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# Chapter 56
# E-Business and Web Accessibility

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## INTRODUCTION

E-business has developed due to the fast penetration of the Web to human activities ranging from work and education to news and entertainment. The power of the Web is in its universality, and, in principle, everyone can access e-business websites and benefit from available information, products and services. However, in practice, universal access to the Web - and subsequently e-business websites - is not merely an issue of availability or technical development.

Web accessibility emphasizes the incorporation of requirements of people with special needs to the design of Internet applications. Notwithstanding these requirements, the spectrum of accessibility concerns is even larger, for example if we think about the changing form of the computer and how people work and communicate: access is not required only from a PC, but also users are on the move and use other access devices (in terms of both hardware and software).

Research on Web accessibility has produced a wide range of results that are also used in mainstream Web design to promoted good design practice. These can be briefly outlined in terms of related legislation that aims at encouraging the development of accessible Web applications, open recommendations for accessible Web design, various accessibility evaluation tools that check – to some extend - the conformance of websites to the aforementioned specifications and various related open standards that promote accessibility.

Despite the large amount of work on Web accessibility, the vast majority of e-business websites are still not accessible. A report of accessible Internet shopping (Shindler, 2003) which involved 17 major high-street companies concluded that after the companies attempt to make their online shopping facilities accessible to people with disabilities during the period between August 2000 and June 2003 only

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five companies out of the seventeen examined, managed to pass the Watchfire Bobby test. The study of Loiacono and McCoy (2006) on evaluating Web accessibility in a large number of websites indicates that a poor 23% of federal homepages are accessible, while this percentage falls down to 11% for non-profit organisations and a totally disappointing 6% for corporate homepages.

The goals of the article are to:

- Argue for the importance of Web accessibility in e-business websites by reviewing related work and its impact at the technical, social, economic and legislative level and identifies typical accessibility problems of e-business websites;
- Propose measures for reaching and maintaining a good level of Web accessibility in terms of the specifications, design and evaluation phases of a user-centred approach to systems development. The proposed measures provide practical guidance to e-business applications stakeholders including managers, designers and developers.

## PERSPECTIVES ON WEB ACCESSIBILITY

Accessibility has received several interpretations in related work. The W3C Web Accessibility Initiative (http://w3c.org/wai) defines Web accessibility as a set of "*strategies, guidelines and resources that make the Web accessible to people with disabilities*", highlighting that accessibility is not simply a technical development issue. The Wikipedia definition on accessibility reveals another dimension of the same coin: "*Web accessibility refers to the practice of making Web pages accessible to people using a wide range of user agent devices, not just standard web browsers. This is especially important for people with disabilities which require such devices to access the Web*". This perspective provides the dimension of good user-based design of the Web that supports different access contexts and multiple device operability with the Web. The Webaim initiative about Web accessibility (http://webaim.org) refers to accessibility noting that: "*(with the advent of the Web) ... at the click of a mouse, the world can be "at your fingertips"—that is, if you can use a mouse... and if you can see the screen... and if you can hear the audio.*" Many other definitions of Web accessibility can be found in related initiatives and literature, which fall under three diverse ends that are briefly outlined below:

- **Accessibility as technology and network effectiveness:** in its most basic sense, accessibility is considered as synonymous to the technical capability to access the Internet. Related metrics of accessibility in this respect are the characteristics of network connection and of the software applications used. This is obviously a limited interpretation of accessibility: the availability of technology does not guarantee that people will use it.
- **Accessibility as good Web content design and implementation practice:** accessibility promotes the syntactic understandability of Web content by multiple access devices (e.g. see Viorres et al, 2003), enables content transformation to other formats and media, and eases the task of customization of presentation to user needs and preferences.
- **Accessibility as advanced personalization of content and services:** this approach promotes the semantic understandability of information from users with varying profiles and cognitive requirements and allows for dynamic system responses to user actions.

