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## ***Digital libraries and the blind and visually impaired***

### **Summary**

*Until recently, the blind and visually impaired have had a very restricted access to information. The reason is that the production of formats readable to them (such as Braille and audio), is rather slow as well as expensive and thus only a minute amount of published works has been made available in the adjusted formats. However, since digital formats have come into being, the situation has significantly changed for the better, primarily because of the possibility to use text-to-speech software that reads aloud digital text on the computer screen. This enables the blind and visually impaired to access digital information at the same time as anyone else and at no additional cost.*

*Digital libraries on the World Wide Web are of particular importance in this context, both if they contain full-text documents or secondary information resources. The existing digital libraries and collections would be discussed from the blind and visually impaired user's point of view, as well as taking into account accessibility issues from several aspects such as user interface and information seeking behaviour.*

### **Introduction**

Ensuring equal access to information for all, which is indispensable to the establishment of the information society, also refers to groups of people with special needs and disabilities. The article provides a picture of how the advancement of digital information and the Internet enables them to come to a more equal level with the rest of the community.

For the first time in history the blind and visually impaired can read from original sources of information, those available on the World Wide Web, at the same time as anybody else. This is enabled through assistive technologies such as text-to-speech software or Braille display that support speech or Braille output. For using digital information resources no mediators such as agencies producing adjusted formats or volunteers and friends to read are needed. Individual access to original sources of information is particularly important to people who lost sight in their later life, as they rarely learn how to use Braille (Williamson, Schauder, Bow 2000).

The problem of conversion to adjusted formats is that the process is rather time-consuming and expensive. The resulting consequences are that books become available to the blind several months later than to everybody else and that only a small amount of published works is ever made accessible to the blind. According to IFLA Libraries for the Blind Section, this amounts to 3 to 5 percent of publications, which is similar to British datum of less than 5 percent in the U.K. (NLB campaigns), whereas in the U.S. less than 10 percent of published works are made accessible (Kerscher, Fruchterman 2002).

In using the World Wide Web there are, however, barriers that assistive technologies and information seeking behaviour of the blind and visually impaired impose. There is a lack of literature dealing with the problem of information seeking behaviour. Significant is the NoVA (Non-Visual Access to the digital library) project, within which research has been conducted on digital library services concerning their accessibility to the blind and visually impaired. Digital libraries, online library catalogues, subject gateways, search engines and a number of commercial sites from the perspectives of accessible design and linear information seeking have been explored.

'Digital library' in this article refers to what Borgman C. (2000, p. 52) encompasses with the term «global digital library»: «...an extension, enhancement, and integration of information retrieval systems and of multiple information institutions, libraries... a construct to encompass digital libraries that are connected to, and accessible through, a global information infrastructure.» Information accessible through the World Wide Web, including online library catalogues and digital collections, are dealt with from the blind and visually impaired user's perspective.

## **How the blind and visually impaired read: assistive technologies**

Computers and assistive technologies have caused a significant change for the the blind and visually impaired in access to information. Assistive technologies involve a Braille display that the blind and visually impaired use instead of a screen, a speech synthesizer (external hardware unit) or a screen reader (software) that read aloud text appearing on the screen. Differences between the Braille display and the screen reader are in alphabets that are used (Braille and common). Also, one needs to bear in mind that the Braille display accesses only one line of the text at a time, and does not caption the whole page on the screen. This largely influences the serial information seeking behaviour of blind users. Braille embossers are another piece of hardware that enable the blind to have materials printed in Braille. An ideal solution seems to be a software that does optical character processing of text on the paper put on the scanner and that immediately synthesizes speech, i.e. automatically reads a printed page. For the visually impaired there is also a screen magnification software.

There are three main types of workstations adjusted for the blind and visually impaired: 1) a completely closed system: one integrated hardware unit comprising of all necessary components (scanner, keyboard, computer); 2) a semi-open system: PC components that are not integrated into one hardware unit, but are separated; and 3) an open system: a typical PC with software for the blind (Internet support for a blind Internet user).

