity.

**The Coding Scheme**

The coding scheme was developed directly from the conceptual framework and is shown in Table 4.2. Each element is reviewed and scored with either a 2 (yes) representing the presence of an element, or a 1 (no) representing the absence of an element. When an element does not apply a 0 (non applicable) is scored.

A summary measure was developed in order to analyze the scores of the individual Texas state agencies. The scores from each category were tallied into one total score. The highest score possible is a 26 and involves the presence of 15 elements. A higher score indicates a higher level of compliance with the standards set forth, meaning that the information provided on the site is accessible to blind and visually impaired.

**Table 4.2**
**Coding Mechanism Linked to Conceptual Framework**

| | | Yes | No | N/A |
|---|---|---|---|---|
| **Assisted Software Technology** | | | | |
| 1 | Bobby Certified | | | |
| 2 | Jaws Screen Reader | | | |
| 3 | Does not use JAVA | | | |
| 4 | Alt Tags | | | |
| **Human Support** | | | | |
| 5 | Phone number available | | | |
| 6 | E-mail available | | | |
| **Presentation** | | | | |
| 7 | Encoding of hyperlinks- enough words so that link can stand alone | | | |
| 8 | Adjacent links are separated | | | |
| 9 | Short text description included for all images | | | |
| 10 | Avoids using images as hypertext | | | |
| 11 | If page is designed using HTML frames alternative layout within NPFRAMES layout exists | | | |
| 12 | Documents are clear and simple | | | |
| **Table Presentation** | | | | |
| 13 | Avoids the use of multi-column tables | | | |
| 14 | Row and column headers are identified for data tables | | | |
| 15 | Tables transform gracefully | | | |

**Description of the Sample Agencies**

Twenty-five state agencies were randomly selected from the Texas Health and Human Services Commission's directory of Texas State Agencies' Web addresses and telephone numbers. The following list of the 25 sample agencies provides the names, internet addresses, and a brief description of their responsibilities in Texas State Government.

1. **Early Childhood Intervention-** http://www.eci.state.tx.us/
   The agency serves families who have babies or toddlers with disabilities or developmental delays.
2. **Employees Retirement System of Texas-** http://www.ers.state.tx.us/
   The agency administers retirement plans and various programs for both active and retired state employees.
3. **Office of the Governor- Gov. Rick Perry-** http://www.governor.state.tx.us/
   The state's governor.
4. **Texas Alcoholic Beverage Commission-** http://www.tacb.state.tx.us/
   The commission regulates sales, taxation, importation, manufacturing, transporting, and advertising of alcoholic beverages.
5. **Texas Attorney General-** http://www.oag.state.tx.us/
   The state's primary legal counsel.
6. **Texas Commission for the Blind-** http://www.tcb.state.tx.us/
   The commission provides an assortment of services to the blind and visually impaired.
7. **Texas Commission on Alcohol and Drug Abuse-** http://www.tcada.state.tx.us/
   The commission administers programs for drug and alcohol rehabilitation.
8. **Texas Department of Agriculture-** http://www.agr.state.tx.us/
   The department administers agricultural law and regulations.
9. **Texas Department of Criminal Justice**- http://www.tdcj.state.tx.us/
   The department operates prisons, jails, and the parole system. It also provides oversight of community supervision and funding.
10. **Texas Department of Health**- http://www.tdh.state.tx.us/
    The department focuses on improving public health outcomes.
11. **Texas Department of Housing and Community Affairs-**
    http://www.tdhca.state.tx.us/    The Department addresses housing and community development issues.
12. **Texas Department of Human Services-** http://www.dhs.state.tx.us/
    The Department attempts to provide financial, health, and human services that

promote the greatest amount of personal independence and responsibility for its clients.

13. T**exas Department of Mental Health and Mental Retardation-** http://www.mhmr.state.tx.us/ The department provides services for individuals with mental illness and mental retardation.

14. **Texas Department of Transportation**- http://www.dot.state.tx.us/ The Department provides transportation systems throughout the state.

15. **Texas Department on Aging**- http://www.tdoa.state.tx.us/ The Department provides services and opportunities for older citizens.

16. **Texas Education Agency**- http://www.tea.state.tx.us/ The agency administers educational laws and policies for the state.

