

# The Role of Accessibility in a Universal Web

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## ABSTRACT

"Universal design" is the process of creating products that are usable by people with the widest possible range of abilities, operating within the widest possible range of situations; whereas "accessibility" primarily refers to design for people with disabilities. While the focus of accessibility is disabilities, research and development in accessibility brings benefits to everyone, particularly users with situational limitations, including device limitations and environmental limitations. Awareness and understanding of the benefits of web accessibility to users without disabilities is growing in some areas with the rapid increase of web-enabled devices such as mobile phones, tablets, televisions, and more; with the increasing focus on the growing number of older web users; and with wider web reach in areas with high incidence of low literacy, low bandwidth, older technology, etc. Although there is significant overlap between designing for accessibility and designing for situational limitations, addressing one set of needs does not necessarily provide sufficient solutions for other needs. Keeping accessibility focused on disabilities encourages research and development on meeting the specific needs of people with disabilities. This communications paper explains the importance of **"accessibility" continuing to focus on people with disabilities**, while further integrating accessibility with web design, development, and research in other areas, including those covered under universal design and design for all. It also describes how the World Wide Web Consortium (W3C) and Web Accessibility Initiative (WAI) are working to address accessibility and related user needs throughout the technologies of the Web, and invites all interested parties to participate in research and development to further integrate accessibility for people with disabilities in ways that benefit all.

## Categories and Subject Descriptors

H.1.2 User/Machine Systems: Human Factors.

## General Terms

Management, Design, Human Factors, Standardization, Theory.

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## Keywords

accessibility, people with disabilities, universal design, inclusive design, design for all, digital inclusion, universal usability, situational limitations, universal web, mobile accessibility.

## 1. The Current Situation

"Accessibility" has historically referred to design that enables people with disabilities to interact with buildings, products, services, etc., and accessibility is one of eight principles of the UN Convention on the Rights of Persons with Disabilities. [1] While the purpose of accessibility is to provide equal access for people with disabilities, the benefits of accessible design for people without disabilities has long been promoted, including in the physical world, in telecommunications, and in web design. [2, 3, 4, 5, 6] While the specific benefits of web accessibility to users *without* disabilities has been well documented for over a decade [7, 8, 9], these broader benefits are recently becoming more understood and explored in some areas such as the W4A 2014 research conference (<http://www.w4a.info/2014>).

Part of the reason for this growing awareness and interest is the increasing use of the Web on a wide range of devices (mobile phones, tablets, televisions, etc.) and in situations that pose various limitations. For example, interacting with the Web on a small mobile phone screen poses similar challenges as interacting on a desktop with high magnification, as used by some people with low vision. Additionally, website owners are increasingly focusing on ageing web users, and governments are focusing on digital inclusion to address users with low literacy, low bandwidth, older technology, etc.

As more people explore the relationship between accessibility and related issues including access to and usability of the Web, it has become apparent that there is a need to clarify how accessibility fits into the ecosystem of web design, development, and research.

## 1.1 The Goal of the Universal Web

"Universal design" is the process of creating products (devices, environments, systems, and processes) which are usable by people with the widest possible range of abilities, operating within the widest possible range of situations (environments, conditions, and circumstances). [10] It is related to approaches called inclusive design, design for all, digital inclusion, and universal usability. These consider how technology can be made available to and usable by people with a wide range of abilities, ages, economic situations, education, geographic locations, languages, etc.; Web examples include people in settings with

low bandwidth, limited access to the Web, expensive connectivity, low language literacy, low computer skills, and older hardware and software. Additional considerations from a user experience perspective address people (particularly people without disabilities) in situations that limit their ability to hear, see, use their hands, concentrate, understand instructions, etc. All of these — including device limitations and environmental limitations — are generally referred to as "situational limitations". [10, 11]

The fundamental design of the Web has the potential to work for all people, whatever their hardware, software, language, culture, location, or physical or mental ability. Tim Berners-Lee, W3C Director and inventor of the World Wide Web, said in 1997: "The power of the Web is in its universality." [12] To achieve this goal, different disciplines focus on specific technical aspects such as device independence, multimodality, internationalization, and accessibility for people with disabilities.

## 1.2 The Overlaps Demonstrate Benefits

One aspect of the universal web is "accessibility", which specifically addresses the needs of people with disabilities, including auditory, cognitive, neurological, physical, speech, and visual impairments. Many of the strategies and solutions developed for accessibility directly benefit users with situational limitations. For example, captions for videos provide important audio content to people who are deaf. People who can hear can also benefit from captions in certain situations, for example, when they are in a loud environment such as a construction site, or in a quiet environment such as a library.

