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Web Accessibility and Usability—Can It Happen with Flash?

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Issues of accessibility and usability in relation to interactive multimedia Web content are discussed; in particular applications producing animation on the Web, such as Flash movies. The barriers that these types of technologies cause to some assistive technology users is mentioned, but it is stressed that with a pragmatic and proactive approach at the design initiation stage, it is possible to ensure that many more people can enjoy the rich media that the Web has to offer on a wide range of devices.

KEYWORDS Accessibility, usability, Flash, assistive technologies, disability

INTRODUCTION

> "Web accessibility means that people with disabilities can perceive, understand, navigate, and interact with the Web, and that they can contribute to the Web. Web accessibility also benefits others, including older people with changing abilities due to aging." (Web Accessibility Initiative, 2007)

However, in the last 10 years with increasing amounts of Web-based interactivity occurring in many different environments, it is not just coding and interfaces within the browsers that require consideration. There are now many options for embedding exciting standalone miniapplications that may be offered for download or appear in pop-up windows. These items are often complex, multimedia objects that need to be evaluated for usability as well as accessibility.

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Usability has been described by the International Organization for Standardization (ISO) as being "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO, 1998). But when developing products for Web use, especially in the case of social networking applications, specified users, goals, and even contexts are hard to ascertain. This is confirmed by Abran and his coauthors, who point out that, "The International Organization for Standardization (ISO) has developed a variety of models to specify and measure software usability but these individual models do not support all usability aspects" (Abran, Khelifi, & Suryn, 2003).

GUIDELINES AND STANDARDS FOR ACCESSIBLE RICH MEDIA TECHNOLOGIES

In the early 1990s those using the Internet experienced a largely text-based world with Gopher searches, simple navigational protocols but a distinct lack of interaction. Accessibility and usability guidelines were sparse and validation of the various forms of hypertext mark-up language minimal.

Early computer-based assistive technologies designed specifically to help those with disabilities, in particular the blind, worked with a limited number of applications, but more could cope with the early browsers. Access was often relatively good for those who used speech synthesis, such as the blind, who needed to navigate around the screen and read text with audio output. Most users depended on the keyboard, which suited not only the blind but many with mobility and dexterity difficulties. The whole design of Web pages worked well for those who did not mind reading streams of text presented in a linear fashion.

The terms *rich media* and *multimedia* appeared as the output to the Web began to include graphics, audio, and later video, animation, and interactions such as mouse-over buttons, drop-down menus, text forms, and any other elements that were designed to enhance the user experience. This enhanced experience may provide an ideal environment for those who enjoy a very visual and aural experience, and it may help some overcome literacy difficulties. However, it has produced difficulties for those dependent on clear text descriptions or captions. So the element that was so much a part of the early Web experience is sometimes sidetracked in the rush to produce elaborate multimedia productions. It is important to remember that accessible text (rather than text as a graphic) can be a useful tool alongside multimedia without greatly affecting the look and feel of a Web page. It can act as a summary and provide a title, as well as being an alternative tag on a graphic or long description for a graph, etc.

"Digital text separates the content from the display, which can then be flexible in several key ways. Visual display can be varied, and other displays, such as tactile (refreshable Braille) and auditory versions (screen

reading or text to speech), can be offered. Digital text can also be tagged, enabling structural (e.g., header, sidebar) and semantic (e.g., summary, key questions) elements to be identified and displayed in different ways. Tagging also enables the designer to embed learning supports in the content" (Linder & Gunderson, 2003).

Over the years accessibility guidelines such as those offered by the World Wide Consortium Web Accessibility Initiative (W3C WAI) and standards coming from the IMS Global Learning Consortium, as well as software protocols such as U.S. Section 508 Voluntary Product Accessibility Template (VAPT, 2004) have helped to champion accessibility and usability of Web content. But they are often considered complex and unwieldy, although the latest versions are designed to be "technology-neutral" (Web Content Accessibility Guidelines 2.0, 2007). This may mean they are vague and will have a tendency to be interpreted in different ways.

IBM has set three basic principles for the development of accessible software, and these can be adapted to provide a base for beginning the process of making interactive materials more accessible, including those developed in Flash or those using Web-based animations with Java and other programming languages (IBM, n.d.):

> **Choice of Input Methods**: Support the user's choice of input methods, including keyboard, mouse, voice, and assistive devices.
>
> **Choice of Output Methods**: Support the user's choice of output methods including display, sound, and print.
>
> **Consistency and Flexibility**: Provide a user interface that can be customized to accommodate the user's needs and preferences including fonts, colors, and display layout.

For developers of online teaching and learning materials there are many more guidelines for ensuring compliance with disability and equality laws enabling students equal access to educational resources. In a quest to standardize so-called learning objects, the Shareable Content Object Reference Model (SCORM) was introduced to "enable interoperability, accessibility and reusability of Web-based learning content" (Advanced Distributed Learning, 2004). A SCORM-compliant learning object can be used in any browser and on any type of computer operating system, usually with text-to-speech output and keyboard access. SCORM compliance also means that educationalists can share their materials across networks.

