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WCAG Success Criteria to Support Accessibility of Elderly Users in Bilingual Websites

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Abstract: The Internet has provided significant opportunities for the inclusion of older adults through their use of websites specializing in medical information, news, and government services. Even though most websites are monolingual, mainly in English, many websites are bilingual or use multilingual content. To make websites senior-friendly and more accessible, it's important to study the impact of localization on the usability of bilingual websites for older adults. To overcome potential digital accessibility or lingual confusion, web pages must be designed to be natively accessible. The website URL and standardizing icons, error messages, warnings, and form filling are very important to web accessibility. A study was conducted to determine accessibility for older users on bilingual websites. Based on the Analysis of the responses, the study established the need for new accessibility success criteria to overcome some language-related challenges using bilingual websites. The study proposes six accessibility criteria supplementary to the WCAG guidelines, with rationale and intent for each recommended criterion.

Keywords: Web accessibility, WCAG, Accessibility, Bilingual websites

Introduction

For the last decade, the world has faced two important challenges, mainly the advancement in ICT-based technologies and the demographic shift in population aging. According to United Nations estimates (Carrillo, 2021; UN, 2020), the world's aging population will increase from 12% to 22% by the year 2050, mainly in developing countries, with women accounting for the largest proportion by 2050. We are witnessing great advancements, mainly the development of information and communication technology and the spread of web applications on various devices, including fixed and portable computers, smartphones, tablets, and wearable devices. WEB accessibility for people with disabilities and the elderly is gaining significant attention to keep pace with these rapid advancements. This is because technology provides easier options for accessing government services and getting much-needed information (Juristic & Bogataj, 2024). This fact is very significant for the elderly and people with disabilities since technology helps to improve their skills to live more easily while maintaining their independence and dignity and enables them to communicate socially and obtain information and services within a digital environment, also improving digital inclusion for all.

Many countries, international institutions, designers, and developers have adopted different web accessibility standards to make new technologies and applications more accessible and easier to use for all web users, mainly people with disabilities and the elderly (Chen & Yang, 2015). The World Wide Web Consortium and the Standards Organization have developed accessibility standards and guidelines for the web and all digital communication, as well as principles and standards for developers and designers alike. Many standards for digital accessibility are officially recognized in many countries, but they are all largely derived from or built on the WCAG Guidelines. Although these principles were developed for people with different functional disabilities, they help web users facilitate access and accessibility in general, including older persons (W3C, 2008).

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While most web pages are designed in one language, mainly English (Ding et al., 2023), non-English websites or multilingual or bilingual websites are on the rise due to the proliferation of web technology globally (Miraz et al., 2013). Many of these websites use scripts written from right to left and numbers or symbols from left to right, like Arabic, Hebrew, and Urdu (Goldenberg & Tractinsky, 2021). The accessibility of such bilingual web pages represents a challenge for people with disability and generally for older users (Sayago & Blat, 2009). Mostly in switching from one direction to another, and in the use of English abbreviations and technical terms. Moreover, when localization issues are ignored or overlooked (Ishida, 2010).

In this paper, we will examine web accessibility guidelines in bilingual web pages as they relate to older people and how it developed across different versions. We will also propose a set of new guidelines to address the difficulties of older adults. These criteria were based on the findings of our study. Adopting these new criteria would make bilingual websites more accessible for older persons, by overcoming the challenges when using two different languages, mainly Arabic and English. The rest of the paper is organized as follows: in Section 2 we present the web accessibility guidelines structure and criteria with detailed accessibility needs and challenges for the elderly. In Section 3, we review related literature. Section 4 describes our survey and findings. In section 5 we propose a set of accessibility criteria for bilingual websites for old users, and Section 6 includes final remarks and future work.

WEB Accessibility Guidelines Overview

WCAG 1.0 is part of the Web Accessibility Initiative (WAI) by the World Wide Web Consortium (W3C). These guideline recommendations were introduced in 1999 to promote accessibility among web developers, not only to persons with hearing disability, blindness, or cognitive and learning disabilities but to all users (W3C, 1999). The standard is organized to include a guideline title, rationale, and the group of users who benefit from it. In addition, a checkpoint definition (for developers) with three priorities (Must, Should, May) and 3 conformance levels (A, AA, AAA). The set of recommendations includes 14 guidelines with 65 techniques, 16 of which are priority 1, 30 of priority 2, and 19 of priority 3. It also includes how to implement each checkpoint, with detailed examples of using HTML, CSS, SMIL, and MathML (W3C, 1999).

