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Briefings from the CFFC

#16 Universal Design and the Americans with Disabilities Act: Not All Systems Are Created Equal—How Systems Design Can Expand Information Access

Sharon Farb

Today information technologies are embedded in all aspects of our lives. According to the U.S. Commerce Department, information and its related products and services now comprise the fastest-growing global market.¹ The National Information Infrastructure (NII): Agenda for Action states, “the free flow of information between the government and the public is essential to a democratic society.” Libraries have historically played a critical role in providing access to print and digital resources and continue to do so today. According to the American Library Association there are an estimated 122,461 libraries of all kinds in the United States today.² Of the 15,718 public libraries nationwide, 83.6 percent are connected in some way to the Internet and 73.3 percent of those offer Internet access to the public.³ The 1997 National Survey of U.S. Public Libraries and the Internet found few libraries actually provide special software or hardware for persons with disabilities. According to the survey only 15.4 percent of respondents indicated that they have made access accommodations to their online catalogs and other automated information systems. To achieve this goal of free flow of information, libraries must make universal access and adaptive technologies available for all digital library resources and services. Universal access must be a priority for all libraries, especially those with Online Public Access Catalogs (OPACs). The NII specifically highlights the importance of universal access to ensure information equity: “As a matter of fundamental fairness, this nation cannot accept a division of our people among telecommunications or information have and have nots.”⁴ Electronic information must be acquired, stored, cataloged, and archived in formats that provide universal access rather than in complex proprietary formats. Library OPACs that employ files stored solely as graphical images are not easily accessible when using standard Braille and speech devices. In

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addition, software relying on graphical user interfaces (GUI) increasingly requires powerful, large-memory systems to run routine applications. Many users without such high-end hardware, who want access to digital information resources, may not have access. The exponential growth of digital information technologies and graphical multimedia formats presents both challenges and opportunities for providing information access to people with disabilities.

This article provides (1) a working definition of universal design; (2) a brief discussion of barriers traditionally faced by people with disabilities in accessing library information systems, including library OPACs, collections, materials, and services; (3) legal guidelines and recent cases regarding information system accessibility including ADA compliance requirements for libraries in higher education; and (4) a template for universal access system design including emerging standards and specifications that can be used to guide system designers.

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[Sharon E. Farb](#) |
Digital Licensing
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University Librar
Research Librar
Angeles, Californi

What is Universal Design?

The concept of universal design originates from architecture and product design fields. The goal of universal design is to accommodate the widest spectrum of users, which in turn increases commercial success. Architects and product designers who practice universal design create structures, products, and spaces that are designed from the outset to be used by all individuals, including people with disabilities. Universal design—when successful—precludes the need for the costly retrofitting of existing structures, products, and systems.

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Library Access Barriers for People with Disabilities

The mission of American libraries is to provide universal access to information, collections, materials, and services. When passing the Americans with Disabilities Act of 1990 (ADA),⁵ Congress estimated that over fifty million Americans have one or more disabilities. Congress further noted that society has historically isolated and segregated individuals with disabilities and, despite some improvements, such forms of discrimination against those individuals continue to be a serious and pervasive social problem.⁶

Individuals with disabilities are part of every demographic group. Thus regardless of library type or location, individuals with disabilities represent an identifiable component of the constituencies libraries serve. However, it is well known that persons with disabilities have historically been underserved by libraries in physical space. Since the adoption of the ADA, physical barriers to access for users with disabilities have been improved and continue to be addressed. In the digital environment, barriers to information and services are just beginning to be identified and addressed. The compliance obligations ADA imposed upon libraries present an opportunity to improve access in both the physical and digital environments, not only to traditionally underserved

communities such as people with disabilities but also to all library users.

Digital information systems, including library OPACs, present a new generation of barriers to persons with disabilities. Generally first-generation library OPACs utilized a character-based information system. Character-based information systems, unlike most Web-based OPACs which rely on a GUI, are readily accessible by people with disabilities, with print impairments in particular (people with blindness, low vision, certain learning disabilities, and orthopedic disability that makes reading physically difficult). These systems provide accessibility due to the relatively straightforward conversion of screen characters into voice output, large print, and Braille. In contrast, second-generation OPACs and other library information systems that rely on the Web and GUIs can provide users with a wider variety of document formats including multimedia applications. However, the GUI environment can present a range of challenges to the print-impaired user, from bitmapped text, images, and icons that do not convert to voice output or Braille to variable screen layouts (such as frames) that may be difficult or impossible for a user who is blind to see.