The main downside to these units of equipment is its expensiveness. Another problem is with minor languages for which text-to-speech software is low-quality or still non-existent. For the Croatian language the development is underway (Internet support for a blind Internet user).

## **Accessible Web sites**

People with disabilities who use assistive technologies are often restricted in accessing the World Wide Web content. The research has shown that one of the major problems in accessing the Internet was poor Web design (Williamson, Schauder, Bow 2000). Access to Web content is sometimes more critical for people with disabilities who can make use of particular digital formats only because they are print-disabled (Why Web accessibility). Legislation in the European Union, in the United States and Australia provides for accessible design; it may be illegal to include information on one's site which is inaccessible to certain users (Policies relating to Web accessibility).

W3C's Web Accessibility Initiative has developed Web content accessibility guidelines 1.0 (1999) (hereinafter Guidelines) and the supporting Techniques (Techniques for Web content accessibility guidelines 1.0 2000) that provide detailed instructions on designing accessible Web pages\*. Blind and visually impaired users have difficulties with pages having

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\* Apart from the Web Accessibility Initiative, there are other organisations issuing guidelines for accessible design. Some of them offer more general hints based on the Guidelines (Royal National Institute for the Blind; National Library for the Blind), and some have a different, but practical approach, such as IBM's

images and other non-textual elements (e.g. scripts, applets, plug-ins) without alternative text, especially if images are used as links (as are in image maps). When graphics are used without alternative text, the user does not know whether they are important or not – for example, the 'NULL' alternative text attribute for bullet points should be used so that the screen reader will skip over it (Craven 2001a). One also has to avoid functions that can be controlled by a mouse only, as the blind cannot use the mouse. Links in general should have title attributes; titles such as «click here» are not to be used. If one uses frames, each frame should be given a title and a name. In the Guidelines it is only mentioned that you should use the title attribute, but some screen readers only read the name attribute (Christensen 2001). Other common problems are non-described tables, poor colour contrast and badly chosen colours for colour blind users.

There are automated validation tools for checking conformance to the Guidelines, although manual checking needs to be conducted as well. W3C's Web Accessibility Initiative lists and describes a number of evaluation and repair tools. Such are, for example, CAST's (Centre for Applied Special Technology) Bobby and SNOW's (University of Toronto's project Special Needs Opportunity Window) A-Prompt. One can also use the W3C's HTML validator (W3C HTML Validation Service) in order to check the underlying HTML for errors in the code.

One should also manually test the site to see if there are any problems when graphics is not loaded, when frames, scripts and style sheets are turned off and whether it is possible to browse without a mouse. For the visually impaired, one should also try changing text size in different browsers (Internet Explorer, Netscape Navigator, Opera) as well as setting them to ignore colours, font size and style. It is also advisable to have a disabled person to browse through the site. Viewing the site through a text browser such as lynx or using a screen reader or an alternative browser (e.g. BrailleSurf), can help in determining problems caused by images with no equivalent alternative text, confusing navigation systems, reliance on Javascript to provide information on navigation, complex use of frames without adequate help or navigation for no-frames browsing (Sloan 2002).

Although Web accessibility is largely influenced by information seeking behaviour of the blind and visually impaired, little research has been conducted in this field. A project dealing with such issues called Non-visual access to the digital library (NoVA) focuses on differences between methods of accessing electronic information resources by sighted and blind and visually-impaired users (Craven 2001a). One of the project's aims is to find out more about serial searching by the blind in non-serial digital library environments and to come up with recommendations for digital library system design. The project involves digital libraries, online public library catalogues (OPACs), search engines, subject gateways as well as a number of commercial sites. Craven J. (2001a) in her article reveals several accessibility problems based on a previous analysis of resources such as subject gateways and online catalogues. The research has shown that the biggest problem in digital libraries for the blind is navigation when frames are being used. This is due to the fact that access technologies support only linear navigation within one frame at a time, which consequently often requires the user to backtrack a long way in order to reach the desired point.

