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WEB ACCESSIBILITY, E-LEARNING, AND ACADEMIC LIBRARIES

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Abstract

Awareness of accessibility issues alone is the first step for potentially providing accessible resources to all online users, disabled or not. In addition to providing an overview of what encompasses the definition of disability in North America, common web barriers associated with accessibility, and the tools available for evaluating the accessibility of web resources, this review focuses on the available research studies applicable to the accessibility of specific remote-accessed, web-based products provided by academic institutions that that are directly, and indirectly, used for e-learning. Literature discussing how (academic) libraries and organizations can help in the provision of accessible web resources is also presented.

Keywords: Accessibility, academic libraries, e-learning, distance learning, learning management systems, OPAC, persons with disabilities, web resources, web validators

1. Introduction

"Growing numbers of individuals with disabilities have access to computers, assistive technology, and the Internet", but this does not mean that all online resources are accessible [Burgstahler, 2002b]. Web accessibility is a growing issue for information centers since many web resources are not designed for persons with disabilities. In the United States, (amended) sections 504 and 508 of the American Disabilities Act (ADA) mandate that Web material be accessible for disabled users [Burgstahler, 2002b; Yu, 2002]. Adhering to this mandate, the World Wide Web Consortium's (W3C) Web Accessibility Initiative provides web designers free access to information pertaining to the necessary web standards and guidelines for making accessible sites [Axtell and Dixon, 2002]. However, it appears that creating universally accessible web information is still a work in progress. Yu states that this slow progress is due to a "lack of awareness and professional preparation, accessibility implementation handled on an *ad hoc* basis, and relying on the utilization of assistive technology" [2002].

Web accessibility studies for people with disabilities are a part of a recent trend in North American library research. In order to promote universal accessibility to information for all library users, focus is placed upon evaluating the accessibility of university web sites, library databases, library catalogues (OPAC), as well as online learning resources and services; all of these online resources are integral in enabling

"learners to interact more with the Internet to obtain resources and practice their Internet skills, which can be invaluable tools" for life-long learning [Opitz, 2002].

With the increased offering of educational web resources that can be accessed on or off campus, it seems reasonable that this would increase scholastic opportunities for persons with disabilities [Black 2005; Oravec, 2002]. However, it is up to the institutions and their support centers, such as libraries, to ensure that their resources and services are accessible to their respective community. This paper first provides an initial overview of what encompasses the definition of disability in North America, common barriers associated with accessibility, and what tools are available for universities and libraries to help provide accessible resources. Next, the available research studies applicable to the accessibility of specific online, web-based products indirectly and directly used for e-learning are examined. Finally, information pertaining to how (academic) libraries can help in the provision of accessible web resources is discussed. Awareness of accessibility issues is the first step for potentially providing accessible resources to all users, disabled or not.

2. Background Information

2.1. Definition of Disability

It is important to have an understanding of what the term *disability* entails when examining the accessibility of web-based information. The *Ontarians with Disabilities Act, 2001, Bill 125*, states that a **disability** is:

> any degree of physical disability, infirmity, malformation or disfigurement that is caused by bodily injury, birth defect or illness and, without limiting the generality of the foregoing, includes diabetes mellitus, epilepsy, a brain injury, any degree of paralysis, amputation, lack of physical co-ordination, blindness or visual impediment, deafness or hearing impediment, muteness or speech impediment, or physical reliance on a guide dog or other animal or on a wheelchair or other remedial appliance or device [Accessibility Ontario, 2001].

The Accessibility in Distance Learning website from the University of Maryland University College supports the aforementioned definition by providing further detail and examples of what constitutes mobility, sensory, speech, health, age-related impairments and learning disabilities [2005]. Burgstahler's article, "Distance Learning: Universal Design, Universal Access" also reiterates the list of impairments and disabilities that call for the provision of accessible web resources, plus extends this list by providing concrete examples of accessibility barriers for each disabled user group [2002b].

The more that academic educational institutions and libraries understand the wide scope of disabled users they might or could be serving, the better they will be able to take the appropriate steps of providing accessible resources.

