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ACCESSIBLE DESIGN FOR LIBRARY WEB SITES:

AN ONLINE HANDBOOK AND TECHNOLOGY GUIDE

A Project Report

Presented to

The Faculty of the School of Library and Information Science

San Jose State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Library and Information Science
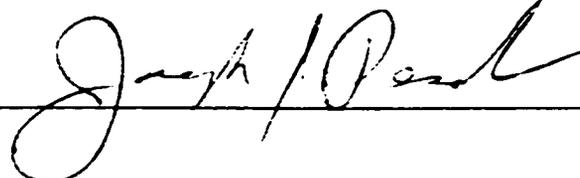
By

Iona S. Derman

August 2000

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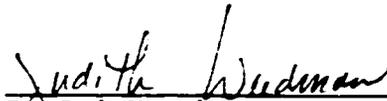
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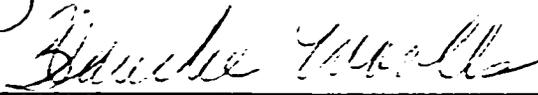
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ABSTRACT

ACCESSIBLE DESIGN FOR LIBRARY WEB SITES:
AN ONLINE HANDBOOK AND TECHNOLOGY GUIDE

By Iona S. Derman

This project report discusses the topic of accessible Web site design and the present need for a concise, step-by-step "How To" guide that simply explains and fully illustrates the essential elements of universal design as they apply to library Web sites. The development of an authoritative, but easily understood online accessibility resource is especially important for today's library professional who is increasingly being called upon to design, develop, and maintain a library Web site.

This project report details the process of creating an online Interactive Accessibility Handbook and Assistive Technology Resource Guide. Through definitions, illustrations, and extensive hyperlinks the Handbook clearly explains the concepts of accessible design as it relates to the development of a library Web site. The companion online Assistive Technology Resource Guide identifies and discusses the various forms of assistive technology including hardware, peripherals, and software utilities.

DEDICATION

This project is dedicated with love to my husband David without whom this project would have never come to fruition. What's more, I am forever grateful for his never-ending support, his technical expertise, and above all else his adventurous spirit.

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INTRODUCTION

There are few who would argue with the generally held belief that World Wide Web has, in a relatively short period of time, become an integral part of our everyday lives. This is no less true for many, if not most, library professionals who also believe that the Web should be an indispensable part of every library's technology plan. As a result of this ubiquitous status, the Web has played and will continue to play an increasingly significant role in both the acquisition and dissemination of information. For libraries whether they be public, academic or otherwise, the conceptualization of the Web as an information conduit is especially relevant insofar as there has always been an institutional tradition of service to the masses which, of course, includes those individuals with disabilities.

Typically a library Web site serves a largely heterogeneous audience that is comprised of users with vastly different learning styles and capability levels. This user base would also include a diverse group of disabled individuals which can be identified as having one or more of the following limitations:

- Visual disabilities - blindness, low vision, and loss of visual acuity

- Auditory disabilities - complete deafness or some level of hearing loss

- Cognitive disabilities - speech, language and learning impairments

- Physical disabilities - impaired mobility or loss of fine motor control

It is a common sense notion that all library users, including those with disabilities, expect and depend upon a smooth and continuous flow of easily accessible information that is both reliable and authoritative. It has also become increasingly true that more and more of the library's information is being made available in electronic formats such as PDF,

ASCII, and HTML which can be viewed on the Web and then downloaded or printed at the patron's discretion. As this electronic migration continues to accelerate at a rapid pace it is incumbent upon librarians, Webmasters, and developers to consider the possible ill effects of this continuing transition to a "paperless" library.

Though there are considerable benefits for any library with a Web presence, there are, for disabled individuals, a whole host of design barriers which may effectively prevent equal access to much needed information. It is therefore sensible, if not essential, to address the issues of accessibility early and often in the Web design process. The early consideration and subsequent implementation of accessible Web design features can effectively reduce or altogether prevent a plethora of potential access problems which often occur when disabled individuals attempt to use the Web. From conception to implementation, Web site designers must be ever mindful of possible access barriers if the desired goal is to create a library Web site that is accessible to the widest possible audience. By implementing a variety of sensible design guidelines it is possible to create a library Web site that is universally accessible to the broadest range of users. In a publication produced by the Center for Universal Design entitled, *The Universal Design File: Designing for People of All Ages and Abilities*, authors Story, Mueller, and Mace (1998) put forth the proposition that every human is unique insofar as age, size, abilities, talents, and preferences.

> Any human characteristic that can be measured spans a broad range in any population. An understanding of human diversity is critical to designing effectively. Successful application of universal design principles requires an understanding of how abilities vary with age, disability, the environment, or the circumstances. (Story, Mueller, & Mace, 1998)

Through the creation of an Interactive Accessibility Handbook, this project will define and illustrate the concepts of accessible design as they relate to the development of a

library Web site. The online Assistive Technology Resource Guide will identify, discuss, and

provide links for the various forms of assistive technology including hardware, peripherals,

and software utilities.

LITERATURE REVIEW

Disability - Definitions and Limitations

In order to more fully understand the depth and breadth of the Web accessibility

issue, it is essential to first define the term "disability" and second, to delineate the most

common technology-related limitations that most affect disabled Americans. The Americans

with Disabilities Act of 1990 (ADA) defines a disability as a "physical or mental impairment

that substantially limits one or more of the major life activities" (ADA, 1990). Subsequent

case law and further regulatory activity have provided that this definition "covers only

individuals with impairments that are serious enough to affect a major life activity, such as

walking, talking, breathing, or working" (Moses, 1990). A 1997 article published by the

Bureau of the Census defines a disabled person in the following way:

> A person is considered to have a disability if he or she has difficulty performing
> certain functions (seeing, hearing, talking, walking, climbing stairs and lifting and
> carrying), or has difficulty performing activities of daily living, or has difficulty with
> certain social roles (doing school work for children, working at a job and around the
> house for adults). A person who is unable to perform one or more activities, or who
> uses an assistive device to get around, or who needs assistance from another person
> to perform basic activities is considered to have a severe disability. (Disabilities
> Affect One-Fifth of All Americans, 1997)

In an article entitled, "Accessible Web Site Design", Walters (1998) opines that the

disabled have difficulty accessing information on the Internet because of poor Web site

design.