17. **Texas General Land Office**- http://www.glo.state.tx.us/ The agency oversees the management of state lands

18. **Texas Natural Resource Conservation Commission-** http://www.tnrcc.state.tx.us/ The commission protects the state's human and natural resource in a manner consistent with sustainable economic development.

19. **Texas Office of Consumer Credit-** http://www.occc.state.tx.us/ The office's primary responsibility is to protect citizens of the state by ensuring that the various laws regulating and restricting credit transactions are adhered to.

20. **Texas Parks and Wildlife-** http://www.tpwd.state.tx.us/ The agency intends to manage and conserve the natural and cultural resources of Texas for the use and enjoyment of present and future generations.

21. **Texas Rehabilitation Commission**- http://www.rehab.state.tx.us/ The commission is the principal authority on the vocational rehabilitation of Texans with disabilities, except persons with visual impairments and the legally blind.

22. **Texas School for the Blind and Visually Impaired-** http://www.tsbvi.edu/ The School is a center for educational services for blind and visually impaired students.

23. **Texas State Auditor's Office-** http://www.sao.state.tx.us/ The office is the independent auditor for the state's government.

24. **Texas Workers' Compensation Commission-** http://www.twcc.state.tx.us/ The commission monitors the delivery of benefits to injured workers and eligible family members of workers killed on the job.

25. **Texas Workforce Commission-** http://www.twc.state.tx.us/ The commission oversees and provides workforce development services to employers and job seekers.

The results of the study are presented in the next chapter.

**Chapter Five**

**Results**

**Introduction**

Twenty-five Texas State Agency web sites are assessed for their accessibility to

the blind and visually impaired.. The purpose of this chapter is to explain the data

compiled from the web site content analysis.

**Note on Accessibility**

The conceptual framework used to assess the web sites implicitly assumes that it

is possible to find the web addresses in the first place.  Unfortunately, it was difficult to

locate the web addresses. This was an unexpected challenge and a factor that influences

accessibility. The author began with the names of agencies and called each agency asking

for the web address. Often the state agencies were unable to provide the web address. As

a result the author searched for a directory of web addresses.

A blind or print handicap citizen ought to be able to call an agency and obtain a

web address. Although search engines like Alta Vista are accessible to the blind, not all

search engines are accessible. Further, blind or visually impaired citizens may not know

how to use search engines. Obviously, they have had experience contacting their

government through the telephone.

**Standard 1: Presence of Assitive Technology**

Assisted software technology must be in place for the visually impaired to have

equal access to any web site. JAWS is a screen reader program for the visually impaired

that assists in finding information over the internet. JAWS is used to review or read web

sites and importantly it is used for the internet. It is not considered a browser tool, rather a tool used to get information from the browser. It is a critical piece of technology used to navigate the internet (surfing the web, e-mails, etc.). JAWS is adaptable to all internet web sites. JAWS also will automatically disable Java which will streamline the web site for compatibility for JAWS. However, Java will not create problems for the visually impaired if the screen reader program is a newer version. The critical question is whether internet web sites make themselves accessible for this population.

Overall, Texas State agencies are in compliance with the first standard (assisted software technology).  All of the web sites used Jaws Screen Readers and did not use JAVA (See Table 5.1). Over 90 percent used Alt Tags. The weakest element was the "Bobby Certification." Only 64percent were "Bobby Certified."  Thus, 36% of the agencies were found to have priority one errors that renders the web sites inaccessible to individuals who are visually impaired. The software technology used by web designers is Bobby 3.2. Bobby certification is based on the standards set forth by Section 508 mandating that 1) the web site must be accessible, 2) the pictures are labeled with Alt. Tags, 3) the pictures must convey some type of vital information. According to Bobby if a web page does not comply with the web content accessibility guidelines it contains priority one accessibility errors. Hence, the visually impaired population cannot access approximately one-third of Texas' state agencies web sites.  Ninety- two percent of the state agencies web sites did an excellent job using Alt. Tags to verbally describe visual images to the user. WC3 requires that there be a label and description about each image and animation. The label should go in the ALT element of the HyperText Markup

Language (HTML) code. The contents of the ALT element should be visible when the cursor is positioned over an image or from a text-based browser.