2.2. Web Software and Disability

To help better address accessibility issues, the World Wide Web Consortium's Web Accessibility Initiative has created a set of web accessibility standards, based on accessibility legislature from the American Disabilities Act, for designers to follow [2005]. WAI provides comprehensive, standardized guidelines and checklists for web developers to follow when creating or revising a site to meet accessibility needs

[W3C, 1999]. These standards, called the Web Content Accessibility Guidelines 1.0 (WCAG) are broken into three stages, or *priorities* [W3C, 1999]. Priority 1 accessibility is what all web sites, especially those for government and related organizations, "must" meet [W3C, 1999]. Priority 2 accessibility provides criteria that web designers "should" take into account, while Priority 3 standards *might* be considered to further web accessibility [W3C, 1999]. Currently WAI is working on the creation of the Web Content Accessibility Guidelines 2.0 [W3C, 2005b]. The working draft of these guidelines build upon what is already established by WCAG 1.0 while attempting to "apply guidelines to a wider range of technologies and to use wording that may be understood by a more varied audience" [W3C, 2005b]. It is important that universities and their respective libraries understand and attempt to apply these guidelines when offering remote e-learning services and resources.

Previous studies indicate that adaptive software can help someone who is physically or visually disabled access the same Web-based information as his/her 'abled' counterparts. However, the process of gathering this information by the disabled user can be problematic on many levels [Stewart, 2002]. Byerley and Chambers state that "many Web-based resources are not designed with an 'eye' toward accessibility, causing tremendous frustration for users with visual impairments" [2002]. Most problems encountered by the impaired user lie within the design of the web interface not being compliant with the technology that is being used to access the information [Sloan et al, 2000; Stewart, 2002]. Problematic areas include:

- The lack of (or the inclusion of vague) *alt tags* to describe the web page's visual information (such as images, graphics, links, etc.) [Axtell and Dixon, 2002; Lewis and Klauber, 2002; Takagi et al, 2004].
- The inclusion of *frames* or *tables* to organize information cannot always be adequately relayed to the user by the screen-reader, especially if they are not labeled accurately [Hoffman and Battle, 2005, Stewart, 2002].
- Some forms of *scripting* (when left activated), such as Java Script, and/or non-HTML files can interfere with the adaptive software's performance [Hoffman and Battle, 2005; Stewart, 2002].
- PDF files are usually unreadable by screen-readers [Stewart, 2002].
- Certain portions of the search interface cannot be accessed by using the TAB key or by keyboard (e.g., hot keys) in general [Hoffman and Battle, 2005; Stewart, 2002].
- Some forms of pop-up menus and/or windows can pose accessibility problems [Lewis and Klauber, 2002].
- A lack of universal terminology or design used to clearly express the various functions/options on the web page [Coonin, 2002; Hoffman and Battle, 2005; Horwath, 2002].

Unfortunately, not all designers of web-based information take into account that there are accessibility standards based upon the previously mentioned sections of the American Disabilities Act.

2.3. Web Validation Tools

Although a variety of methods can be applied to check the accessibility of web-related material, a standardized method that is available is through the use of validation software. A web validator is a standardized tool that checks HTML code for conformity to predefined accessibility standards. Most Web validating tools check for accessibility standards that are established by W3C's Web Accessibility Initiative [2005]. These standards are based on pre-existing legislature from the Americans with Disabilities Act, Section 504 of the Rehabilitation Act and Section 508 of the Rehabilitation Act Amendments [W3C, 2005]. Several web validators that assess standardized criteria include:

- **A-Prompt:** a validation tool from the University of Toronto that evaluates the accessibility of Web pages while following standards set by Web Accessibility Initiative. It is free to download. (http://aprompt.snow.utoronto.ca/index.html)

- **WebXACT:** formerly known as Bobby, it is a validation tool that evaluates the accessibility of Web pages while following standards set by the Web Accessibility Initiative. Its online version allows for free access. (http://webxact.watchfire.com/)

- **Wave 3.0:** an online validation tool that is similar to A-Prompt and Bobby and is powered by WebAIM (Web Accessibility in Mind). Similar to A-Prompt and Bobby, it is free to use. Wave 3.5 is currently being developed. (http://www.wave.webaim.org/index.jsp)

- **InFocus:** accessibility validation software available from SSB Technologies. Interested users must register for a free 10-day trial. The education/government use version costs $1,277.87 Can. (http://www.ssbtechnologies.com/products/InFocus.php)

- **AccVerify:** from HiSoftware Solutions, AccVerify is another brand of validation software. A 15-day trial version is available to order. (http://www.hisoftware.com/access/newvIndex.html)

In their 2003 study, Harrison and O'Grady evaluated the effectiveness of the several of the aforementioned web validators. Although these are useful tools for universities and libraries in assessing the accessibility of their web resources and services, it is important to keep in mind that they are only standardized tools. The problem with validation tools is that they "merely check if the HTML tags" are compliant, not necessarily if the web resources are fully accessible in terms of usability and navigability [Takagi et al, 2004]. Manually checking the source code for the web resource and/or using screen-reading software while following the accessibility checklist provided by WCAG should also be done in accessibility testing in order to fully assess all potential barriers [Harrison and O'Grady, 2003; Mankoff, Fait, and Tran, 2004].