Many of the site designs actually create barriers for information access. Students with visual and cognitive disabilities have the greatest barriers to overcome to gain access to the information. There is very little that users can do to change site design to accommodate their own needs. Site designers must accommodate the user. (Walters, 1998)

By understanding how to design a Web site for accessibility, developers can avoid the barriers that often confront disabled users. In an online presentation entitled, "Universal Access: Electronic Resources in Libraries," authors Burgstahler, Comden, and Fraser (1997) offer the below-listed information regarding the disabled and technology-related limitations:

- For individuals with low vision, standard written materials are too small to read and/or objects appear blurry. Others may only see objects within a specific field of vision. Still others may see an image with sections missing or blacked out. Learning via a visual medium may take longer and may be more mentally fatiguing for people who have low vision than for people who have standard vision. Computers equipped with large print keyboard labels and home-row key indicators can help users with visual impairments locate keys. Computers equipped with screen enlarger software can enable a person with low vision to read characters on the screen without assistance; large monitors allow them to maximize the amount of text they can see at one time.

- Blindness affects the ability to access written materials independently. Some people who are blind know how to read Braille; others do not. Assistive computer technology can provide a blind person with greater flexibility and independence by allowing access to library and Internet resources.

- Library users with hearing impairments may hear at a functional level with the assistance of amplification devices. Others may hear only specific frequencies, sounds within a certain volume range, or nothing at all. Generally, hearing and speech disorders alone do not interfere with computer use. In fact, libraries can use computers as a means of communication in order to assist patrons with reference and circulation questions by providing electronic mail access to these services.

- Cognitively, a person who is learning disabled may have difficulty transmitting or understanding auditory, visual, or tactile information. In order to increase reading speed and comprehension assistive computer technology can be utilized to present information in a multi-sensorial format, such that the text is displayed while it is being read by a voice synthesizer can increase some people's reading speed.

- Individuals with physical disabilities may have a wide range of motor limitations including upper body impairments which may result in limited or non use of one or both hands. For some it may be difficult to type at a keyboard or manipulate small objects such as a mouse. Disabled patrons can be aided by assistive equipment that allows for mouse alternatives such as special keyboards or voice recognition software. Web based resources and services can also assist patrons with mobility impairments who cannot easily visit the library facility (Burgstahler, Comden, & Fraser, 1997).

Web Accessibility and the Disabled Community

In *Designing Web Interfaces to Library Services and Resources*, authors Garlock and Piontek (1999) point out the interchangeability of the terms "accessible design" and "universal

design" (Garlock & Piontek, 1999). The authors also note that these are "the phrases most often used to describe the creation of Web pages that are accessible to the widest audience possible in a variety of technical environments" (Garlock & Piontek, 1999, p. 61).

Most often, libraries, not unlike other service-oriented organizations, design their services with the average user in mind. The implementation of universal design and accessibility broadens the target audience by including users with a wider range of abilities. The use of universal design and accessibility means preparing in advance for the range of users who will need to access the library's resources (Fraser, Comden, & Burgstahler, 1998). For disabled patrons who may require additional help in order to access the Web, building accessibility into a library Web site ensures that every patron has equal access to all of the library's resources. In "Design of Accessible Web Pages," authors Berliss, Kraus, and Stoddard (1996) note that "unfortunately computer design assumes use of several physical capabilities or combination of capabilities - sight for viewing the monitor, manual dexterity for typing on the keyboard, and hand-eye coordination for using the mouse, etc." (Berliss, Kraus, & Stoddard, 1996). While it is true that assistive technology helps to alleviate some of these difficulties, accessibility has to be built into the Web site itself (Casey, 1999).

In their often quoted paper entitled, "Electronic Curbcuts: How to Build an Accessible Web Site", Campbell and Waddell (1997) eloquently define the accessibility problem in the following way:

> Because the World Wide Web (WWW) has rapidly advanced from a text-based
> communication format to a graphical format embracing audio and video clip tools,
> persons with disabilities cannot navigate Web sites unless Web pages are designed in
> an accessible format. Just as curbcuts enable persons using wheelchairs to navigate a
> city, electronic curbcuts enable persons with hearing, visual and learning disabilities
> to navigate your Web page. . . . Currently, Universal Design Standards are not fixed
> and have been evolving as part of the efforts of the NII [National Information

Infrastructure]. Specifically, Universal Design calls for the development of information systems flexible enough to accommodate the needs and preferences of the broadest range of computer and telecommunications users, regardless of age or disability. Certain features of Universal Design are evolving in the Internet community to ensure electronic curbcuts. (Campbell & Waddell, 1997)

Authoring tools have made it exceedingly simple for libraries of every kind to design a Web site. As a result the number of libraries with a presence in cyberspace has increased exponentially, with no end in sight. The biggest barrier to Web access, however, remains Web page design. Filling pages with graphics, omitting explanatory text, or the excessive use of columns and frames makes Web pages all but inaccessible to visually disabled users (Kautzman, 1998). With only the ability to read from left to right across a page, many screen readers will ignore structural elements like columns and frames and combine the contents into a nonsensical jumble of words. Similarly, many screen readers cannot distinguish the graphical elements of Web page unless they are enhanced by the use of ALT text which describes the graphic to the visually disabled user (Hinn, 1999; Carnevale, 1999). In an article entitled, "Web's Double-edged Sword: Accessibility vs. Complexity", McKeefry (1998) notes that "it is ironic that all of this information that is going on the Web is creating a huge opportunity, but is also being added in formats that present new barriers. . . . Some common problem areas are pages that include frames, interactive forms, tables, and video" (McKeefry, 1999, p. 140).

The Web Accessibility Initiative (WAI) founded in 1997 as an offshoot of the World Wide Web Consortium (W3C) has the stated mission of pursuing accessibility of the Web through five primary areas of work: ensuring that core technologies support accessibility; developing guidelines for Web content, user agents, and authoring tools; developing evaluation tools for accessibility, conducting education and outreach programs; and tracking

research and development that can affect Web accessibility (W3C Issues Web Content
Accessibility, 1999). In February of 1998, as part of their work, the WAI issued the first of
several draft versions of a document entitled "Web Content Accessibility Guidelines 1.0."
Heralded as a definitive set of guiding principles for Web developers wishing to make their
sites accessible, the WAI provides this explanatory note:

> These guidelines 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. 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, in a hands-free environment, etc.). 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. (Web Content Accessibility Guidelines 1.0, 1999)

Although these recommended guidelines and any revisions must be treated as a work
in progress, library Web sites can be made more accessible by combining a common sense
approach with the WAI recommendations. In a recent press release, the WAI described the
Web Content Accessibility Guidelines as a set of recommendations that do the following:

> Establish stable principles for accessible design, such as the need to provide
> equivalent alternatives for auditory and visual information. Each guideline has
> associated "checkpoints" explaining how these accessibility principles apply to
> specific features of sites. For example, providing alternative text for images ensures
> that information is available to a person who cannot see images. Providing captions
> for audio files makes information available to someone who cannot hear audio. The
> guidelines are designed to be forward-compatible with evolving Web technologies,
> yet enable sites to degrade gracefully when confronted with legacy browsers.
> Specifics on how to implement the checkpoints with the latest versions of mark-up
> or presentation languages such as HTML, CSS (Cascading Style Sheets), or SMIL
> (Synchronized Multimedia Integration Language) are described in a parallel
> "Techniques" document, to be updated periodically. (W3C Issues Web Content
> Accessibility Guidelines, 1999)

According to Tim Berners-Lee, Director of the W3C, "the Web Content Accessibility

Guidelines Explain what to do" (W3C Issues Web Content Accessibility Guidelines, 1999).