Santos et al. (2007) describes in Figure 1 how they have developed an Accessible e-Learning Platform using Course Genie, which is SCORM compliant but also follows a series of evaluations to ensure ease of access to most learners Figure 1.

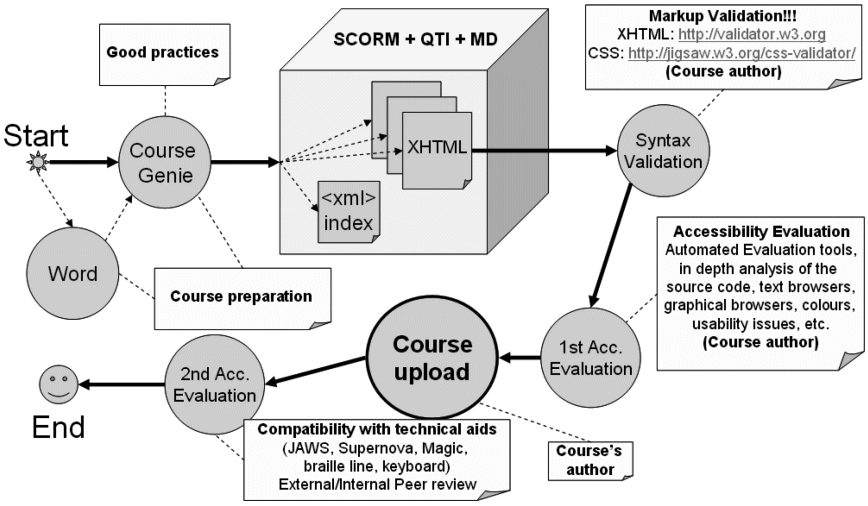

FIGURE 1 Process to customize existing courses for ALPE service, resulting in accessible SCORM-compliant courses (Santos et al., 2007)

ASSISTIVE TECHNOLOGIES ISSUES

Assistive technologies are usually developed to work in conjunction with software and Web guidelines and standards. As has been mentioned, they are the technologies that allow users access or enhance user adaptations to Web pages and online resources: for example, by screen reading content, magnifying, changing colors, or altering fonts.

Learning to use a screen reader with speech synthesis, if one is blind, usually requires good auditory perceptual skills and auditory acuity as well as a high standard of keyboard skills, competent memory skills, and patience. Working through content in a linear fashion, trying to listen to the output of what may be a random collection of data on a Web page with additional elements, such as hypermedia and stand-alone applications, is not easy. Sighted users and those with good coordination skills tend to take it for granted that they can skip an animated introduction to a Web site, scan text for keywords, and jump to a required feature without going through each aspect of the page in a top-to-bottom manner.

Thinking of the developer designing animated content, it may be impossible for interactive elements to be created by someone using keyboard-only access, a screen reader, or high levels of magnification. It may also be inappropriate for them to attempt to interact with some subject matter—for instance, drawing the final section of hangman to complete a spelling task. It is at this point that perhaps a pragmatic and holistic approach needs to be adopted alongside the internationally recognized guidelines (Kelly, 2004).

There are in fact, very few people who have the skills to make an animation by writing code integrated with drag-and-drop icons, as required by Flash authoring tools such as those designed by Adobe. It is also sometimes impossible to design content to be appropriate for a person who perhaps has no concept of multidimensional animations. An equally rich experience may be provided using other techniques—take this example provided by Brian Kelly (2004):

- Flash game developed for use in Libraries
- "It's not accessible—I'll have to remove it or I may be sued."
- "What is it used for?"
- "To keep kids entertained while parents select books. They seem to like it."
- "So keep it. But make sure you have an equivalent amusement for children who can't (e.g., visually impaired) or won't (don't like it) use the game. What about a bouncy castle, building blocks, . . ."

Everyone wants online technologies to be easy to learn, easy to use, memorable and satisfying (Nielson, 2003), but it is a salutatory thought that when it comes to the subject of usability and accessibility of Web pages, it takes on average a person using a screen reader and keyboard six times longer and someone using magnification three times longer to surf the Web for a piece of information (Nielsen Group, 2001).

Nevertheless, time spent in developing materials that follow good patterns of design and ensure ease of access usually enhance everyone's experience on the Web, not just those who are aging or have disabilities. They offer easier access for inexperienced users, users of handheld devices such as mobile phones and personal digital devices (PDAs) as well as stand-alone kiosks. It is possible to achieve these ideals with Flash and many other animation authoring tools by planning to incorporate accessibility, usability, and the extra component of device independence at an early stage in the design, rather than attempting to retrofit. The latter is costly and rarely provides a totally satisfactory outcomeFigure 2.

"We want to enable the user to perceive and interact with the Web using many kinds of device, or more generally, via many kinds of access mechanism" (W3C, 2003). The author has introduced the layer of assistive technologies and the idea of being able to adapt content on the Web to suit user preferences.