2.4. Accessibility Research

From the available literature pertaining to web accessibility, only a handful of published studies have attempted to research and evaluate the accessibility of specific

online, web-based product interfaces used for academic research and learning. Most of the studies available have focused on evaluating online databases indexing article citations, abstracts, and/or full-text. These studies include evaluative research by: Bowman [2002], Byerley and Chambers [2002], Coonin [2002], Horwath [2002], McCord, Frederiksen and Campbell [2002], Riley [2002], Stewart [2002], and Stewart, Narendra, and Schmetzke [2005].

The accessibility study by Bowman evaluates three selected databases by applying an ordinal rank to each predefined accessibility characteristic [Bowman, 2002]. Over a specified schedule, Bowman used the adaptive screen-reading software, WindowEyes, to assist in her evaluation. Like Bowman, Byerley and Chambers conducted a similar study. Their study involved the researchers using JAWS and WindowEyes along with following the ADA Section 508 guidelines to evaluate two similar databases [Byerley and Chambers, 2002]. Although the respective databases evaluated at that time were relatively accessible, some complications were reported when accessed using screen-reading software [Bowman, 2002; Byerley and Chambers, 2002]. This reinforces the need for product developers, vendors, and libraries to keep current with accessibility standards and to avoid relying on only one method (e.g., validators) when testing for potential accessibility barriers [Byerley and Chambers, 2002].

Coonin, McCord et al, and Riley's respective database accessibility studies followed similar methods. All three studies involve the use of several adaptive technology tools, such as JAWS and Bobby plus Section 508 standards, to assist in the evaluation of pre-selected databases (or in Coonin's case, e-journals) [Coonin, 2002; McCord, Frederiksen, and Campbell, 2002; Riley, 2002]. Meanwhile, the respective database accessibility studies by Horwath [2002] and Stewart [2002] conduct similar surveys that present nominal data generated from visually impaired participants. Later, Stewart, Narendra, and Schmetzke would take database accessibility studies one step further by also evaluating usability [2005]. Their findings suggest that many online databases are compliant with basic accessibility guidelines, but are generally not "user-friendly" for persons with disabilities using adaptive software, such as screen-readers [Stewart, Narendra, and Schmetzke, 2005]. This limitation implies that vendors and designers of these products are not necessarily using alternative methods for checking accessibility adherence, therefore ignoring a particular segment of users.

Two studies that are distinct from the previous set of web database interface accessibility studies involve the assessment of several library catalogue (OPAC) systems. One study, by Axtell and Dixon, evaluates the accessibility of Voyager 2000, a popular academic library catalogue system [2002]. Meanwhile Johns evaluates a relatively new OPAC system, called iPac 2.0 [2002]. Although the OPAC systems evaluated in each respective study only presented a limited number of accessibility issues, accessibility barriers are contingent to the development of the product by the issuing company and/or the features that can be manipulated by library staff [Axtell and Dixon, 2002; Johns 2002]. The limitation to both studies: each have respectively only focused on one of the several types of OPAC products used by academic libraries in North America. This is an area that needs further research since almost all users will need to consult the library's online catalogue to locate materials that are relevant to their studies and research.

In addition to the aforementioned studies focusing on the accessibility of databases and library catalogues, there are a handful of studies that directly relate to accessibility and distance learners. Using different methodologies, two respective

studies evaluate the accessibility of online learning courseware, also referred to as learning management systems (LMSs) [Johnson and Ruppert 2002]. The 2002 study by Johnson and Ruppert evaluates the accessibility of online courseware developed by Blackboard 4.0, Blackboard 5.0, Prometheus 4.0, and WebCT 3.0, while Harrison's paper refers to the results of the "Inclusion in an electronic classroom" study, which examines the accessibility of Blackboard 4.0, Web Course in a Box, Mallard 2000b, WebCT 2.1, Virtual-U 2.5, and Topclass 3.1 [2002].