Berners-Lee further notes that:

> It has always been difficult to know, when making a site more accessible, which
> changes are critical. These guidelines answer that question, and set common
> expectations so that providers of Web sites and users can be much more strategic.
> The bar has been set, and technologically it is not a very high bar. Some of the items
> in these guidelines will be unnecessary once authoring tools do them automatically.
> Now it is time to see which sites can live up to this. (W3C Issues Web Content
> Accessibility Guidelines, 1999)

In concurrence with the WAI guidelines, Casey (1999) indicates that the initial step in

making a Web site accessible is to determine what makes it inaccessible. Users facing visual,

hearing, motor, learning, and cognitive barriers each encounter different problems and on

many occasions, a remedy for one can create a barrier for another. Keeping the design as

simple as possible is a good starting point for building a barrier-free, fully accessible Web

site. This does not mean that the content presentation has to be bland or boring. It does,

however, mean that every component of every page must be chosen with deliberate intent.

In other words, every element should serve to enhance the content as opposed to being a

distraction or mere window dressing (Casey, 1999).

The Rudiments of Accessible Design

Conceptually, the foundation of accessible design is not complicated or difficult to

understand. In fact, the fundamental elements of Web site accessibility are predicated upon

three very basic concepts: simplicity, clean organization, and consistent navigation.

According to Casey (1999), there are some structural details that can improve the

accessibility of a library Web site. "Keeping the screen uncluttered and using consistent page

layouts aids people with visual and cognitive barriers." Furthermore, Casey (1999) states that

optimal accessibility can be assured by using HTML in such a way so as to convey meaning and not format or layout.

> Some Web site designers try to create a magazine-like display and have resorted to clever techniques to extend the range of HTML. Even though these visual effects have increased the popularity of the Web, they've had a serious impact on the ability of assistive technology to "read" a page. Fortunately, a library Web site is content driven, so many of these design issues can be avoided.

In keeping with Casey's (1999) basic theme, authors Rogers and Rajkumar (1999) stress the importance of three specific goals which should be kept in mind when designing a Web site:

- Simplicity of design - keep design elements to a minimum and repeat the design element pattern.

- Appropriateness - keep the design elements and content appropriate for the audience.

- Function - provide multiple simple ways to navigate through the document - emphasize the content not the navigation function - keep it simple.

In "Making the Web Accessible", Rouse (1999) notes that the provision of information and services for all users always involves the dilemma of style versus functionality. Many times users are fascinated by colorful multimedia Web sites with fancy layouts and sometimes Web authors use tables or frames to convey information. Unfortunately, according to Rouse (1999), "this may lead to an end product that is not suitable or accessible for all users."

The concept of accessible design should not be thought of as being synonymous with dull and boring as is pointed out by Garlock and Piontek (1999) who opine that the

"key to accessible design lies in using multiple approaches. Fun and flashy HTML tags and special features do not need to be avoided altogether. You can combine them with accessible tagging and make your resources available to everyone" (Garlock & Piontek, 1999, p. 72). In other words with the intentional employment of the graceful degradation principle, Web authors are able to put in elements designed to take advantage of the latest and greatest features of newer browsers, but it is done in such a way "that older browsers, and browsers letting users disable particular features, can 'step down' to a method that still allows access to the basic content of the site, though perhaps not as snazzy in appearance" (Dan's Web Tips, 1999).

The Web Content Accessibility Guidelines 1.0 address the issue of graceful degradation by noting that pages that transform gracefully remain accessible despite physical, sensory, and cognitive disabilities, work constraints, and technological barriers. According to the WAI some keys to designing pages that transform gracefully include:

- Separate content from structure from presentation. The content of a document refers to both what the document says and the bytes that make it up. The structure of a document is how it is organized logically. The presentation of a document is how the document is rendered (e.g., as print, as a two-dimensional graphical presentation, as a text-only presentation, as synthesized speech, as Braille, etc.).

- Provide text (including text equivalents). Text can be rendered in ways that are available to almost all browsing devices and accessible to almost all users.

- Create documents that work even if the user cannot see and/or hear. Provide information that serves the same purpose or function as audio or video in ways

suited to alternate sensory channels as well.

- Create documents that do not rely on one type of hardware. Pages should be usable
  by people without mice, with small screens, low resolution screens, black and white
  screens, no screens, with only voice or text output (Web Content Accessibility
  Guidelines 1.0, 1999).

The Role of Assistive Technology

With the introduction of the term "electronic curbcuts" by Campbell and Waddell

(1997), came a heightened awareness of the many technology barriers that often confront

disabled individuals. In "People With Disabilities Reach for Web Access," Goodstein (1999)

provides this very apt analogy:

> Think about sidewalk curbs. For people in wheelchairs, the curb was a cliff, and
> activists lobbied for curbcuts. Now everyone from bicyclists to parents with strollers
> uses curbcuts. Speech recognition technology is a curbcut for the Net. Developed
> as an assistive technology, it has gone mainstream. For people with mobility
> impairments . . . speech recognition can be enormously helpful. (Goodstein, 1999)

At present, there are numerous types of assistive equipment that can be utilized by

disabled library patrons. In order to accommodate users with low vision screen

magnification programs can be added to make a PC or terminal accessible (Lisiecki, 1999).

For blind individuals or those with little usable vision, screen readers are a viable option.

This software produces a synthesized voice output for the displayed text. The screen reader

depends on some knowledge of Web site layout and the accessibility of the site (Kautzman,

1998). Refreshable Braille displays, "allow the text on the screen to reproduce, one line of

text at a time, on a strip where the fingers rest lightly. The device connects to the CPU and

allows for some interaction with the screen" (Kautzman, 1998).

Many adaptations are available to assist those with mobility impairments. Among those most frequently used are modified or alternate keyboards, ability switches, headpointers, and joysticks (Rouse, 1999). "These methods are used in many variations and combinations, based on the abilities and needs of the individual user. The computer treats the input from these methods as if it has been received through the standard keyboard."

