

# Exploring Web Accessibility Solutions in Developing Regions as Innovations for the Benefit of All

Shadi Abou-Zahra  
W3C Web Accessibility Initiative (WAI)  
2004, Route des Lucioles BP94  
06902 Sophia-Antipolis, France  
+43.1.263.7081  
shadi@w3.org

Shawn Lawton Henry  
W3C Web Accessibility Initiative (WAI)  
32 Vassar Street, Building 32-G528  
Cambridge, MA 02139-4307, USA  
+1.617.253.2613  
shawn@w3.org

## Abstract

Accessibility solutions for people with disabilities are key drivers for innovation and technology. Developing accessibility solutions benefits everyone and adds to the quality of all our lives. This communication paper explores some of the web accessibility challenges for people with disabilities in developing regions and discusses how accessibility solutions for these users would benefit many other users, regardless of abilities, age, skills, education, languages, cultures, economics, and devices.

## Categories and Subject Descriptors

H.5.2 [User Interfaces (D.2.2, H.1.2, I.3.6)]: Auditory (non-speech) feedback; Ergonomics; Graphical user interfaces (GUI); Haptic I/O; Input devices and strategies (e.g. mouse, touchscreen); Interaction styles (e.g. commands, menus, forms, direct manipulation); Natural language; Prototyping; Screen design (e.g. text, graphics, color); Standardization; Style guides; Theory and methods; Training, help, and documentation; User interface management systems (UMIS); User-centered design; Voice I/O.

## General Terms

Design, Economics, Human Factors, Standardization, Languages.

## Keywords

Web accessibility, people with disabilities, developing regions, user-centered design, universal design, design for all.

## 1. Introduction

Throughout history, accessibility has spurred innovation in ICT. Technology that was initially designed for people with disabilities has become pervasive in many areas of our information society. For instance, the telephone technology was initially designed by Alexander Graham Bell to assist people with hearing disabilities and quickly spread to become one of the key pillars of ICT. Later developments at Bell Labs lead to the invention of microphones, speech recognition, and transistors. Other examples of innovation through accessibility include the keyboard, the printer, optical character recognition (OCR), text-to-speech (TTS), and more.

While many of these accessibility solutions are being increasingly

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.  
W4A2010 - Communication, April 26-27, 2010, Raleigh, USA. Co-located with the 19th International World Wide Web Conference.  
Copyright 2010 ACM 978-1-4503-0045-2 ...\$5.00.

deployed in mainstream technologies such as computers, mobile phones, and car navigation systems, they are largely unavailable to many people with disabilities in developing regions due to a number of reasons. Providing access to such users requires new approaches and solutions from what we know today. Developing accessibility solutions for people with disabilities in developing regions promises to provide new innovations that benefit all.

## 1.1 Prevalence of the Web

The Web has become a key resource in our information society for news, education, employment, civic participation, research, commerce, and much more. It is evolving rapidly and continually displacing traditional forms of media and communication. Also, it is converging with other technologies such as the telephone, the television, and radio to make access to information a ubiquitous commodity with a universal interface. While the Web is only one aspect of ICT, research and development of accessibility solutions enables unprecedented opportunities for people with disabilities to access information and to participate equally in society.

## 1.2 Web Accessibility Guidelines

The W3C Web Accessibility Initiative (WAI) develops strategies, guidelines, and resources to make the Web accessibility for people with disabilities. It ensures that core web technologies such as HTML, CSS, SMIL, and SVG provide accessibility features. WAI also maintains accessibility guidelines that are widely recognized as the international standard for web accessibility. These include:

- **Web Content Accessibility Guidelines (WCAG)**  
requirements for text, images, multimedia, and other content
- **User Agent Accessibility Guidelines (UAAG)**  
requirements for web browsers and media players
- **Authoring Tool Accessibility Guidelines (ATAG)**  
requirements for editors and content management systems

These accessibility guidelines are developed in an forum with international participation from developers, researchers, experts, and users, and have proven to be successful in many parts of the world. However, to date there has been little or no participation from stakeholders from developing regions. It is unclear how well these guidelines address the accessibility needs of people with disabilities in developing regions. For instance, the underlying approach largely assumes that the users have available certain accessibility features in their web browsers and media players, and assistive technologies as needed. However, for many people in developing regions, such accessibility functionality and assistive technologies may not be available to them for a variety of reasons. There are opportunities for further research and development, to help understand and increase the applicability of these guidelines to people with disabilities around the world.

### 1.3 Opportunities for Research

This communication paper explores some of the particular web accessibility barriers facing people with disabilities in developing regions, and how developing accessibility solutions for these users will benefit many other web users with or without disabilities. It recommends additional research on how existing and future WAI guidelines and supporting materials can better meet the needs of people with disabilities in developing regions, and encourages innovative development that contribute to a better Web for all.

