Universal Design, Inclusive Design, Accessibility, and Usability

Digital content cannot be assumed to be accessible to assistive or adaptive technologies such as text-to-speech screen readers. Early PDFs that still populate library websites and databases were often image-only files, and some software will not recognize columns in articles nor translate charts, graphs, and figures into something meaningful and accurate. Crowded database search screens with image-only buttons for critical navigation or access to full text have similarly been problematic. But even as some problems are solved, others are created if accessibility is not an upfront consideration. E-books are a key example.

> The primary factors that have excluded visually impaired users from the e-book revolution are the use of file formats that cannot be read by the technologies used by the blind; DRM schemes that prevent such technology from accessing these files; and proprietary e-book reading software or devices that the blind cannot use. E-books, which hold the promise of truly equal access by the blind to all printed information, are in serious danger of becoming an even greater barrier to such access.[47]

In a Canadian study of students using screen readers to use popular library databases, the authors found significant barriers to discovery and full-text access.

> Studies have shown that information literacy is a critical element in fostering problem solving and independent learning in higher education students…The question this study asked was whether the barriers in database design can affect a student's information gathering process. The results would point to yes, the first step in information literacy— the ability to critically locate and select appropriate articles is being compromised. The students in our study were forced to abandon articles because of technological barriers and this limited the amount of resources they could use to write their assignments. Only the intervention of a librarian or peer would have allowed them to continue in locating the full text and reading the article. Their self-efficacy as independent learners is challenged every time they encounter an unreadable PDF or take up to eight hours to find four articles.[48]

Universal design is a concept that originated in architecture and the built environment. Perhaps its most cited example and metaphor is the curb cut, mandated and designed for wheelchairs but appreciated by anyone with a stroller, shopping cart, bicycle, or rolling suitcase. "Similarly, text captions of speech in videos were intended for individuals who are hard of hearing or deaf, but the primary users are patrons at noisy sports bars and fitness centers and spouses who wish to continue watching television while their spouse sleeps. In addition to being more sustainable, integrated accessibility features are also far less costly in the long run and, according to a study by Microsoft, are used by up to 67% of users."[49]

Retrofitting technology, like architecture, is far more expensive than planning for inclusion by design. "The cost of accessibility when carefully planned and designed is almost zero…However, often extreme

challenges and significant expense is involved in the process of retrofitting an existing website for accessibility."[50]

Universal design in instruction or learning (UDI or UDL), which first surfaced in K–12 education but has grown in post-secondary institutions, recognizes that designing the classroom for maximum inclusion of diverse learning styles and physical abilities, without sacrificing either standards or aesthetics, will bring unanticipated benefits to the entire population served. The information literacy movement has long recognized that diverse learning styles were important considerations in delivering effective library instruction to all students.

Experts in the field of universal design note many instances of accessible technologies leading true innovation and widespread adoption, including "the typewriter, the telephone, email, the PDA, speech synthesis and recognition. All these innovations were motivated by a need to address the needs of people with disabilities."[51] IBM is an example of a successful corporate entity that has embraced accessibility by design as a successful marketing strategy for one of its largest consumers—the federal government. By corporate instruction, IBM trains its developers to "begin to focus on accessibility in the initial design stages and conduct assessments at key checkpoints in the development process."[52] Academic leadership has also recognized the value of universal design, noting that universities would work to "make 'universal design' and accessibility part of the education that we provide to computer scientists and engineers at all levels—undergraduate, graduate and continuing education."[53]

Unfortunately, as was the case with early website development, the opposite process can also prevail.[54] "In the age of the Internet, the average time between the introduction of a new information technology and the availability of a version that is accessible to persons with disabilities is three years."[55] To a student working toward degree completion, that is an unacceptable and effectively discriminatory length of time.

> I've been told every year, "Oh, we're working on it,"…Well, you know, I've gotten to the point that I doubt it. I'm angry that something was put in place that was not verified.[56]
> —Blind senior at the University of Montana, September 2012

As Thomas E. Perez, Assistant Attorney General of the Civil Rights Division, US Department of Justice, recently stated in regard to a new report on accessibility of US federal government information technology, "Technology and technological innovations can improve everyone's lives. However, if technology is not accessible, persons with disabilities can't benefit from those improvements."[57] Perez also remarked on the high cost of retrofitting: "It is not terribly difficult or expensive to ensure that technology is accessible, but accessibility has often been an afterthought. Modifying existing technology to make it accessible is much more expensive than designing technology in an accessible manner in the first place."[58]

In the virtual environment, some use the term "inclusive design" to distinguish the approach from the built environment, but make a similar claim that such design drives innovation for all users. If a platform, interface, space, or facility is equally accessible to all, it has the capacity to improve the experience and functionality for all. "Universal design focuses on eliminating barriers through initial designs that consider the needs of diverse people, rather than overcoming barriers later through individual adaptation. Because the intended users are whole communities, universally designed environments are engineered for flexibility and designed to anticipate the need for alternatives, options and adaptations to meet the challenge of diversity."[59]

Libraries and librarians do not need to become experts in every disability to meet the goals of universal or inclusive design. Rather, research libraries should advocate for content portability so that users can use the devices they prefer. A person with dyslexia might want to read text on a screen the size of a smart phone, a blind person might want that same content on a text-to-speech-enabled iPad. Research libraries should promote both portable content and discovery tools that can be effectively accessed by adaptive or assistive technologies.

In an open letter to all librarians, written in 2011, the President of the National Federation for the Blind, Marc Mauer, wrote: "Libraries can meet their obligations by adopting and publicizing accessibility policies; incorporating accessibility into their technology procurement, development, and testing processes; holding vendors accountable for accessibility; training staff; seeking input directly from patrons with disabilities; and conducting regular audits of accessibility."[60]

The Canadian study of databases and screen readers concluded:

> The digital collection of articles, books and resources provides greater access to resources 24/7 for our students. Various sectors are benefiting from digital access like distance education students and to a certain extent, students with print disabilities. While the print collection of a library is usually inaccessible to students with print disabilities, a database that can offer accessible features like simplified search screens will mean instant access to resources. As the digital information world continues to grow and offer more and more features for its users, it must also evolve to take into consideration the needs of these students. The Academic library and database vendors must work together, in consultation with students with print disabilities, to ensure technology opens up doors and tears down walls. To allow barriers to exist in this technological advanced age would prove to be the greatest failure of the twenty-first century library.[61]