It is worthwhile to mention, as do Campbell and Waddell (1997), that the "basic rule for providing access to persons with disabilities is to provide HTML code that can be read by the access technology being used (including text-only browsers and screen readers)" (Campbell & Waddell, 1997). That is to say, for disabled users there is a symbiotic relationship that necessarily exists between the HTML code and the assistive hardware that reads it. "It is important to remember that in order to access Web resources, this technology relies on the Web developer to design pages in such a way that the site content may be understood and interpreted by the assistive devices" (Garlock & Piontek, 1999, p. 61).

Accessibility Testing and Evaluation

There is a general consensus amongst the experts that the design process is not complete until the Web site has been thoroughly tested for accessibility. This is especially true for most libraries where the primarily goal is to develop, design and maintain a user friendly, information-rich environment for all its online patrons including those with disabilities. Garlock and Piontek (1999) suggest that if assistive technology equipment is available, a good approach is to test pages using these tools. Viewing the pages on the same equipment that patrons would use can accentuate any inaccessible areas that may require additional development.

According to Casey (1999), "for the ultimate accessibility test, submit the page to Bobby, a Web site validator. . . . Bobby will analyze single Web pages for browser compatibility and their accessibility . . . based on a list of commonly accepted accessibility barriers." Lisiecki (1999) as well as Garlock and Piontek (1999) further elaborate by noting that Bobby, a Web-based public service offered by the Center for Applied Special Technology, examines the designated URLs and a report is generated that indicates any inaccessibility problems. If the site passes the examination a "Bobby Approved" icon may be displayed which indicates to users that the site is universally accessible (Lisiecki, 1999; Garlock & Piontek, 1999).

The need for an Authoritative Resource

One very important conclusion to be drawn from this literature search is the apparent need for an authoritative and easy to understand resource that specifically addresses the accessibility issues inherent in the creation of a library Web site. Although bits and pieces of applicable information can be gleaned from various sources, it is often overly broad, highly technical, and only peripherally relevant to the development, improvement, and maintenance of a fully accessible library Web site. In other words, there is not, at present, a concise, step-by-step "How To" guide that simply explains and fully illustrates the essential elements of universal design as they apply to library Web sites. Furthermore, the need for an authoritative, but easily understood, accessibility resource is especially critical for today's library professional who is increasingly being called upon to design and develop library Web sites. In an article entitled, "Information Access by Design: Electronic Guidelines for Librarians", it is noted that "the construction of library sites and electronic

instructional materials has rarely gone to professional designers, but instead has become part of 'other duties as assigned' for technically savvy librarians" (Nicotera, 1999, p. 104).

The purpose of this project is to create an Interactive Accessibility Handbook which will allow Web designers to be sure they are meeting the needs of all patrons including those with a wide variety of disabilities. Additionally, an online Assistive Technology Resource Guide will provide librarians and developers with a one-stop resource for the latest in cutting edge assistive technology. Along with informational summaries about the various forms of assistive hardware and software, this guide will furnish links to the companies that specialize in the design, development, and sale of assistive technology equipment. It is important and certainly worthwhile to mention that the intentionally chosen Web-based format for this project undoubtedly allows for the creation of a resource that can easily be revised and updated as needed. After all, there would be little value in creating anything other than a living document that evolves along with the technology about which it reports.

PROJECT DESIGN AND METHODOLOGY

The goal of this project was threefold. First, it was to design and develop an interactive Web-based Accessibility Handbook that was specifically geared to designers of library Web sites. Second, it was to create, through extensive research, a companion Resource Guide that provided essential information regarding assistive technology. Third, it was hoped that with these resources Web site designers would become more aware of the accessibility problems that plague the disabled community and that there are creative solutions for designing Web sites that are both accessible and visually interesting.

The Accessibility Handbook

This interactive "How To" guide was intended to define, explain, and illustrate innovative ideas and practical solutions for the integration of accessible elements into each step of the design process. The topical chapters included are as follows:

- Web site organization

- Navigational tools and options

- Utilization of accessible HTML tagging

- Using client-side image maps

- Appropriate use of color

- Using Style sheets

- Using multimedia (graphics, video, and audio)

- JavaScript and accessibility

- Employing the concept of graceful degradation

- PDF access issues

- Evaluating a Web site for accessibility

This Accessibility Handbook for library Web site developers offers clear concise advice on creating an accessible Web site that is interesting, well-designed, and effective. It primarily focuses on the interface and graphic design principles that underlie accessible Web site design. Through the extensive use of hypertext links, graphical illustrations, sample pages, and simple explanations Web site designers are provided with an easy to understand step-by-step instructional guide for the design of accessible Web interfaces.

It is anticipated that the Handbook will be utilized by Web site designers with varying levels of expertise and thus it is not overly technical or laden with unfamiliar technical jargon. It is, however, expected that users will have had some experience working with HTML. The following appendices are included in the Handbook:

- Glossary of terms

- Online accessibility design resources

- Online resources for evaluating Web pages for accessibility (i.e. Bobby)

- Online assistive technology resources

The Assistive Technology Resource Guide

As a companion to the Accessibility Handbook, the online Assistive Technology Resource Guide was created to be a comprehensive online resource that provides information about the following types of assistive technology:

- Screen magnification software

- Screen reading software

- Text to speech systems

- Voice recognition systems

- Keyboard alternatives

- Mouse alternatives

- Optical Character Recognition (OCR) tools

- Personal Data Assistants (PDA)

- Refreshable Braille display

Explanatory summaries for each type of technology include a technical description of the currently available products as well as the identification of those library patrons who would most benefit from their use. Other included specifics are as follows:

- Platform availability (Macintosh, Windows NT 4.0 Workstation, Windows NT 4.0 Server, Windows 2000 Professional, Windows 2000 Server, Windows 98, Windows 95)

- Language availability (English, French, German, Spanish, etc.)

- Cost of the product

- Company contact information

- Hyperlink to the company Web site

Web site Themes and Organization

In the planning and development stages of this project consideration was given to the themes of accessible design as recommended by the Web Content Accessibility Guidelines 1.0 (1999). It was the intent of the author to not only provide an accessibility resource for creators of library Web sites, but also that the final product itself be a showcase for some of the best and most innovative features of accessible design. Several Web authoring manuals were consulted throughout the duration of the project. These are listed with full citations in Appendix A.

From an organizational perspective, the project Web site reflects a simple hierarchical structure with information that is set out in a logical, intuitively obvious manner. A brief, but descriptive, table of contents on the homepage delineates the discrete sections of both the Accessibility Handbook and the Assistive Technology Resource Guide. Page

layouts are simple, elegant, and consistent throughout with the appropriate use of headers

and ALT text (descriptive text for all images). Although graphics were not used gratuitously,

it was the author's intention to include graphical illustrations that either enhanced or

demonstrated particular concepts. In order to facilitate the retrieval of specific information,

the Web site incorporates a site map as well as an internal search engine that allows for

keyword searching.