A mainstream conception about designing for accessibility is that design projects usually result to constrained solutions addressing very specific

requirements of people with special needs. Indeed, as Keates and Clarkson (2003) remark in the context of inclusive design, "*traditionally, design research tends to focus on accommodating single, primarily major, capability losses*." Despite that some design solutions may indeed have specialized characteristics, the awareness created about the requirements of people with disabilities is radically changing the overall approach to address accessibility. People with special needs are not interested in specialized solutions, for various reasons, ranging from social acceptance to aesthetics, but require access to mainstream designs that may be used by as many people as possible. As noted by Paddison and Engefield (2003) "*it is not enough to follow accessible guidelines and make the appropriate technical accessibility changes... people with special accessibility needs should be considered as a distinct user profile with their own requirements, within a user-centered design process*."

## RE-THINKING ACCESSIBILITY FOR E-BUSINESS: ASSOCIATED BENEFITS

There are many arguments for incorporating the requirements of people with disabilities to product and systems design in general (for further analysis see for example Paddison and Engefield, 2003). The ethical stand that calls for providing equal opportunities to all has for long ceased to be the main argument, since that there are numerous examples of people with special needs that are contributing in a distinguished way to society. The need to incorporate the requirements of people with disabilities to design has been identified in many countries in terms of legal frameworks. Despite that e-business websites do not need yet to conform to this legislation, doing so will gain them a competitive advantage both in terms of social responsibility and technical excellence.

The business prospects of incorporating accessibility can be identified in various ways. To start with, people with special needs are not simply those that suffer from permanent disabilities but also other groups such as the aging population. The percentage of people with disabilities in most countries ranges between 10% and 20% of the population (United Nations Statistics on Disability: http://unstats.un.org). The age group over 60 is the most rapidly growing and there is a large overlap between the groups of elderly and disabled. Furthermore, the percentage of elderly people that will be using ICT (Information and Communication Technologies) by 2020 will increase considerably since current ICT users will have grown older by that date. This rise in the elderly population and the envisaged use of ICT by this group of people signify that if not now, in the near future the ICT companies should provide mainstream technology and Web-based services that address fully the requirements of people with special needs.

Further to these arguments, perhaps the most important misconception about accessibility is that it does refer only to people with special needs. Designing for accessibility addresses other user access issues as well, such as for example, performance for low network speed, usable access under constrained environmental conditions, and variable, personalised contexts of use. Thus, "special needs" may not simply denote irreparable physical constraints, but actually include many other, temporal or permanent, limitations of access that may be related to various factors, such as user mobility, access from alternate devices, the work environment conditions and the context of use. A few examples of contexts of use where accessible design can overcome include "handicapping" situations where customers may:

- Not be in a position to hear spoken information – e.g. noisy environment
- Not be in a position to see visual information – e.g. while driving a car

- Not be able to use the mouse (pointing device) or keyboard – e.g. a temporal injury, or a mobile device
- Not understand the language used – e.g. foreign customers
- Be using a text-only screen, or screens with small screen analysis and a few colours - e.g. a mobile or household device

Thus, from a technical point of view, designing for accessibility promotes good technical design and implementation that has obvious implications for maintenance and extensibility, which is a critical aspect of e-business websites that often need to update the content and look & feel with new products and styles respectively. Actually, accessibility concerns are relevant to the mainstream design process, rather than the design for specific groups of people only, emphasising the design of alternate, rather than specialised, means, modes and forms of access.

## MEASURES TO MANAGE AND MAINTAIN A GOOD LEVEL OF WEB ACCESSIBILITY IN E-BUSINESS APPLICATIONS

A number of important steps for the management of accessibility include: identifying accessibility requirements and specifications; applying rigorous and frequent Web accessibility assessment and re-design, if needed; and forming a Web accessibility policy to be consistently followed. These steps are briefly discussed below.