## 2. Web Accessibility Challenges for People with Disabilities in Developing Regions

The majority of the world population lives in developing regions, including in countries with emerging economies and in rural areas of countries with more advanced economies. The United Nations Population Fund (UNFPA) projects a significant rise in the world population living in less developed regions due to lower mortality, longer life expectancy, and high fertility rates<sup>1</sup>.

According to the United Nations Development Fund (UNDP), the World Health Organization (WHO), and the World Bank, the ratio of people with disabilities is disproportionately higher in developing regions and among groups with lower social or educational attainment<sup>2</sup>. It is therefore estimated that two of three people with disabilities live in developing regions, with an estimated population of 400 million. The increasingly ageing population is further adding to this growing number.

People with disabilities in developing regions encounter a variety of challenges that hinder them from being able to fully benefit from the opportunities provided by the Web. In many cases these challenges are also shared by people with or without disabilities in many parts of the world but are amplified disproportionately for people with disabilities in developing regions.

### 2.1 Affordability of Access and Technology

One of the primary challenges of web accessibility in developing regions is the cost of internet access and of computing technology. For instance, in many cases access to broadband connectivity is disproportionately more expensive in developing regions than in urbanized areas or in areas with more advanced economies. Some factors for this phenomenon include lower incomes of people in developing regions, increased prices due to limited providers in such regions, as well as other factors<sup>3</sup>. Similar aspects apply to the cost of computer hardware and software, so that the cost of ICT for people in developing regions is estimated to make ~17.5% of the total income, while it is as little as ~1.5% in other regions<sup>4</sup>.

People with disabilities often encounter additional expenses. For instance, many assistive hardware and software technologies are considerably expensive. At the same time, people with disabilities, especially in developing regions, often belong to the economically poorest and most marginalized groups. With often less income and access to government support, yet more expenses for access and technology, people with disabilities in developing regions are particularly impacted by the affordability of ICT and solutions.

---

<sup>1</sup> <http://www.unfpa.org/pds/trends.htm>

<sup>2</sup> <http://www.un.org/disabilities/default.asp?id=18>

<sup>3</sup> UNCTAD Information Economy Report 2009

<sup>4</sup> ITU Measuring the Information Society 2010

### 2.2 Support for Languages and Scripts

Initially the Internet and the Web evolved from a predominantly English language environment and have only recently started to become truly international. Increasing awareness and research and development in a number of countries have contributed to higher language support on the basic protocol level such as DNS, URI, and HTTP; the formats including HTML, CSS, and XML; and the application level including browsers, media players, and authoring tools. However, the majority of the world languages, some of which are only spoken and do not have a written script, are still not supported adequately or not at all by ICT protocols, formats, applications, and standards, including accessibility standards.

While missing language support presents a general barrier for all, people with disabilities often rely more strongly on the language support for the accessibility features provided by the protocols, formats, and applications. For instance, text-to-speech (TTS) and speech recognition are fundamental to accessibility, yet these are not available for many languages used in developing regions.

### 2.3 Applicability of Accessibility Solutions

More research is needed to better understand how well existing concepts and solutions address the accessibility needs of people with disabilities in developing regions. For instance, many of the web accessibility concepts and solutions originate from the model of desktop computers with broadband connectivity. However, in many regions, especially in developing regions, internet access through the mobile phone has or will soon exceed access through the desktop computer<sup>5</sup>. Moreover, many other forms of access and interaction are emerging, for instance through public terminals (kiosks), shared computers, television, radio, phone, and SMS. It is unclear what types of accessibility features these platforms can provide, and how these relate to the accessibility features of the desktop. More importantly, it is unclear how uniformly available these accessibility features are in the different technologies and devices, and how to mature these accessibility features to match those that are meanwhile available in desktop computers. Finally, it is also unclear how these technologies are being adopted and used by people with disabilities in different parts of the world. For instance, it is unclear if certain types of technologies or forms of information are preferred over others by specific user groups, and how this is reflected in the related accessibility provisions.

### 2.4 Recognition of People with Disabilities

Besides the many technical challenges, there are also many social challenges for people with disabilities, especially in developing regions, which impact access to the Web. For instance, in many places around the world people with disabilities are not entitled to equal access or are otherwise not adequately recognized as equal citizens of society. This lack of recognition further increases the lack of awareness and hinders the implementation of accessible solutions and services. In many cases people with disabilities may not have the opportunity to learn sign-language, braille, or other skills that enable them to access information and to communicate.

At the same time, people with disabilities are often also not aware of existing accessibility solutions and, therefore, do not advocate for such solutions and policies. The level of awareness among the different stakeholders including users, developers, policy makers, and researchers is generally low in developing regions, so that a whole cascade of non-technical barriers adds to the existing technical barriers for people with disabilities.