The overlap between designing for mobile devices and designing for people with disabilities is illustrated by Yesilada [13], which lists nineteen aspects of design that are covered in both Web Content Accessibility Guidelines (WCAG) 2.0 and in Mobile Web Best Practices (MWBP) or Mobile Web Application Best Practices (MWABP). An example is users who have difficulty entering text. Some users with physical disabilities such as partial paralysis, hand tremor, or lack of coordination have difficulty typing. Mobile devices have small keyboards and are sometimes operated when the user is unsteady, such as on a bumpy train. These are covered in WCAG Guideline 3.3 and in MWBP MINIMIZE KEYSTROKES, PROVIDE DEFAULTS, and DEFAULT INPUT MODE.

Another area of increasing interest among product managers and designers is meeting the needs of aging web users. The overlap between how age-related impairments that affect how older people use the web and the accessibility needs of people with disabilities is introduced in Henry [14]. Arch [15] discusses how the accessibility requirements in WCAG address the needs of older users. For example, contrast between text and background and moving ads were cited as of particular difficulty for older users; these are covered in WCAG 2.0 success criteria 1.4.3, 1.4.6, and 2.2.2.

In addition to addressing the overlap between accessibility and digital divide issues, Henry and Arch [16] provides examples of how specific accessibility requirements in WCAG benefit people with low literacy or who are not fluent in the language, people with low bandwidth connections or who are using older technologies (hardware, browsers, etc.), and new and infrequent web users.

While there is significant overlap between designing for accessibility and designing for other situations, there are important considerations that require a focus on accessibility for people with disabilities, as noted in section 2 below.

## 1.3 Accessibility Solutions Go Mainstream

Another aspect of how accessibility benefits all people is shown in the evolution of technology that is developed specifically for people with disabilities that later becomes included in mainstream technologies. Jacobs [4] lists several of these, including the typewriter, telephone, electronic speech synthesizer, transistor radio, and speech recognition. Many of these technological developments are now available in ubiquitous mainstream products, such as mobile phones. Throughout history, meeting the needs of people with disabilities has provided the impetus for a range of technological developments, and many of those we rely on today in mainstream technology. Thus, accessibility fuels innovation.

## 2. Keeping Accessibility Focused on Disability

For people with disabilities, accessible technology is essential in order to provide equal access to information and interaction and equal opportunity in today's digital world. [12] For many people with situational limitations, technology enhancements are conveniences. Judith Heumann, when the U.S. Department of Education's Assistant Secretary of the Office of Special Education and Rehabilitative Services, said: "For people without disabilities, technology makes things convenient. For people with disabilities, it makes things possible." [17]

Although there is significant overlap between designing for accessibility and designing for situational limitations, addressing one set of needs does not necessarily provide sufficient solutions for other needs. For example, designing a device so that drivers can perform some tasks without looking at it, is not as robust as designing it so that people who are blind can access all functionality of the device all of the time; and ensuring interoperability with refreshable braille displays would likely get lost without a focus on people with disabilities. Just as accessibility solutions do not solve all problems for situational limitations, solutions for specific situational limitations do not solve all accessibility problems. Changing the definition of accessibility to apply more broadly beyond disabilities would risk losing clear focus on the needs of people with disabilities and risk such needs not being addressed effectively.

Keeping accessibility focused on disabilities, and not broadening it to address other situations, encourages research and development on the specific needs of people with disabilities, and solutions that are optimized for these specific needs.

A related point is that referring to situational limitations as such, rather than "situational disabilities", helps maintain the distinction of "disabilities" as referring to people's functional limitations (auditory, cognitive, neurological, physical, speech, and visual impairments).

## 3. Integrating Web Accessibility

While keeping the focus of accessibility on people with disabilities, strategic collaboration between the specialty of accessibility and related areas strengthens overall web design, development, and research. While accessibility is becoming more

integrated in some areas, such as user experience design [18], there is room for improvement.

With more integrated research and development, existing and developing accessibility solutions can more quickly and effectively inform other specific research and development areas and general mainstream development. Similarly, the field of accessibility benefits from inter-disciplinary research and development. With the increased focus on mobile devices and other situational limitations, mainstream interests are motivating development of solutions that can inform advances in assistive technologies and other solutions for people with disabilities.

When technology issues are understood to apply broadly across domains and benefit large numbers of users — including people with situational limitations and people with disabilities, the research and development of solutions can potentially attract more resources, and have additional benefits such as reduced production costs due to economies of scale.