Although upgraded versions of each respective LMSs and assistive software packages used by persons with disabilities have surfaced since the time of the aforementioned studies, it is still important to note that all online courseware packages contained a variety of WCAG Priority 1 to Priority 3 accessibility barriers [Harrison, 2002; Johnson and Ruppert, 2002]. Accessibility barriers ranged from lack of ALT tags for images and/or buttons, inaccessible chat rooms due to the use of JavaScript, pop-up windows, and inadequate labeling of frames and/or tables [Harrison, 2002; Johnson and Ruppert, 2002]. Unfortunately, accessibility barriers associated with online courseware can result from the product developers and/or the program facilitators due to the lack of familiarity, or the choice to ignore, accessibility and universal design standards [Harrison 2002; Johnson and Ruppert, 2002; Oravec 2002]. These aforementioned standards should be considered by online course facilitators (which can include partnerships with libraries), when selecting an LMSs package and when customizing such package so that the needs of all learners are appropriately accommodated.

3. What Can Libraries Do?

The accessibility of online learning and research resources "requires the involvement of all stakeholders," such as web developers, product vendors, university instructors, program directors, courseware designers, librarians, persons with disabilities advocates, and most importantly, students representing the various types of learning needs (e.g., visual, auditory, and/or kinesthetic) and abilities [Burgstahler, 2002b]. Although academic libraries do not always play a direct role in the creation of the online resources they offer access to, it is their responsibility to make sure that all resources are accessible to every facet of their user community, including persons with disabilities. In their respective articles, Black and Burgstahler provide a series of steps that academic libraries can follow for ensuring accessible online services and resources. Several of these steps from Black's [2005] and Burgstahler's article [2002] include:

- Check to see what policies the respective government and university have in place for ensuring accessibility.

- Establish, review, and renew an accessibility plan/policy statement specifically for the library.

- Assign specific library staff members (management, information technology, librarians, etc.) for ensuring that accessibility standards are maintained and revised as necessary.

- For online resources and services that are created and maintained by the library, ensure that all pages validate with current standards, while fixing "simple" errors immediately.

- Advocate for accessible online resources and services purchased from outside organizations (e.g., vendors), while testing previously acquired resources for accessibility, then contact the product vendor (if necessary) to see how accessibility barriers can be resolved.

- Assign a qualified library staff member as a contact point for persons with disabilities.

- Collaborate with the respective university's Office for Persons with Disabilities for providing training and current awareness information to all stakeholders (e.g., library staff, university staff, students, and faculty, vendors, etc).

- Encourage and enlist the expertise of persons with disabilities registered with the respective university.

These aforementioned steps recommended for libraries would be further enhanced if organizations, such as the American Library Association (ALA), addressed accessibility in their official standards and guidelines. Currently the Association of College & Research Libraries (ACRL), a division of the ALA, does not include a section about accessibility in their *Guidelines for Distance Learning Library Services* [2004]. However, this might change with its pending revisions [National Centre on Disability and Access to Education, 2005].

4. Conclusion

The research studies examined here help to provide a general idea of the accessibility issues associated with a select number of online research tools and resources offered by academic institutions in North America. Additional research in this area of accessibility is necessary in order to provide further insight into the accessibility of the various online research tools offered by academic institutions. From the literature examined, the myriad of online resources that are provided by academic institutions for the purpose of learning and research vary in how they adhere to the accessibility standards and guidelines established by the WCAG. Some of the resources evaluated through the respective research studies were found to contain accessibility issues for persons with disabilities using assistive software, such as screen-readers, to access information. This suggests that alternative evaluation methods need to be used to help ensure accessibility.

It does appear that many organizations, educational institutions, and most importantly, libraries, are trying to accommodate their respective population of learners by providing access to a number of online resources and services. When considering the diverse group of users that they serve, these providers of online learning sources need to take persons with disabilities into consideration when developing or selecting LMSs packages, research databases, e-journals, web sites, OPACs, etc. The accessibility of these resources is a critical factor in providing information for all users, abled or disabled. By providing resources and services that are inaccessible,

specific groups of online learners are alienated from actively, independently, and successfully participating in the world of academia. It is up to e-learning providers and their associations to develop a protocol for providing and promoting the accessibility of all online materials.

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