How Will Users Find this Site?

The final stage of this project was to successfully market the Handbook and the

Resource Guide to the widest possible audience of Web site designers. In order for the

targeted users to find the site, the following Web marketing techniques were implemented:

- Site registration on popular search engines (Alta Vista, Northern Light, Excite, etc.)

- Site registration on various directories (Yahoo!, Look Smart, Omni Search)

- URL submission to several subject guides (The Argus Clearinghouse, Galaxy)

- URL submission to Metasearch Engines (Dogpile, SavvySearch)

- Use of Metatags to insure proper indexing by search engines and directories

- Title choices that reflect the content of the HTML documents

Additional marketing ideas such as those noted by Carpenter (1998) and Guenther (1999)

included the sending of an electronic flyer to various online discussion lists such as the Web

Accessibility List Serve and the Webmaster Resources Discussion Forum (see Appendix B

for URLS for the discussion lists).

PROJECT IMPLEMENTATION

The project can be viewed at http://senna.sjsu.edu/lmain/isdaccess/home.html. In order to properly implement the proposed plan, it was essential to begin with the formulation of a simple mission statement followed by a set of clearly stated goals. Once these essential ingredients were firmly in place, a project plan was developed in order to effectively manage the implementation process from inception through completion. These initial steps, though somewhat time consuming, served as effective organizational tools over the duration of the implementation phase. Lynch and Horton (1999) in their *Web Style Guide* confirm the importance of these preliminary tasks wherein they state that:

> The first step in designing any Web site is to define your goals. Without a clearly stated mission and objectives, the project will drift, bog down, or continue past an appropriate end point. Careful planning and clear purpose are the keys to success in building Web sites. (Lynch & Horton, 1999, p. 1).

The Mission Statement

In order to adequately represent the spirit of this endeavor, it was felt that the mission statement needed to reflect the themes of intuitive construction and accessible Web site design which had, thus far, prevailed as the guiding principles for the project. Simply put, the mission statement is as follows: the essence of the Accessibility Project is to promote, provide, and enhance the availability of high quality information in the various subject areas related to accessible Web site design and assistive technology. In a format that is intuitively organized, the Interactive Accessibility Handbook and the Assistive Technology Resource Guide will enable developers to create effective, content rich, and visually stimulating library Web sites while also maintaining the principles of universal design.

Implementation Goals

- To create a Web site that is user-centric and audience directed.

- To provide dependable, well-researched, quality information with a strong emphasis on leading edge technology.

- To combine usable content with an intuitive interface that is simple and easy to understand.

- To construct Web pages that are well-designed, consistent in their organization, and free of unnecessary clutter.

- To provide a Web site that is pleasant to use and highly interactive.

- To provide an efficient navigation system.

- To conclude the project by conducting a usability study that gives an approximate measure of the success of the Web site.

Project Plan

The work that was necessary to complete the Web site occurred in phases over the duration of the Spring 2000 semester. Along with the anticipated completion dates, the following plan delineates the various tasks that were accomplished during each phase .

- Phase One: Research and development. Included the gathering of information that comprise the content of the Accessibility Handbook and the Assistive Technology Resource Guide. This phase also included the development of a design plan for building the Web site (completion date - March 1, 2000).

- Phase Two: Implementation of the design plan for building the Web site homepage and the Interactive Accessibility Handbook (completion date: April 1, 2000).

- Phase Three: Implementation of the design plan for the Assistive Technology Resource Guide (completion date - May 1, 2000).

- Phase Four: Implement the marketing plan. Draft the final report which will include an analysis of the completed project, a user study, as well as suggestions for further research (completion date - June 15, 2000).

RESEARCH AND DEVELOPMENT

Gathering the Information

There is little doubt that the value of an educational or informational site is directly related to the quality of its content. This was no less true for the project Web site since it was expected that visitors would be relying upon the content as being accurate and timely. In an article entitled, "Concise, Scannable, and Objective: How to Write for the Web", authors Morkes and Nielsen (1997) discuss the importance of Web site content from a user's perspective.

> Indeed, we have come to realize that content is king in the user's mind: When asked for feedback on a Web page, users will comment on the quality and relevance of the content to a much greater extent than they will comment on navigational issues or the page elements that we consider to be "user interface" (as opposed to simple information). Similarly, when a page comes up, users focus their attention on the center of the window where they read the body text before they bother looking over header bars or other navigational elements. (Morkes & Nielsen, 1997)

Since the goal was to provide visitors with quality content that was up-to-date, dependable, and well-researched it was crucial to develop a set of unique and highly structured online search strategies that would result in the retrieval of the most useful and relevant information. In other words, it was important to formulate accurate system-dependent search queries that quickly and efficiently separated the wheat from the chaff.

The information was gleaned from numerous online sources, including several search engines and proprietary databases including the following:

- AltaVista (http://www.altavista.com/)

- Northern Light (http://www.northernlight.com/)

- Google (http://www.google.com/)

- About.com (http://www.about.com/)

- DialogWeb (proprietary/password protected)

- DowJones Interactive (proprietary/SJSU Proxy Server)

- Lexis/Nexis Academic Universe (proprietary/SJSU Proxy Server)

Although several thousand documents were initially bookmarked for review, fewer than 200 were retained as informational resources for the project Web site. Despite its reputation as a virtual treasure trove of information, the World Wide Web contains thousands of useless documents that lack any sort of authority control. Pages may be outdated, orphaned, deserted, or just plain wrong. As is often noted in the literature, it is extremely important to scrutinize each and every Web site for its veracity as a reliable resource. "Much of the information on the Internet is fraught with inaccuracies, errors, and incorrect data. Validating the information available on the Internet is a critical task" (Connell & Tipple, 1999). Information expert Sawyer (1999) in her article entitled, " The Pied Piper goes Electronic" furthers this notion by offering the following opinion:

> More and more information of dubious merit proliferates on the World Wide Web. This information is highly repetitious, skewed, and often hopelessly inaccurate. . . . Unlike trade magazines, newspapers, and other "archaic" print sources, the Internet does not [verify] its information: There is little copy editing or fact checking. Anything and everything gets circulated in electronic form, including wild rumors, junk science, appalling misinformation, and inane gibberish. (Sawyer, 1999)