In 2000 the Danish National Library for the Blind opened the Webcenter, with the mission to help Web developers create Web sites accessible to everyone. They advise on solutions that are both of interesting design and accessible. Sites are not difficult to adjust, particularly if accessibility details are taken into account in the development stage, and doing it right can mean a world of difference to many users with special needs and disabilities (Christensen 2001).

## **Online library catalogues and digital collections for the blind and visually impaired**

At the international level, IFLA Libraries for the Blind Section has one of its missions in its strategic plan to «promote the evolution of the digital library for the physically handicapped», emphasizing collaboration and international resource sharing. There is a need for a union catalogue of accessible formats, as in some countries there are over a hundred producers of accessible formats, and efficient cross-searching of catalogues of accessible formats at the international level should be an aim to strive for. These catalogues should include digital texts on the World Wide Web, both those that are freely accessible such as in Gutenberg (Project Gutenberg) as well as those restricted to the blind, such as in Bookshare (Bookshare.org). Including Braille holdings in national and regional catalogues is one of the principles in Guidelines for library service to Braille users (1998).

TESTLAB (Testing Electronic Systems using Telematics for Library Access for the Blind) is a European Union project aimed at building a central catalogue of accessible library materials and adapting existing OPACs for the blind users, also promoting establishment of computer workstations for the blind at local libraries. There are large online national catalogues of accessible formats, such as those of the U.K. National Library for the Blind, the Canadian National Institute for the Blind (the catalogue also includes electronic texts (VisuTEXT module) and Web access to newspapers (VisuNews module)), and of the U.S. National Library Service for Blind and Physically Handicapped (includes New Zealand, Canadian, and some European agencies' holdings data as well). For blind musicians a European project called MIRACLE (Music Information Resources Assisted Computer Library Exchange) has been started in order to provide a central catalogue of Braille musical scores, the hope being for as many special libraries for Braille music to join. It is not meant to be an international catalogue of music only, but also digital files of pieces would be provided with records (Tucker 1999).

Digital texts can be downloaded onto a PC, enabling a blind or visually impaired user to choose his/her preferred method of access - screen magnification, speech or Braille output. There are many texts that are available in the digital format now, but there are many more that are not, particularly new publications that are copyright-protected. Digital collections that are freely accessible contain only documents that are copyright-free. Such is the Gutenberg Project, an archive of free electronic texts of works that include mainly fiction, but also non-fiction and even reference. There are many other general and special digital collections on the World Wide Web that can be found in directories, such as IFLA Electronic collections or the British Columbia Digital library's guides. Concerning accessibility of digital collections, the Framework of guidance for building good digital collections (2001), issued by the U.S. Institute of Museum and Library Services, clearly provides for accessibility to people with disabilities in the fourth principle of the Collections part: «A good collection is broadly available and avoids unnecessary impediments to use. Collections should be accessible to persons with disabilities, and usable effectively in conjunction with adaptive technologies.» This principle mainly refers to accessible design. A digital collection in which particular attention has been paid to accessibility for all is called Austrian Literature Online, that in co-operation with i3s3 (Interuniversitäres Institut für Informationssysteme zur Unterstützung sehgeschädigter Studierender) additionally provides exam literature for blind and visually impaired students at Austrian universities.

There are projects producing digital text formats solely for the blind and visually impaired. They restrict access to the blind members in order to ensure copyright protection, since producing adjusted formats for people with disabilities is usually understood as fair use. The formats often used are the Braille digital format, which allows producing embossed Braille, reading with a Braille display or back translating it to standard computer text for use with a speech device, DAISY digital talking book standard (Daisy Consortium), or common text formats.

In the United States there is Bookshare.org, which enables people with print disabilities to legally share scanned books. The collection is created by volunteers and members who submit books. Authors and publishers can also submit digital versions of the books, thus saving time and additional work for scanning. Members can be exclusively the print-disabled who are U.S. residents. Non-members can order a book in embossed Braille. There is a wish list to which members can add a book they wish to be scanned.