Many library systems developers do not have expertise in adaptive computing technology and its integration into online library information systems. A number of design specifications and emerging standards have been developed to guide systems developers when building and retrofitting existing library OPACs and digital information systems and services. These guidelines collectively represent much of the current state of computer and information accessibility design knowledge. Disability access specifications and standards are areas of concern not only to system designers and developers, but also to library administration, library computing services, reference, instructional services, and so on. These are the units that will be responsible for advocacy, design, implementation, training, and ongoing support and service for an online information system that is accessible to users with disabilities.

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Information System Accessibility Legislation and Policies

The Requirements of the ADA

The ADA prohibits discrimination against persons with disabilities in the areas of employment, public accommodations, state and local governmental services, transportation, and telecommunications. Pursuant to Title II of the ADA, which became effective on January 26, 1992, any public entity must make its programs, activities, and services readily accessible to and usable by persons with disabilities unless doing so would result in a fundamental alteration in the nature of such programs, activities, or services, or would result in undue financial and administrative burdens. Libraries are public entities within the meaning of Title II, and thus the ADA requires that all library programs, services, and activities be readily accessible to persons with disabilities. In this regard, Title II provides certain general guidance for libraries in ensuring compliance, as follows:

Program access can be provided by, among other methods, reassigning services from inaccessible to accessible locations, providing auxiliary aids (such as note takers, qualified sign language interpreters and readers, taped texts, assistive listening devices, large print, Braille, or ASCII diskette materials), redesigning equipment, modifying policies,

altering existing facilities to remove architectural barriers, or constructing new accessible facilities.

In order to ensure adequate communications with persons who have hearing, vision, or speech impairments, a library may supply assistive listening systems, television and video captioning, telecommunication devices for the deaf (TDD), Braille, large print, and so on.

All special programs, social events, readings, lectures, or similar events (e.g., exhibits) must be held in architecturally accessible locations.⁷

Several recent cases involving access to library resources in higher education reflect a growing awareness for the need for universal design and accessibility for all library and information resources and services. This section will highlight two recent Office of Civil Rights (OCR) cases. The OCR cases at California State University Los Angeles and Loyola Marymount University clarify the ADA accessibility requirement for information services in both public and private higher education. Following the discussion of recent cases in higher education there is a summary of legislation that highlights the trend to provide equitable information access by calling for universal design and access in a variety of communication environments.

California State University Los Angeles

In 1996 OCR received a complaint against California State University Los Angeles (CSULA), alleging the university failed to provide access for blind and low-vision students to “library resources, campus publications, and its open computer laboratories located within the various departments.”⁸ After an investigation, OCR issued a letter of findings on April 4, 1997. The OCR letter included clarification of the term “communication” within the context of the ADA Title II requirement that public colleges and universities take appropriate steps to ensure that communications with persons with disabilities “are as effective as communication with others.”⁹ OCR held that “communication” includes the “transfer of information, (including but not limited to) the verbal presentation of a lecturer, the printed text of a book, and the resources of the Internet.”¹⁰

OCR outlined three criteria for determining comparable communication efficacy for persons with disabilities: (1) timeliness of delivery, (2) accuracy of the translation, and (3) provision in a manner and medium appropriate to the significance of the message and the abilities of the individual with the disability. The courts have held that a public entity violates its obligation under the ADA when it simply responds to individual requests for accommodation on an ad hoc basis versus establishing a comprehensive policy in compliance with Title II in advance of any request for auxiliary aids or services.

In the CSULA case, OCR provided technical assistance on the subject of access to library resources by visually impaired persons that can be useful to library administrators and information system designers. In the Letter of Findings, OCR clarified a commonly asked question regarding exactly what resources a library is obligated to provide in an accessible medium. OCR stated, “The short answer is any resource the library makes available to patrons without disabilities must be made accessible to blind patrons. This includes the library catalog, OPAC, the archived microfiche, daily newspapers, and the Internet (if it is a service provided to sighted persons).”¹¹ Given the OCR findings in CSULA, libraries in

higher education would benefit from incorporating universal design in the planning and implementation of any new information services. As more and more information resources are becoming available in digital forms and using multimedia or graphical formats, libraries must comply with the mandate to make any resource the library has available to users without disabilities accessible to blind and low vision users. Large institutions can no longer use the excuse that their budgets prevent them from complying with universal access as required by the ADA.