Developing a Design Plan

Since the principles of user-centered design played a key role in the development

process, it was vitally important that the entire Web site be intuitively constructed in order to

facilitate ease of navigation. Further, it was determined that the "look and feel" of the site

should be simple but interesting, highly interactive, and above all else, consistent in its

presentation. Over several weeks time, numerous design plans were drafted, tested, and then

discarded as unusable. As it turns out, it was somewhat of a challenge to design a Web site

that was both simple and interesting. Although these goals did seem somewhat

contradictory at first, they formed a complimentary partnership once a consistent

organizational framework was in place. The importance of consistency is echoed by Lynch

and Horton (1999) when they state the following:

> Site design should be built on a consistent pattern of modular units that all share the
> same basic layout grids, graphic themes, editorial conventions, and hierarchies of
> organization. The goal is to be consistent and predictable; your users should feel
> comfortable exploring your site and confident that they can find whatever they need.
> (p. 16)

The design plan included a variety of interactive elements primarily for the purposes

of educating and engaging users. In this context, adding an interactive component was not

about bandwidth-hogging audio or video or three-dimensional animated graphics. It was

about enhancing the instructional process by allowing visitors to test ideas, choose a next

step, or access the information in a personalized way. For this project, interactivity made the

difference between a Web site that simply presents information, and one that actually

captivates the user. Certain interactive features were designed not only to fascinate visitors,

but also to encourage them to visit the site time and again. The use of JavaScript allowed for

the creation of several dynamic browser-based applications that were highly interactive as well as informative.

The Importance of Internal Order

Early on in the design process, it was determined that the ordered simplicity of a hierarchical structure creates an intuitively obvious and familiar way of organizing the Web site's content. In their book *Information Architecture for the World Wide Web*, Rosenfeld and Morville (1998) clearly note that information has been organized into hierarchies since the beginning of time. The authors further this notion by offering the following examples:

> Family trees are hierarchical, our division of life on earth into kingdoms and classes and species is hierarchical. Organization charts are usually hierarchical. We divide books into chapters into sections into paragraphs into sentences into words into letters. Hierarchy is ubiquitous in our lives and informs our understanding of the world in a profound and meaningful way. Because of the pervasiveness of hierarchy, users can easily and quickly understand Web sites that use hierarchical organization models. (p. 37)

In addition to providing a context that was familiar to most users, the hierarchical model provided a structural framework for organizing all of the information that had been gathered during the research process. Incorporating this top-down approach early on in the design process allowed for the identification of the primary content areas of both the Accessibility Handbook and the Assistive Technology Resource Guide. Figure 1 shows an abbreviated representation of the basic hierarchical structure of the project Web site.
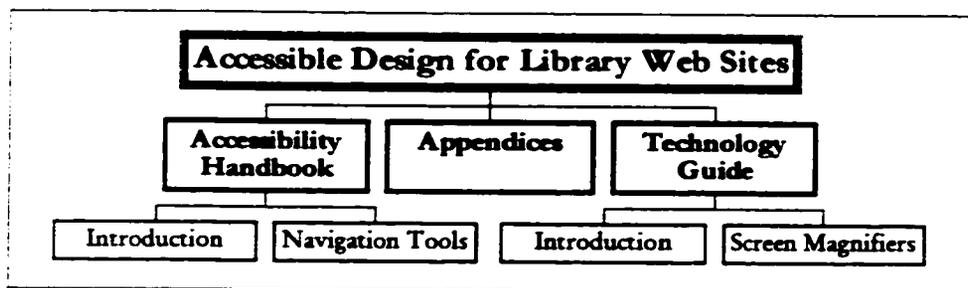
Figure 1. Graphical depiction of Web site hierarchy.

Planning the Home Page - First Impressions Count!

First, with simplicity and consistency as organizational themes, it was critical that the home page be designed to reflect these structural parameters. Secondly, but of no less importance, it was the design of this page that would elicit either interest or apathy. Simply put, visitors would either stay or leave based on their first impressions of the home page. "The design of the [home] page can affect whether or not the user goes beyond the first page. In addition, the design of the page sends a message to the user about the organization" (D'Angelo & Little, 1998).

For the purposes of designing the home page, it was assumed that most visitors would be purposeful in their intent to obtain accurate and timely information regarding various aspects of accessibility. It was also clear that the home page, and for that matter all subsequent pages, needed to be designed so that knowledge-seeking users could find what they needed in the most expeditious manner possible. With this logic in mind, the following principles of audience-directed design were given top priority:

- The purpose and scope of the Web site should be understood easily and quickly.

- Users should be able to find the information they want with efficiency and ease.

- Information should be organized in a logical order.

- Information should be separated into manageable chunks to facilitate information scanning.

- Navigational links should be consistently placed and simple to use.

Creating the Blueprint

Just as architectural building plans are necessary in the physical world, an integral component of the development phase was the actual creation of a viable design blueprint for the entire site. This architectural blueprint not only created a physical rendering of the overall site plan but more importantly, it provided a detailed road map, a tool which became indispensable during the implementation process. Although the Web site was not extraordinarily large or unwieldy, the blueprint was in perpetual use as production guidepost. From a very practical perspective, the blueprint provided an ongoing indication of the project's progression. In other words, it showed with great clarity, what had been done and what needed to be done to complete the project. The blueprint also helped to maintain the integrity of the original design plan insofar as it detailed the complete hierarchical structure of the site including such things as the order of the pages and their titles. With every page from the home page to the destination pages represented on the blueprint, it was relatively simple to begin building the site.

Content Mapping

The content mapping process involved the reformulation of the site's information into usable chunks. Rosenfeld and Morville (1998) describe chunking in the following way:

> The process of content mapping involves breaking down or combining existing documents into logical content components or chunks, thereby separating the

content from its container. A content chunk is not a sentence or a paragraph or a page. Rather it is the finely grained portion of content that merits or requires individual treatment. (p.165)

Although much information was gathered as resource material, most of the site's content, unless otherwise noted, was original material and thus did not require chunking in the traditional sense. Chunking was, however, utilized as a way of synthesizing a great deal of information into the small and highly usable sections that would eventually comprise the destination pages of the Web site. By subdividing each page into discrete units of information, users would be more able to scan the site's contents in order to find the needed information quickly and efficiently.

BUILDING THE WEB SITE

With a Web site blueprint firmly in place, building the Web site was, for the most part, a mechanical, paint-by-numbers process. Although there were a few minor changes that did became necessary along the way, there were no major deviations from the original design plan. The fact that there were only a few minor glitches during the production phase is a testament to the importance of the planning process. Although it was a time consuming and often tedious undertaking, the creation of a detailed plan certainly proved to be a worthwhile endeavor.

This is not to say that the production phase was entirely problem free. There were several technical hurdles that often required further research or the sage advice of an expert. Issues related to emerging technologies and browser compatibility were encountered with the greatest frequency. Other equally important, but more easily solved, problems were editorial in nature. In several instances, it became necessary to make on-the-spot decisions to either rearrange, revise or eliminate content. This was done in order to maintain the goal

of creating an audience directed Web site that combined usable content with an intuitive interface.