Flash and Other Animation Authoring Tools

Adobe, which produces some professional Flash authoring tools, has in recent years provided developers with the ability to comply with many of

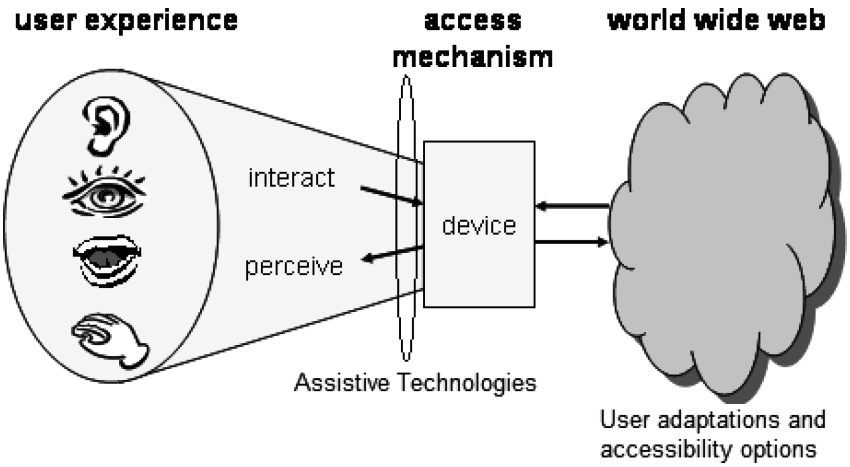

FIGURE 2 The diagram introduces the key user-related concepts

the guidelines already mentioned (Adobe Accessibility, 2007). They have allowed for additional captioning when video and audio are used, they have encouraged the use of descriptive tags for all graphics, keyboard access for playing sounds and animation controls and when items need to be moved across the screen as in drag-and-drop, which can become a click-and-click exercise. It is possible to design clear navigational tools such as buttons and site maps, promote good reading order, and offer color backgrounds that can be user-defined along with a choice of font types, sizes, and colors. Text-to-speech may be incorporated into the design as well as magnification.

However, the onus is on the developer to be aware of these attributes, and it has to be accepted that not all browsers are able to make the best use of the enhancements—for instance, the text-to-speech addition may work in the latest versions of Internet Explorer but perhaps not in Mozilla Firefox or Opera. It is also true that not all assistive technologies are able to access certain features, so a complex screen reader application in the hands of a proficient user may be adapted to work with the animation, whereas someone using a more basic screen reader may not have the facility without further scripting.

Heightened awareness of these issues in educational situations (where there is a requirement to make reasonable adjustments to support disabled students) has resulted in the development of tools such as Xerte from the University of Nottingham (UK). This development tool can be used for presentations, quizzes, interactive games, demos, and screen animations bundled as learning objects that are either available through a Learning Management System (LMS), Content Management System (CMS), or directly from Web pages.

It is SCORM-compliant, but as the author of the product says; "There is no silver bullet for accessibility. Many considerations can only be addressed as the content is written and designed. However, some things can be done that apply to all the content you develop" (Tenney, 2006).

Xerte allows those who are not programmers to make interactive features that can be keyboard accessible, use built-in text-to-speech when launched in Internet Explorer, enlarge and rescale the entire viewing area without distortion, and offer color background and text changes. The designer can add summaries and text for all videos, audio, and embedded Flash movies. It may not have all the attributes of a more expansive software package, but it is free, and with very little extra effort makes it possible to create accessible learning objects. There are other free tools that generate Flash files to export to Web sites, like CamStudio, which makes.avi movie files that can be exported as.swf Flash files. This software is very useful for making tutorials with screen grabs and synchronized audio—any text has to be made separately as a summary. Wink, another free program, offers more interactivity with buttons and additional text elements, but as with CamStudio, the features are graphically based so cannot be individually accessed by keyboard, a screen reader, or magnification software.

CONCLUSION

The introduction of broadband with its increasingly fast download times has opened up the world of rich media with the possibility to stream audio and video on demand, play games and quizzes, and to discuss these activities with Voice Over the Internet Protocol (VOIP) as well as using digital cameras—Webcams—to visually connect with family, friends, and colleagues, and share screenshots and photographs. Digital inclusion is considered all important, but the digital divide is still in place. This is not just a "gap between individuals, households, businesses and geographic areas at different socio-economic levels with regards both to their opportunities to access ICT and to their use of the Internet for a wide variety of activities" (Organization for Economic Cooperation and Development, 2001). This is a gap that occurs between those who can use the media successfully and those who are barred from access due to the poor design or complexity of the materials.

It is possible to develop easy-to-use, accessible, and highly interactive materials for Web sites, using many types of programming languages, not just Flash. But as has been shown, the effort needs to occur at the beginning of a development phase, while acknowledging international guidelines and standards as well as understanding the assistive technology issues that may arise. In fact, "when all accessibility techniques are applied to Flash, it can be universally accessible, perhaps even more so than HTML, because the need

for specific assistive technologies (with their accompanying limitations) is removed" (WebAIM, 2004).

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ADDITIONAL RESOURCES

CamStudio Free Streaming Video Software available from http://camstudio.org/

Wink Tutorial and Presentation creation software available from http://www.debugmode.com/wink/