Loyola Marymount University

In 1992 OCR issued a Letter of Findings in response to a complaint from a visually impaired student attending Loyola Marymount University (LMU) in Los Angeles. Among its findings OCR noted that “at the time of the investigation, none of the computers that LMU made available to nonhandicapped students had been equipped to be accessible to a visually impaired student.”¹² OCR ruled that “LMU has a responsibility under Section 504, as set out in 34 C.F.R. Section 104.44 (d) to make its computer services accessible to the visually impaired student upon request.”¹³

The ADA requirement that public colleges and universities take appropriate steps to ensure that communications with persons with disabilities “are as effective as communication with others” can be accomplished by utilizing principles of universal design as early in the process of system design as possible.¹⁴

Assistive Technology Act 1998 PL 105-394

On October 5, President Clinton signed the Assistive Technology Act of 1998. This legislation aimed to promote greater interest in assistive technologies within the federal government and the private sector, address the unmet technology needs of individuals with disabilities, and provide methods enabling people with disabilities to purchase assistive technologies. The Assistive Technology Act builds on the “Tech Act” (Public Law 100-407) that was enacted in 1988. The Tech Act supports all fifty states in providing for the technology needs of the fifty million American citizens with disabilities. Since the enactment of the Tech Act, every state has established programs that promote assistive technologies to people with disabilities. The Assistive Technology Act authorizes the development of a national online resource and distance learning center for people with disabilities where information can be obtained on the latest assistive technologies. In addition, support for universal design of accessible information systems and services is included in section 213 of the Assistive Technology Act which provides for “universal design in products and the built environment.”

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Universal Access System Design

The Current State of the Art

In 1997 researchers from the Center of Universal Design (TCUD) defined universal design as “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation and specialized design.”¹⁵ The Trace Research and Design Center (Trace), a nonprofit organization widely regarded as the leading research, development, and resource center in the area of access to computers by people with disabilities, defines universal design as “the process of creating products (devices, environments, systems, and processes) which are usable by people with the widest possible range of abilities, operating within the widest possible range of situations (environments, conditions, and circumstances).”¹⁶ Advocates of universal design from TCUD developed seven universal design principles that can be applied to guide the design process, evaluate existing designs, and educate designers and consumers about the characteristics of more usable products and environments. TCUD’s seven principles of universal design as follows:

1. Equitable use: the design is useful and marketable to any group of users.
2. Flexibility in use: the design accommodates a wide range of individual preferences and abilities.
3. Simple and intuitive use: use of design is easy to understand.
4. Perceptible information: the design communicates necessary information effectively to the user.
5. Tolerance for error: the design minimizes hazards and adverse consequences of accidental or unintentional actions.
6. Low physical effort: the design can be used efficiently and comfortably.
7. Size and space for approach and use: appropriate size and space is provided for approach and use.”¹⁷

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Universal Access System Design Framework

A Template for Universal Design¹⁸

The template for universal design is an outline of the components necessary for planning and implementation of a universal design project. As the preceding cases indicate, libraries are responsible for providing “communications as effective as those provided users without disabilities.”¹⁹ While in many cases library OPACs are provided by outside systems vendors, libraries are obligated under the ADA and other federal legislation to recommend design specifications that provide as effective communication for people with disabilities as for users without disabilities. The four parts of this template can be used as a checklist to support the planning, retrofitting, and identification of access barriers.

1. Create a statement on the level of accessibility the entire system must meet. This statement reflects the guiding principles and goal of full equality in both information accessibility and usability. For institutions receiving federal funding, new accessibility guidelines have been proposed to implement the Rehabilitation Act Section 508. The new guidelines cover federal purchasing and contracts including hardware, software, telecommunications, and Web design.²⁰

Example:

The system shall meet or exceed standards set by state and federal disability law. The system shall be accessible to and fully usable by users with disabilities.

2. Indicate specific design criteria for the system. These criteria provide a framework for system developers, library administrators, library computing services, and so on, to organize their accessibility efforts. These are grouped into four areas: accessible user interface, accessible electronic document, accessible public workstations, and accessible documentation.

Accessible User Interface

The user interface shall be accessible to and fully usable by users with disabilities. Accessibility to the interface applies to on-campus and remote use.

Examples:

- Screen design must be readable by users of speech and Braille devices. This can include having the cursor track along with a highlight bar.
- The command environment must be fully controllable with keystroke commands, as an alternative to pointing devices, for people with visual and certain orthopedic impairments.
- Visual cues must be provided for people who cannot hear audio cues, and audio cues for people who cannot see visual cues.
- Screen colors must be adjustable for people with color blindness, certain learning disabilities, and for visually impaired people who must configure screen reading software.
- Ability to turn off or adjust cursor blinking rates must be available for people with epilepsy.