Emerging Technologies and Browser Compatibility

In regard to emerging technologies such as cascading style sheets and JavaScript, the importance of testing every bit of HTML code prior to its inclusion as content cannot be over-emphasized. It was thought that for users of the Accessibility Handbook, there is little else that would be more irritating than attempting to implement a cascading style sheet or a JavaScript feature that is inconsistently supported by major browsers such as Microsoft Explorer or Netscape. For the purposes of this project it was felt to be important that the Accessibility Handbook include information regarding the use of emerging technologies, but only after several tests had been run in order to assure that the HTML code was indeed viable on as many browsers as possible.

There were a few unfortunate instances where a particular piece of error laden HTML code was tested and tweaked and tested again, but did not, in the end, produce the specified results as documented by a seemingly reliable Web source. Although erroneous information of this type was excluded as content in the Handbook, it is mentioned here in order to strongly emphasize the importance of testing. For a vivid example of this problem see the CNET tutorial by Schmuller (1998) entitled, "Use CSS to Replace Images." In theory the idea was spectacular insofar as it offered an accessible alternative to the use of graphical images and ALT text. In practice, however, it was nearly impossible to fully implement the HTML code on any browser to any satisfactory degree. Simply put, the HTML code did not work well enough on either Netscape or Explorer to be considered as a viable replacement for the use of GIFs or JPEGs.

Editing for the Web

When comparing the Web page and the printed page there are, without a doubt, similarities and differences in the editing process. Not only did every page of the project Web site require a thorough check for errors in spelling and syntax, but there was also persistent need to massage the content of each page in order to ensure a common voice for the entire site. This was true for both the Handbook and the Technology Guide since they each covered a great deal of information on a wide variety of accessibility-related topics. In order to present users with a cohesive and easily navigable Web site, each page was scrutinized for flow, uniformity, and context. Similar to printed material, it was also imperative to maintain a consistent, albeit dogmatic, approach to page titles, headings, and subheadings. Lynch and Horton (1999) reiterate the importance of titles and subtitles when they offer the following opinion:

> Editorial landmarks like titles and headers are the fundamental human interface device in Web pages, just as they are in any print publication. A consistent approach to titles, headlines, and subheadings in your documents will help . . . readers navigate through a complex set of Web pages. (p. 101)

More so than with traditional paper documents, Web sites, if they are to be useful, must allow users to easily scan the contents to find what they are looking for. In order to achieve an optimal level of "scannability" (Nielsen, 1999, p. 104) each of the following usability factors was considered during the editing process:

- Structure pages with multiple levels of headings in order to facilitate easy access to the information.

- Use meaningful headings that vividly describe what the page or section is about.

- Use bulleted lists or other design elements in order to break up large blocks of text.

- Highlight and emphasize important text in order to catch the user's attention.

The concept of scanning and its relationship to the usability of a Web site is noted by Nielsen (1999) who "found that 79% of . . . test users always scanned any new page they came across only very few users would read word-by-word" (Nielsen, 1999, p. 104). Furthermore, "skimming instead of reading is a fact of the Web, and it's been confirmed by countless usability studies. Those who write for the Web must acknowledge this fact and write for scannability" (p. 104).

USABILITY TESTING

Subsequent to the production phase, an informal usability test was conducted in order to assess the usefulness of the project Web site. Feedback was requested and received from a group of five library professionals all of whom were thought to be representative of the targeted audience. The efficacious nature of small group testing in this context is confirmed by Web usability expert Nielsen (2000) who states the following in his article entitled, "Why You Only Need to Test With Five Users":

> Some people think that usability is very costly and complex and that user tests should be reserved for the rare Web design project with a huge budget and a lavish time schedule. Not true. Elaborate usability tests are a waste of resources. The best results come from testing no more than 5 users and running as many small tests as you can afford. (Nielsen, 2000)

The small sample size is given further credibility by Kuniavsky (1998) who offers this opinion:

> Most designers feel you can flush out the majority of problems in an interface by showing it to only a couple of people. . . . Four to five people seems to be the

optimal number; you see most of the problems you're going to see and you can do the evaluation quickly.

Using e-mail, respondents were asked to read a short synopsis of the project prior to their review of the Web site. Unstructured feedback regarding usability and content quality was then requested in the form of comments and criticisms. The respondents, three university librarians and two middle school media specialists provided some interesting comments. The following is a sampling of what they said:

> I was glad to see you addressed the issue of color contrast, and I liked your use of examples. Even print publishers don't always do this well. I thought color blindness also involved difficulty distinguishing between blue and green. Some of the test patterns relate to this. (G. Carlson, personal communication, May 14, 2000).

> I like that you have focused on the major issues/points without rambling on an on. It's concise and to the point. It looks like you did a thorough job in researching the topic and addressed the most important points that needed to be discussed. (S. Higaki, personal communication, May 6, 2000).

Lessons Learned

Although the general consensus was mostly favorable there were several well-founded comments by three of the five respondents regarding the fact that the site's pages did not fit the screen and thus they were forced to scroll back and forth from left to right in order to see the pages in their entirety. The following comments reflect this problem:

> It looks great. Well done. My only problem is in the format. The pages overflow the display on my monitor. (J. Paul, personal communication, May 13, 2000).

> Maybe it's just me, but I dislike scrolling left-to-right constantly to get at the whole screen. Maybe you could make your vertical button bar more compact to make room for the text on the right side of the screen. Notice, the NCAM site has no horizontal scroll bar at the bottom. (G. Carlson, personal communication, May 14, 2000).

> Web site design and use by the disabled is not an area that I know a great deal about. One comment that I have though, (which may be attributed to the browser I am using) is that I have to scroll to the right because the text goes off the screen. (S. Higaki, personal communication, May 6, 2000).

If only for this one discovery alone, the usability test was worth its weight in gold. The simple fact that users discovered and described a serious design flaw only serves to highlight the importance of usability testing.

Although this was a serious problem, it was a non-fatal error that was easily solved by using relative (i.e. percentage) rather than pixel measurements for the tables and cells on each page. By restructuring the pages in this way, the tables would resize along with the browser window, however the columns and elements would remain proportional to one another. For example, two table columns with widths of 40% and 60% would always retain their proportional integrity regardless of the size of the monitor on which they are being displayed.

In the context of accessibility, this particular problem and the subsequent solution is significant insofar as it exemplifies a design issue with much broader ramifications. A responsible Web developer's repertoire should include the ability to design a site with flexible pages that are resolution independent.