**Table 5.1**
**Standard 1:**
**Assisted Software Technology Elements (percentage distribution)**

| S1 | Assisted Software Technology | Yes | No | Total (n=25) |
|---|---|---|---|---|
| E1 | Bobby Certified | 64 | 36 | 100 |
| E2 | Jaws Screen Reader | 100 | 0 | 100 |
| E3 | Does not use Java | 100 | 0 | 100 |
| E4 | Alt. Tags | 92 | 8 | 100 |

**Standard 2: Human Support**

The Human Support category consists of elements that make human contact a possibility. Human contact by telephone and e-mail is necessary for individuals to receive orientation to the web site, communicate with the Webmaster and to attain information about the scope of the web site.

For the most part web sites of Texas State agencies included ways to contact a person inside the agency if there were problems (See Table 5.2). All of the web sites had telephone numbers and 72 percent had e-mails.

**Table 5.2**
**Standard 2: Human Support**

| S2 | Human Support | Yes | No | Total (n=25) |
|---|---|---|---|---|
| E5 | Phone number available | 100 | 0 | 100 |
| E6 | e-mail available | 72 | 28 | 100 |

**Standard 3: Presentation**

Presentation styles varied within the state agencies. The encoding of hyperlinks on a web page enables the blind citizenry to navigate easily between web pages by the use of the Tab and arrow keys and without the use of a mouse (See Table 5.3). All state agencies scored a 100% in this area. Also, there was differentiation between adjacent links that avoids the possibility of confusion for the user.

In some instances, visual images are links within themselves that can create confusion for a blind user. Ninety-two percent of the Web pages avoided using images as links, averting the possibility of navigation difficulty. A visually impaired person would not have any difficulty traversing through these sites.

Some web sites contain visual images that either do or do not contain short text descriptions that describe the image. Eighty percent of the state agency web sites included short text descriptions with their visual images making them accessible to the blind user. This allows for equal information access for the entire population.

Documents should be organized so that they are readable without requiring an associated style sheet. All documents contained in the web sites were graded as clear and simple and therefore enhanced the user-friendly aspect of the assistive technology, such as a Braille embosser..

**Standard 3: Presentation**
**Table 5.3**

| S3 | Presentation | Yes | No | Total (n=25) |
|----|--------------|-----|-----|--------------|
| E7 | Encoding of hyperlinks enough word so that link can stand alone | 100 | 0 | 100 |
| E8 | Adjacent links are separated | 100 | 0 | 100 |
| E9 | Short text description included for all images | 80 | 16 | 96* |
| E10 | Avoids using images as hypertext | 92 | 8 | 100 |
| E12 | Documents are clear and simple | 100 | 0 | 100 |

* one web site was not ascertainable

**Standard 4: Table Presentation**

Results for Standard four (Table Presentation) is found in Table 5.4. It is important for people with visual disabilities to be able to detect the presence or lack of presence of frames on the web page. In addition, people with visual disabilities should be able to identified row and column headers for data tables. If frames are used on a web page it is helpful to add titles to each frame on the page. According to WC3, frames shall be titled with text that facilitates frame identification and navigation. If PDF is used , HTML or Text version should also be in the source document.

Another possible difficulty for a visually impaired user is the use of multi-column data tables. Screen reader read left to right. Therefore, when there are multi-columns, the screen reader cannot detect this and will continue to read left to right. When this occurs it is easy to misconstrue the information because the information is in a different form of inaccessibility. All of the state agencies avoided using multi-column data tables, making this information accessible.

It is not recommended to use rows and columns when organizing text. However, if text is organized in that style then each separate column and row should be identified and given a title. Data tables should also transform gracefully. There was no evidence of data tables or the use of frames on Texas' state web pages. Hence, neither "row and colums headers identified" or "Tables transform gracefully" applied.

**Table 5.4**
**Standard 4: Table Presentation (percent distribution)**

| S4 | Table Presentation | Yes | No | N/A |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| E13 | Avoids the use of multi-column data tables | 100 | 0 | 0 |
| E14 | Row and column headers are identified for data tables | 0 | 0 | 100 |
| E15 | Tables transform gracefully | 0 | 0 | 100 |
| | Totals in percentages | N=25 | | |

The average score was 24 with a score of 25 as the highest score for an agency.

The mode for the sample was a score of 24.5 and the median score was 24.