---

<sup>5</sup> AdMob January 2010 Mobile Metrics Report

## 2.5 Level of Education and Literacy

People with disabilities in developing regions are often excluded from basic school systems and education. For instance, according to the UNESCO, “98% of children with disabilities in developing countries do not attend school”<sup>6</sup>. With less education and literacy, people with disabilities are often less qualified for employment and are therefore often economically and socially marginalized. At the same time, the Web currently tends to be heavily text-based and requires some level of literacy to use, and is therefore in itself often a barrier for people with disabilities in developing regions.

Fortunately the Web does not need to be text-based only but is actually capable of supporting other forms of information and of interaction. It also provides an unprecedented opportunity for people with disabilities in developing regions to benefit from online resources, including access to education, job search, and much more. The question is how well the current accessibility solutions address the needs of people with disabilities with less education and literacy, and how these accessibility solutions can be best deployed in developing regions.

## 2.6 Availability of Capacities and Skills

While the United Nations Convention on the Rights of Persons with Disabilities<sup>7</sup> (UN CRPD) is having significant impact on the recognition of people with disabilities and on raising awareness for the need of accessibility solutions, in many developing regions there is a lack of expertise and skills to implement such solutions. For instance, policy makers, managers, web developers, advocacy groups, and other stakeholders may often not have the necessary training and skills to develop and implement accessibility policies and solutions. More over, there is a lack of skilled trainers and training facilities to help leverage the expertise of the relevant stakeholders. Also, people with disabilities in developing regions often do not have access to training, for instance to learn about available assistive technologies and to acquire ICT skills to enable them to fully benefit from the opportunities provided by the Web.

## 3. Conclusion

The Web has become a fundamental media of the information society, and provides unprecedented opportunities for people with disabilities. However, many people with disabilities in developing regions face significant barriers that hinder them from accessing the Web and taking full advantage of the opportunities it provides. Some of these barriers include affordability of internet access and computing technology; lack of language support in the protocols, formats, and applications; and lack of policy and implementation of web accessibility. More work is needed to better understand and document the web accessibility barriers that are specific to people with disabilities in developing regions, and to develop accessibility solutions for these users.

The W3C Web Accessibility Initiative (WAI) provides a forum for developers, researchers, experts, users, and other stakeholders, to develop strategies, guidelines, and resources to make the Web accessibility for people with disabilities. WAI invites contribution from international stakeholders on how existing and future WAI guidelines and supporting materials can better meet the needs of people with disabilities in developing regions. WAI encourages the innovative development of web accessibility solutions that contribute to a better Web for all.

## 4. References

- [1] World Wide Web Consortium (W3C)  
<http://www.w3.org/>
- [2] W3C Web Accessibility Initiative (WAI)  
<http://www.w3.org/WAI/>
- [3] W3C Internationalization Activity (I18N)  
<http://www.w3.org/International/>
- [4] UN Convention on the Rights of Persons with Disabilities (UN-CRPD) <http://www.un.org/disabilities/>
- [5] Raising the Floor  
<http://www.raisingthefloor.net/>
- [6] DAISY Consortium  
<http://www.daisy.org/>
- [7] The Global Initiative for Inclusive ICTs (G3ICT)  
<http://www.g3ict.org/>
- [8] United Nations Global Alliance for ICT and Development (UN-GAID) <http://www.un-gaid.org/>
- [9] United Nations Population Fund (UNFPA)  
<http://www.unfpa.org/>
- [10] United Nations Educational, Scientific, and Cultural Organization (UNESCO) <http://www.unesco.org/>
- [11] United Nations Conference on Trade Development (UNCTAD) <http://www.unctad.org/>
- [12] United Nations Development Programme (UNDP)  
<http://www.undp.org/>
- [13] The World Bank  
<http://www.worldbank.org/>
- [14] World Health Organization (WHO)  
<http://www.who.org/>
- [15] Disability Knowledge and Research  
<http://www.disabilitykar.net/>
- [16] Disabled Peoples' International  
<http://www.dpi.org/>
- [17] Handicap International  
<http://www.handicap-international.org/>
- [18] Disability Rights Fund  
<http://www.disabilityrightsfund.org/>
- [19] Independent Living Institute (ILI)  
<http://www.independentliving.org/>
- [20] Internet Governance Forum (IGF)  
<http://www.intgovforum.org/>
- [21] IGF Dynamic Coalition in Accessibility and Disability (DCAD) <http://www.itu.int/themes/accessibility/dc/>

---

<sup>6</sup> UNESCO Director General on 30 October, 2003

<sup>7</sup> <http://www.un.org/disabilities/>