### Identifying Relevant Accessibility Requirements and Specifications

User accessibility requirements can be identified when accessibility is included into the goals of a user centred design approach. Web accessibility specifications include:

- The US Rehabilitation Act (http://www.section508.gov);
- Open recommendations for accessible Web design such as the W3C.WAI Web Content Accessibility Guidelines (http://www.w3.org/WAI/intro/wcag) that are of particular interest to B2C (Business to Consumer) e-business websites;
- Various accessibility evaluation tools that check – to some extend - the conformance of websites to the aforementioned specifications (for a good overview of these tools see: http://www.w3.org/WAI/ER/tools/complete);
- Various related open W3C standards that promote accessibility including, among others: CSS (Cascading Style Sheets), XSLT (eXtended Stylesheet Language Transformations), SVG (scaleable Vector Graphics), SMIL (Synchronized Multimedia Integration Language) and the Device Independence Activity that builds on previous CC/PP recommendation.

Currently, there are many accessibility (and usability) evaluation groups that offer consultancy on accessibility as well as conduct fast assessments of an e-business website at a reasonable cost of a few hundred dollars. Keeping in mind the social and economic benefits of accessibility, this cost should not be considerable even for small in size online enterprises.

### Web Accessibility Assessment and Re-Design Process

A fast assessment of Web accessibility is possible by using free accessibility tools (technical accessibility conformance to guidelines) and applying simple heuristics (manual, expert-based accessibility inspection). However, a thorough approach on accessibility assessment and redesign mainly requires another important element in the process: that of user involvement through user testing.

## Tool-Based Accessibility Conformance to Guidelines

Accessibility evaluation tools scan the source code of a web page using interpretations of either WCAG or the United States Rehabilitation Act Section 508 standard. The use of these tools is the first step for accessibility evaluation since that they can quickly identify accessibility problems that can be identified at the level of the source code of a web page and produce reports with accessibility errors and warnings. These tools save the designer from the task to inspect source code for the evaluation of accessibility and provide a first account of accessibility problems. However they cannot provide a complete account of accessibility problems mainly because accessibility is not a solely technical issue, but primarily requires human judgement. According to Webaim (http://www.webaim.org) of the combined 65 checkpoints in WCAG 1.0 Priority 1 through Priority 3, only nineteen can be partially evaluated automatically.

Currently there are many accessibility evaluation tools available, both free and commercial (for a review see: http://www.webaim.org/articles/freetools) to the degree that methods that enable their comparison have been proposed (Brajnik, 2004). A major problem for accessibility tools is that their vast majority are designed for fast evaluations of single web pages. Currently, research on the design of new generation accessibility tools attempts to address these concerns such as the MAGENTA tool (Leporini et al, 2006) and the BenToWeb benchmarking tools that will include the aforementioned capabilities (Herramhof et al, 2006). Also, some proprietary solutions have appeared like Oracle's e-business suite accessibility (2008). Both types of works need also to be tested in practice though.

## Expert (Manual) Accessibility Inspection

Manual evaluation includes a number of steps that must be followed by a designer to check the accessibility of web pages according to guidelines. These steps are another essential task of accessibility evaluation that can assess the accessibility in terms of the aspects that require human judgement. Such aspects include for example that alternative text for images substantially describes the meaning of an image in textual form, in case this is needed (i.e. when the image conveys information and is not used for other purposes such as decoration) and that the use of colours promotes accessibility of text and images if viewed in a constrained context of use (e.g. when printed by a black and white printer).

Expert inspections of accessibility can identify a considerable number of problems that are not possible to find by using accessibility tools alone. Typical inspections of Web accessibility include:

- Inspection of human checks for accessibility according to the WCAG guidelines: WCAG explicitly refers to accessibility issues that require human check and provides techniques that can assist expert evaluators
- Inspection of accessibility following simple heuristics: there is a number of empirical heuristics that complements the list provided by WeC.WAI, such as: turning frames off; turning sound off; navigating without a pointing device; accessing the website via multiple browsers; accessing the website via text browsers; accessing the website via a voice browser; test with different screen resolution; and others.

The expertise required to conduct accessibility evaluation is wide-ranging, including both organisational and technical skills. According to the W3C.WAI (http://w3c.org/wai) an acces-

sibility evaluator should have "*an understanding of Web technologies, evaluation tools, barriers that people with disabilities experience, assistive technologies and approaches that people with disabilities use, and accessibility guidelines and techniques*."