## Chapter 6

## Conclusion

**Introduction**

The purpose of this chapter is to summarize the findings of the research, discuss the

weaknesses of the study and discuss follow-up research.

**Discussion of Findings**

As shown in Table 6.1 all Texas State Agencies scored well in "overall" compliance to

the standards. The mode score was 24 out of a possible 26. The range was from 25 to 22.

The average summary score was 24.5.

Overall, the agencies were compliant with the guidelines established by Section

508. They showed strengths is in almost all the categories assessed, with a miniscule

number of problems arising when it came to the inclusion of Alt. Tags, the inclusion

short text descriptions for all images, and the avoidance of images used as hypertext.

Even taking these problems into consideration, all of the Web sites assessed proved to be

clear and simple when navigated using assistive technology.

**Table 6.1**

**Summary of Results by Agency**

| Agency | Score |
|---|---|
| Texas Alcoholic Beverage Commission | 25 |
| Texas Attorney General | 25 |
| Texas Department of Agriculture | 25 |
| Texas Department of Health | 25 |
| Texas Department of Human Services | 25 |
| Texas Department of Mental Health and Mental Retardation | 25 |
| Texas Education Agency | 25 |
| Texas General Land Office | 25 |
| Texas School for the Blind and Visually Impaired | 25 |
| Early Childhood Intervention | 24 |
| Office of the Governor- Gov. Rick Perry | 24 |
| Texas Commission for the Blind | 24 |
| Texas Department of Criminal Justice | 24 |
| Texas Department of Housing and Community Affairs | 24 |
| Texas Natural Resource Conservation Commission | 24 |
| Texas Rehabilitation Commission | 24 |
| Texas Workers' Compensation Commission | 24 |
| Texas Workforce Commission | 24 |
| Texas Commission on Alcohol and Drug Abuse | 23 |
| Texas Department on Aging | 23 |
| Texas Office of Consumer Credit | 23 |
| Texas Parks and Wildlife | 23 |
| Texas State Auditor's Office | 23 |
| Employees Retirement System of Texas | 22 |
| Texas Department of Transportation | 22 |

**Weaknesses of the Research**

One weakness that hindered this research was the lack of previous research on this topic of web accessibility for the blind/visually impaired. To date, there has never been a study that focused specifically on this population.

Another weakness is the time constraint, which limited the scope of the research. Had a greater amount of time been available, it would have been possible to analyze the State agencies' Web sites beyond the homepage level. Had more in-depth research been

possible, it would have been beneficial to assess the level of accessibility of the state

agencies' online forms such as job applications, etc.

**Follow-up Studies**

Additional research on this topic is merited. For example it would be useful to

assess online forms for accessiblity. Additionally, private sector web sites should be

assessed for their level of accessibility.

**Recommendations and Conclusions**

Public state agencies appear to be complying with the section 508 guidelines

that govern Web site accessibility. If these same guidelines were adhered to by the

private sector, the digital divide between the sighted and visually impaired populations

would be well on its way to narrowing. Since the amount of information on the World

Wide Web is growing exponentially and the demand for this information is growing as

well, the call for equal access is increasing imperative.

**Appendix A:**
WC3 guidelines Web page

**Appendix B:**
Bobby guidelines Web page

**Appendix C:**
NFB guidelines Web page

**Appendix D: Overall Sample Scores**

| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Agency** | | | | | | | | | | | | | | | | |
| TABC | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 25 |
| TAG | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 25 |
| TDA | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 25 |
| TDH | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 25 |
| TDHS | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 25 |
| TDMHMR | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 25 |
| TEA | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 25 |
| TGLO | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 25 |
| TSBVI | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 25 |
| ECI | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 24 |
| OFG | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 24 |
| TCB | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 24 |
| TDCJ | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 24 |
| TDHCA | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 24 |
| TNRCC | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 24 |
| TRC | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 24 |
| TWCC | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 24 |
| TWC | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 24 |
| TCADA | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 23 |
| TDA | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 0 | 0 | 23 |
| TOCC | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 0 | 0 | 23 |
| TPW | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 0 | 0 | 23 |
| TSAO | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 0 | 0 | 23 |
| ERST | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 0 | 0 | 22 |
| TDT | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 0 | 0 | 22 |

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