In Argentina there is a similar project called Tiflolibros, enabling the blind and visually impaired to register for free and download books that have been scanned by others, as well as to upload what they themselves have scanned. The majority of literature is in Spanish.

In the United Kingdom there is Online Originals, a publishing company that has a special arrangement with the National Library for the Blind (NLB) according to which titles that have been formatted for speech synthesis and refreshable Braille are available free via the NLB Web site (Chapman 2000). NLB's KnowUK is a collection of most heavily used reference in British libraries. Talking Newspaper Association of the U.K. links talking newspapers in the U.K. and makes newspapers and magazines available as electronic texts, distributed on computer disks, by email or retrieved from a bulletin board service (McLachlan 1997).

In Croatia there is a project Internet support for a blind Internet user (Internet pomoć slijepom Internet surferu – IPSIS), lead by the Croatian Association for the Blind, in co-operation with the Faculty of Philosophy, University of Zagreb. It started in 2001 and covers four separate parts: 1) Talking Linux for the Blind, a computer system optimised for the blind and free-of-charge<sup>\*\*</sup>, allowing access to the Internet and to the most common computer applications; 2) Internet access free of charge for the Croatian blind and visually impaired users; 3) Web portal with selected information resources and a system of assistance, whereby a blind surfer can ask for any kind for help; and 4) Digital collection for the blind and visually impaired with exam literature, literary works and other documents made available online for the blind and partially sighted users<sup>\*\*\*</sup>.

## Conclusion

As Christensen S. (2001) puts it, «...if we look at the library Web sites today, they are in fact a lot better than they were a year ago. It almost seems to be a trend now--to ensure accessibility on your Web site is to signify that you are technologically in front...» In Croatia the situation is not that advanced yet. Just as a case in point, none of the Croatian public libraries has a Web site that conforms to the most basic level of W3C's Web content accessibility guidelines 1.0 (Golub, Lazić 2002). Promotion of accessible design is a must and establishing a centre that would give advice on creating accessible Web sites would probably make a difference.

More research needs to be conducted on information seeking behaviour of the blind and visually impaired users. The NoVA project was expected to be finished by June 2002.

Today the tendency in libraries is to open their services to all, providing library materials in accessible formats such as digital, audio, but also large print and Braille formats, developing electronic library catalogues of these materials on the World Wide Web, ensuring on-site workstations equipped for the blind as well as developing other library services.

As the efforts mentioned in this article have proven, a lot can be done to enhance access to information for the blind and visually impaired in the digital age. However, more

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<sup>\*\*</sup> As the research has shown (Williamson, Schauder, Bow 2000), the most frequent barrier to accessing the Internet was cost.

<sup>\*\*\*</sup> The main problem is copyright, as no exception for the disabled has been regulated in the Croatian Copyright Law so for every work a contract with the copyright owner needs to be signed.

cooperation could and should be invested at the international level in order to enhance services worldwide. These actions should include stimulation for creating online library catalogues of accessible formats, based on international cataloguing standards as to ensure international cross-searching of the catalogues. Online catalogues of libraries for the general public should also include bibliographic information on the materials available in accessible formats. Such systems would enable interlibrary lending and coordinated acquisition. Inclusion of remote digital texts from resources dispersed on the World Wide Web that are freely available as well as those restricted to the blind should also be enabled.

In creating collections of digital texts for the blind the major advantage would be digital versions of works published on paper provided by publishers. Due to easy copying and distribution of digital documents, publishers are still hesitant to deliver a digital copy of a work being printed and published. Ensuring legal deposit law on digital copies and restricting it to usage by the blind and visually impaired would be one of the solutions. This should be stimulated by international treaties and proscribed by national regulations. Exceptions to copyright regulations for people with disabilities should be provided where absent in order not to additionally restrict access to information. IFLA Libraries for the Blind Section strives to remove these additional barriers for access to information by those who are print disabled.

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