Accessible Documents

Electronic documents must be accessible to and fully usable by users with print impairments. Full usability requires the preservation of document data and structure.

Examples:

- Use of valid HTML 4.0 for document markup enables the translation of documents, via the SGML DTD, into Braille, preserving much document structure. Translation to speech and large-print output is under development.
- Use of style sheets can preserve document structure across multiple media, implementing new features of HTML 4.0.
- Note that attention must be given so that graphical document elements have textual equivalents in order to provide access for the print impaired.

Accessible Public Workstations

Public workstations must be accessible to and fully usable by users with

disabilities.

Examples:

- Users with wheelchairs may need keyboards and displays set to differing heights.
- Users who are blind may need tactile marks on keyboards and voice synthesizers for audio output of screen information.
- Users with low vision may require screen magnification software or large (17" or greater) displays.
- Users with low vision may require voice recognition or speech synthesizer capability.
- Users who are blind or have low vision would benefit from talking web browsers that are capable of recognizing HTML, the document encoding tags used to design web pages, in order to translate text, tables, graphic descriptions, text in column format and data fields, providing blind users the same information as sighted users.

Accessible Documentation

Documentation must be provided to users with disabilities in alternative formats. In selection of format, priority is given to the user's own format preference (following the ADA).

Example:

Alternative formats may include audiotape, Braille, large print, ASCII files, or other accessible digital document formats.

3. General design considerations provide a design philosophy to implement the specific criteria above. They include mainstreaming, electronic curb cuts, usability analysis and built-in (direct) accessibility.

Mainstreaming

All public-computing areas must be universally accessible. Whenever possible, adaptive software solutions should run from network servers. This will provide accommodations on all networked workstations. This will allow adaptive hardware peripherals to be used flexibly on any networked workstation. All public-computing areas should include stand-alone adaptive computing technologies.

Electronic Curb Cuts

Wherever possible, accommodations, which enhance computing for all users in addition to benefiting users with disabilities, should be utilized.

Examples:

- Hardware: large displays (17" and up), trackballs, light-touch keyboards, and so on.
- Software: Use of valid HTML 4.0 for document markup enables the translation of documents, via the SGML DTD, into Braille, preserving much document structure.

Translation to speech and large -print output is under development. Use of style sheets can preserve document structure across multiple media, implementing new features of HTML 4.0. Note that attention must be given so that graphical document elements have textual equivalents in order to provide access for the print impaired.

- Furniture: height adjustable tables, adjustable chairs, indirect lighting, and so on.
- Under Windows NT and Windows 2000 it is possible to block user access to accessibility features in the Control Panel. This is usually done to preserve the same look on all systems; however, unblocking these features is an easy way to provide low vision users and others more options without posing an additional security risks.

Usability Analysis

The system must not only be accessible, it must be fully usable by people with a range of disabilities. Full usability shall be determined through a usability analysis by experienced adaptive technology providers.²¹

Built-in Accessibility

Accessibility for voice output, large print, and keyboard control can be built directly into the user interface, augmenting individualized access solutions, or eliminating the need for them altogether. This is also known as “direct accessibility.” A prototype demonstrating the viability of this approach was developed by the Trace R & D Center for access to bibliographic database software.

3. Identify digital barriers to universal access. This section includes examples of some known features of digital and multimedia systems that present barriers for people with disabilities. As information technologies continue to evolve new barriers may be identified that require revised design or accommodation.

Examples:

- Graphics without alternative text. Blind and low vision users utilizing screen readers that translate text are unable to translate graphic images where alternative text is not used to describe or explain the purpose of the graphics. Alternative text is required to describe or explain the function of images.
- Web site structure. Linking text pages to graphical pages without alternative text defeats the purpose of a text-based interface. Using the principles of universal design, the text version should provide an option on every text page to switch to graphics, and an option on every graphics page to switch to text.
- Multicolumn layout presents barriers for blind and low vision users because screen readers have difficulty decolumnizing information. This problem has been addressed in the latest versions of major screen reading programs (JAWS and WindowEyes). If a library has control of the screen reading software used, this is no longer a major issue; however, there are still problems with some tabular data, e.g., tables, which are not designed to be read by most screen readers which read from left

to right.