### 3.1 Examples of Integrating Accessibility

Progressive enhancement and responsive design are the first two techniques listed in the 15 top web design and development trends for 2012. [19] Progressive enhancement is a technique to allow everyone to get and use basic web content and functionality with any browser or Internet connection, while providing an enhanced version of the web page to those with more advanced browsers or greater bandwidth. [20] Responsive web design is an approach for designing websites that work in a range of different viewing contexts, from large desktop monitors to small mobile phones. [21] Marcotte's 2010 article states: "...responsive web design... requires a different way of thinking. Now more than ever, we're designing work meant to be viewed along a gradient of different experiences." Both responsive web design and progressive enhancement are directly related to "graceful transformation" that the accessibility field worked on in the 1990s and included in WCAG 1.0. [22] Perhaps if more attention had been paid to accessibility and the need for web content to work along a gradient of different disabilities, the approaches and techniques of progressive enhancement and responsive design would have been developed and more widely implemented earlier.

Natural language processing (NLP) and web accessibility are areas that can currently benefit from collaboration in research and development. There has been extensive research and development in NLP areas such as knowledge extraction from text with tools that are potentially beneficial to people with learning disabilities. [23] At the same time, research and development in the field of learning disabilities can bring new insights and potentially new markets to the field of NLP.

Most browsers have features that are only available under an "Accessibility" category that is buried in menus and/or dialog boxes. Research shows that some people who would benefit from such features do not consider themselves to have disabilities and do not want to use features labeled as accessibility, particularly people with impairments due to ageing. [24] Understanding of this issue was likely behind the change in Microsoft Windows from "Accessibility" to "Ease of Access". If such features were better integrated in the user interfaces, more users would likely take advantage of them.

### 3.2 Integrating Web Accessibility at W3C

W3C strives to integrate accessibility throughout the development of web specifications, and provides a forum for increasing collaboration among web accessibility and related areas. While several of the WAI Working Groups are tasked with some coordination with other W3C work, the Protocols and Formats Working Group is specifically tasked with such horizontal work, including reviewing all W3C specifications during their development to ensure that they provide sufficient support for accessibility. While some WAI work involves developing specific guidelines for accessibility of websites, web applications, browsers, authoring tools, etc. [25], much of WAI's work involves integrating accessibility in other specifications.

The areas of mobile accessibility, HTML5, and Independent User Interface (IndieUI) are examples of integrated approaches to accessibility. WAI's work on mobile accessibility focuses on ensuring that the foundational technologies, such as HTML5 and CSS, and other mainstream W3C specifications support mobile accessibility. The HTML Accessibility Task Force is tasked with identifying accessibility requirements and managing the progress of accessibility solutions in HTML5, as well as expanding participation, fostering mutual understanding, and facilitating collaboration between experts in HTML and in web accessibility as a means to meet the requirements and goals of each group. IndieUI is an example of work that was significantly motivated by accessibility, yet is broadly applicable, especially for interactions with mobile devices. [26]

Increasing the awareness of accessibility and the integration of accessibility considerations into mainstream web-related research is part of the mission of the Research and Development Working Group, with a desired outcome of decreasing the number of potential accessibility barriers in future web technologies.

WAI invites participation in WAI Working Groups by people interested in contributing to advancing web accessibility in collaboration with related areas. [27]

### 4. Promoting Web Accessibility

One aspect of improving integration of accessibility throughout research and development is successful promotion of accessibility to increase awareness and understanding of accessibility issues. Further increasing awareness of the additional benefits of web accessibility beyond those for people with disabilities helps accessibility supporters, because if project managers, website owners, researchers, etc. are aware of the additional benefits, they are more likely to allocate more resources for accessibility. When the overlap between designing for accessibility and designing for situational limitations is better understood, developers can more efficiently meet both goals. [28] When research is presented as benefiting both people with disabilities and people with situational limitations, it can get more attention.

While it is useful to promote the additional benefits of accessibility, it is important to maintain the core focus of accessibility on meeting the needs of individuals with disabilities. It is useful to understand accessibility within the context of access to information as a human right, which includes equal access regardless of physical or mental abilities. [1]

## 5. Conclusion

While there is significant overlap between the strategies and solutions for people with disabilities and for people operating with situational limitations, the interactions of people with disabilities pose specific challenges that warrant maintaining a dedicated discipline of accessibility for people with disabilities. The focus of accessibility needs to remain on people with disabilities so that specific needs do not get lost among the broader issues of designing for situational limitations. At the same time, more integrated research and development that addresses accessibility along with related issues will fuel innovations that better support the needs of all users. W3C WAI encourages increased collaboration between accessibility, specific disciplines such as device independence and multimodality, and general web research and development, in order to more effectively reach the goal of an accessible and universal web.

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