### User Testing Of Accessibility

The involvement of users with disabilities is an important aspect of accessibility evaluation. Explicit user involvement is usually neglected in software development and maintenance practice mainly due to arguments related to the increase of costs and delivery times; some practitioners even doubt the usefulness of user involvement and instead promote training programmes instead. However careful user involvement has various advantages such as: increasing the amount of knowledge gained about a software development and maintenance project; identifying the advisability of target system components, which saves the project team from unneeded effort; contributing to system acceptability; reducing training costs; and assisting the identification of a wide range of usability problems. These advantages are particularly important for e-business websites that are interested to provide information and services to the widest range of potential users.

In the context of Web accessibility, user testing with people with disabilities contributes to a better understanding of accessibility issues by all people involved, and especially Web developers. For example, having Web developers see people with disabilities accessing a Web page with a voice browser makes them immediately identify related accessibility problems that their website may have such as the inappropriateness or absence of alternative text, the ordering of controls in a form, and others. Certainly, a user-centred accessibility evaluation will not be effective unless the site is already at a minimum level of accessibility. Furthermore, including users into the accessibility evaluation process can also identify various usability problems. Analytic methods and guidelines for involving users in accessibility evaluation include the work of Gappa and Nordbrock (2004) and Petrie et al (2006).

### Web Accessibility Policy

In order to reach and maintain a good level of Web accessibility, e-business websites need to establish a Web accessibility policy that will be applied during the design, development and update of their website. Currently, web accessibility policies have been established for a number of, mainly academic and governmental, websites and in a few e-business systems that are designed with the participation of organisations of people with disabilities, such as the RNIB (e.g. Gladstone et al, 2002).

An important issue for the design of the Web accessibility policy is what standards, guidelines, methods and processes to identify from related work. Indeed, there is ongoing work in all these respects (for a review see Gulliksen et al, 2004). However, the common basis for the standardisation aspects of the work related to Web accessibility is the W3C.WAI guidelines for the accessibility of Web content, authoring tools and user agents. W3C is the leading open standards (they are not called standards, but recommendations) organisation for Web technologies and their recommendations are the outcome of an open international process with participation from industry and academia.

## SUMMARY AND CONCLUSION

The article argued for the need to include accessibility concerns into the lifecycle of e-business websites and proposed several measures to need to be taken up in order to ensure that Web accessibility is incorporated to the daily operation of e-business applications. There are many reasons for e-business websites to become accessible. The social responsibility of e-business companies

requires that they provide accessible Web-based information and services. The market segment of people with disabilities including the elderly is too large to be ignored; these people want to autonomously access and use e-business. The robustness of the technical design when accessibility is taken into account is another major argument for taking up this approach. Last but not least, there are already legal frameworks for governmental organizations to apply accessibility to their design; e-business websites may need to follow up in order to ensure that there are equal obligations for all in terms of their legal responsibilities.

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## KEY TERMS AND DEFINITIONS

**Accessibility Specifications:** an organised, validated and testable set of (among others) principles, guidelines, techniques, examples that have to be followed by design practitioners to ensure accessibility.

**Accessibility:** the property of a designed artifact to be usable, manipulable and undestandable by all people regardless temporal or permanent injuries or disabilities.

**Expert (Manual) Web Accessibility Inspection:** a generic category of accessibility evaluations that mainly includes experts that review a website for accessibility flaws on the basis of their knoweldge fo accessibility and with reference to accessibility specifications.

**Inclusive Design:** or Design for all: the practice of designing for all people as potential users, thus including the requirements of people with disabilities.

**People in Handicapping Situations:** people that face temporal disabilities mainly due to factors related to temporal injuries, the access context or the environment in which they are situated in.

**User Testing of Web Accessibility:** a generic category of accessibility evaluations that mainly includes user interaction with the web site and recording of accessibility flaws.

**Web Accessibility Evaluation Tool:** a software tool that checks the conformance of a web page to a set of Web accessibility specifications (that can be tested automatically)

**Web Accessibility Policy:** a set of practices for the design, development and update of a website that ensure that Web accessibility is maintained through time.

**Web Accessibility:** accessibility of (any type of) a website.