4. Access Guidelines, Standards and Specifications resources.

This section outlines a growing body of accessibility resources including recommended standards, regulatory guidelines and specifications regarding accessible design, computer hardware and software, and Web design. These references provide the applicable reference resources for designing an accessible online system. The list is not meant to be exhaustive, and libraries are encouraged to seek out additional resources that may be relevant.

Accessible Design Guidelines, Standards and Specifications References

Legislation and Policies

- [Section 255 Report and Order released September 1999, Telecommunications Act of 1996](#)
- [Section 508 of the Workforce Investment Act of 1998, PL 105-220](#)
- [Assistive Technology Act of 1998](#)
- [Revision of OMB Circular No. A-130, Transmittal 2, Management of Federal Information Resources](#)
- [Waddell, C. "An Overview of law and Policy for IT Accessibility: A Resource for State and Municipal IT Policy Makers."](#)

Accessible Design Guidelines

- [Department of Education Regulations for Accessible Software Design](#)
- [W3C Web Content Accessibility Guidelines: Carter, N. A. \(1999\) "Making Your Web Pages Accessible."](#)
- [California Community College Web Design Guidelines](#)
- [Authoring Tool Accessibility Guidelines \(ATAG\)](#)
- [User Agent \(browser\) Accessibility Guidelines \(i.e. for browser makers to design in access features, a proposed recommendation\)](#)
- [Center for Information Technology Accommodation \(formerly COCA\), U.S. General Services Administration.](#)
- [Equal Access to Software and Information. "EASI's Adaptive Computing Evaluation Kit for Colleges and Universities."](#)

Built-in Accessibility References

- [Access to Current and Next-Generation Information Systems by People with Disabilities. Vanderheiden, G., 1995, Trace Research and Development & Center.](#)

World Wide Web Accessibility References

- [Making the Web Accessible for the Blind and Visually Impaired, Paciello, M., 1995](#)
- [Page Author Guidelines —Version 8 Unified Web Site Accessibility Guidelines, Vanderheiden, C., 1998](#)
- [Accessibility Guidelines Implementation Project, HTML Writers Guild, 1999](#)
- [Making Your Web Pages Accessible, Carter, N. A. 1999](#)
- [NCSA Mosaic Access home page](#)
- [PDF and Adobe\(R\) Acrobat\(R\) Viewers for the Visually Disabled, McQuarrie, Liz, 1997](#)
- [UCLA Disabilities and Computing Program's Web Accessibility Page](#)

- [Web Accessibility Initiative. WAI Reference List on Web Accessibility. \(1998\)](#)
- [IBM Guidelines for Accessible Web Development](#)

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5. Accessed Sept. 29, 2000, <http://web.archive.org/web/20021203123145/http://www.eeoc.gov/laws/ada.html>.
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6. The United States Code Volume 42 USC Section 12101(a)(5) provides that “individuals with disabilities continually encounter various forms of discrimination, including outright intentional exclusion, the discriminatory effects of architectural, transportation, and communication barriers, overprotective rules and policies, failure to make modifications to existing facilities and practices, exclusionary qualification standards and criteria, segregation, and relegation to lesser services, programs, activities, benefits, jobs, or other opportunities” (ADA, 1990). [[BACK](#)]
7. ADA Title II, 1990. [[BACK](#)]
8. OCR Docket Number 09-97-2002, 1997. [[BACK](#)]
9. Volume 28. C.F.R. Part 35.160. [[BACK](#)]
10. OCR, Letter of Findings, 1997. [[BACK](#)]

11. Ibid. [[BACK](#)]

12. Letter of Findings, 1992. [[BACK](#)]

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15. Universal Design Definition. The Center for Universal Design. North Carolina State University. Raleigh, North Carolina. Accessed Sept. 29, 2000, http://web.archive.org/web/20021203123145/http://www.design.ncsu.edu/cud/univ_design/ud.htm. [[BACK](#)]

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19. Volume 28. C.F.R. Part 35.160. [[BACK](#)]

20. For more information on Rehabilitation Act Section 508 accessibility guidelines see <http://web.archive.org/web/20021203123145/http://www.section508.gov/>. [[BACK](#)]

21. For more information on usability consult Jakob Nielsen's Usability Engineering. See also Jakob Nielsen's Web site at: <http://web.archive.org/web/20021203123145/http://www.useit.com/>. [[BACK](#)]

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[Sharon E. Farb](#) is a Senior Analyst and the Digital Licensing Coordinator for the UCLA Library. Sharon can be reached at: The University Library, Room 33442 Young Research Library, Box 951575, Los Angeles, California. 90095-1575.