> In other words resolution-independent pages that adapt to whatever size screen they are displayed on. The main principle for resolution-independent design is to never use a fixed pixel-width for any tables, frames, or other design elements. . . . Instead of using fixed sizes, you should specify layouts as percentages of the available space. (Nielsen, 1999, p. 29)

By creating resolution-independent Web pages, designers are in keeping with the principles of universal design where the stated goal is to reach the widest possible audience. This necessarily includes individuals who have monitors in a variety of sizes.

SUGGESTIONS FOR FURTHER STUDY

No longer in its infancy, the World Wide Web in all its ubiquitous glory has become an indispensable information tool for thousands of libraries and countless other educational institutions throughout the world. With its innumerable applications, the Web has come to serve a widely divergent group of users that now includes both "abled" and disabled individuals. There was a time, however, in the not-so-distant past when the term accessibility had little, if any, significance to most Web site developers. Designers believed that as a highly visual medium the Web would be degraded by any attempts to make it more accessible to blind or physically impaired individuals. This, of course, has proven to be utter and complete nonsense. The Accessibility Handbook has clearly demonstrated that with a small amount of effort it is certainly possible to create Web sites that are both visually exciting and highly accessible to the disabled community.

While it is true that enormous strides have been made in the area of accessible design, it is also true that further research is necessary in order to promote continued improvements to the overall accessibility of the World Wide Web. Although emerging technologies such as cascading style sheets (CSS) have the potential to make the Web far more accessible, the use of CSS as a design tool has been somewhat limited due to inconsistent support by the major Web browsers. Additional research is necessary in order to encourage the development of a conforming set of CSS standards that can be easily implemented on all browsers.

With the plain, information-only Web site a thing of the past, it is probably safe to say that the use of design elements such as tables and frames are here to stay. At present, many assistive technology devices such as screen readers have difficulty deciphering the

textual content of pages structured with multi-column tables or multiple frames. This is, to say the very least, terribly frustrating to visually disabled users who, in many instances, depend upon a screen reader as their only means of interpreting Web pages. In other words, without the ability to adequately decipher Web pages using a screen reader, visually disabled users are effectively cut-off from the World Wide Web and all it has to offer. Web developers and technologists must remain diligent in their quest to further improve the assistive devices that provide much needed lifelines for disabled users. The goal of future research should be to provide handicapped users with devices that seamlessly interpret the contents of any Web page no matter how complicated its structural elements happen to be.

For the Web designers who are aware of the importance of accessible design, it is essential that they remain conscientious in their efforts to carefully consider who they might be excluding if their pages are not built to degrade gracefully. For those who continue to build inaccessible Web sites, it is crucial to find innovative ways to educate these designers and developers regarding the principles of universal design.

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APPENDIX B: URLs for Marketing Resources

Search Engine Registration

Alta Vista: http://www.altavista.com/cgi-bin/query?pg=addurl.

Northern Light: http://www.northernlight.com/docs/regurl_help.html.

Excite: http://www.excite.com/info/add_url.

Directories Registration

Yahoo!: http://docs.yahoo.com/info/suggest/.

Look Smart: http://www.looksmart.com/.

Omni Search: http://www.comstart.com/c/suggest.html.

Subject guides URL submission

The Argus Clearinghouse: http://www.clearinghouse.net/submit.html.

 Galaxy: http://galaxy.einet.net/cgi-bin/annotate?/galaxy/.

Metasearch Engine URL submission

Dogpile: http://www.dmoz.org/add.html (Open Directory Project).

SavvySearch: http://www.savvysearch.com/submit.

Accessibility Discussion Lists

Web Accessibility List Serve: http://www.webaim.org/training/WebAcc.htm

Webmaster Resources Discussion Forum: http://www.webmaster-resources.com/.

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APPENDIX C - Web Site Screen Shots

Accessible Design Home Page - Netscape

File Edit View Go Communicator Help

Back Forward Reload Home Search Netscape Print Security Stop

Bookmarks Location: http://serra.sjsu.edu/main/redaccess/home.html What's Related

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Graphics.
If proper coding has not been used, a graphic is noted by screen readers and text-based browsers as being present without an explanation of what it is or how it relates to the page content. To make graphics accessible, simply provide an alternate text description (ALT-TEXT). Run your mouse over the picture to read the description and then look at the HTML code below.

```
<IMG SRC = "bridge.gif" ALT = "Golden Gate Bridge Photo" >
```

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Design Checklist
- Making Toolbars and Buttons Accessible.
- Using Links that Convey Meaning
- Using Navigation Tools to Provide Information about Site Layout.
- Understand that Everyone is Different

Making Toolbars and Buttons Accessible.

Two of the most frequently used navigational aids are graphical toolbars and buttons, both of which are inaccessible to a screen reader. The text on these popular devices cannot be read by screen reading software without the inclusion of descriptive ALT text. Run your mouse over the images below to see how ALT text works.

STONY BROOK

For users that have cognitive disabilities and low vision, it is often difficult to determine the organizational structure of your site without the inclusion of large, prominently displayed, easy to read buttons and toolbars. Large graphical buttons also enable users with mobility impairments to move comfortably through your site,

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Interactive Accessibility Handbook

Technology Details
- General Description
- Featured Products
- Additional Resources

General Description

Most computer software is now designed to be used by controlling an on-screen pointer with a mouse or other pointing device. Some people do not have the required degree of manual dexterity and the hand-eye coordination that is required to move the pointer or to press the buttons. There are a number of alternative devices that can be utilized to solve this problem.

Alternative Mouse systems enable individuals who experience difficulty with conventional mouse designs to use computers. Mouse Alternatives are devices that let users move the cursor more easily with or without their hands. Devices include trackballs, joysticks, touchscreens, headpointers, and touchpads.

Featured Products
- **Headmaster Plus** by Prentke Romich.
- **HeadMouse** by Origin Instruments Corporation.

Headmaster Plus

Glossary of Terms

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

ALT-TEXT

Descriptive text information accompanying an image or graphic embedded in the HTML. When a user chooses not to view graphics, or uses a text-based browser, this is displayed instead of the image that it is associated with. The format is

<IMG SRC="image.gif" ALT="Description">

Animated GIF

A GIF graphic file, which consists of two or more images shown in a timed sequence to give the effect of motion.
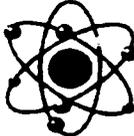
ASCII

ASCII is an acronym, short for the American Standard Code for Information Interchange. It is the code which most computers use to represent ordinary text. Note that it was originally intended for domestic use and was written in the 1960s, so the number of characters it defines is fairly small, basically the digits, upper and lower case English characters, some punctuation characters and "control characters". Recent international standards have established other ways to code