The next major guideline, WCAG 2.0, was introduced in 2008 and revised in 2018 (W3C, 2018) with a significant shift in its structure. It divides the guidelines into four main principles, Perceivable, Operable, Understandable, and Robust (POUR), while keeping the three levels of conformance. Table 1 details the hierarchy of these guidelines.

Table 1. WCAG 2.0 guidelines hierarchy

Principle	Guidelines	Success criteria	Level A	Level AA	Level AAA
Perceivable	4	22	9	5	8
Operable	4	20	9	3	8
Understandable	3	16	5	5	7
Robust	1	2	2	0	0

WCAG 2.1, published in 2018 introduced 17 newer success criteria to improve compliance with WCAG 2.0 and to provide room for future improvements (W3C, 2024). Both WCAG 2.0 and WCAG 2.1 guidelines had no criteria just for older people in particular but highlighted the criteria that meet the needs of older people's web accessibility, which overlaps with users with disabilities (W3C, 2018). In their literature review (Henry & Arch, 2018), WAI highlighted 20 success criteria with full explanation and techniques for how to apply them for old users.

The newer WCAG 2.2 guidelines extended the work of WCAG 2.1 with the addition of 8 new criteria to support accessibility for older users. However, the issue of multilingual or bilingual in particular received little attention in all the guidelines, nonetheless, it included a few techniques for using HTML language attribute or setting a default language for a page or a PDF document (W3C, 2024).

Elderly Accessibility Needs and Challenges

The use of the Internet by older adults is as important as any other age group for what it can offer for their mental or physical health, and social interaction (Ding et al., 2023; Yang et al., 2022; Rasi-Heikkinen & Doh,

2023). Their digital inclusion is also deemed important in developed countries, while in the rest of the world, the issue of older adults' inclusion is greatly influenced by Internet availability, digital skills, and accessibility issues (Helsper, 2021).

The Web accessibility initiative (WAI, <https://www.w3.org/WAI/>) aims at making the Internet available for all web users mainly people with functional disabilities, has identified 6 functional disabilities affecting accessibility such as vision disability, hearing disability, physical impairment, and cognitive and learning disabilities. While older adults may share similar disabilities, the cause of these impairments is due mainly to aging. Table 2 below lists 4 age-related impairments and 4 age-related challenges that influence accessibility for older users. The recent standard.

Table 2. Old adults' impairments and challenges

Impairment	Effects
Declining vision	Reduction in color contrast and sensitivity, and focus
Declining physical capability	Reduced motor control
Declining hearing	Difficulty hearing
Declining mental abilities	Decline in short-term memory, lower mental concentration, and being easily distracted
Geographical challenge	Low connection speed
Technological challenge	Use of old technology
Skills Challenge	New to the web
Skills challenge	Infrequent user

*Source w3c

Czaja et al. (2019) argue that older users are slower in learning new techniques if multiple tasks are required at the same time. These abilities tend to decline with age, and it is essential to take that into account when designing web pages, and even more for multilingual or bilingual pages (Ding et al., 2023). Numerous studies focused on the older person's accessibility of health-related sites or common services web pages (Fernandes et al., 2023; Acosta et al., 2020), but few researched the adequacy and accessibility of multi-lingual or bi-lingual pages (Vázquez & Bolfing, 2013; Ishida, 2010). For this reason, and to promote better and less confusing interaction, we propose several accessibility criteria as an addition to the WCAG standards to facilitate the use of bi-lingual web pages for older people.

Related Work

Web accessibility for older people has been extensively studied and researched while focusing on common disabilities shared amongst people with disabilities and older people (Sayago & Blat, 2009; Affonso et al., 2010). With many studies that suggested making websites more accessible and friendly to use, the National Institute on Aging (<https://www.nia.nih.gov/>), enforced a policy to make websites more elderly-friendly that is based on WCAG standards. These include designing readable text, information presentation, and audiovisual content.

Website accessibility evaluation also received more attention across many disciplines such as education, healthcare, and government services, covering all disabilities and elderly needs (Itinier et al., 2022; Bhagat & Joshi, 2019; Vigo & Conway, 2013). Acosta et al. (2020) identified the challenges and suggested improvements in health services website Accessibility by integrating intelligent human systems. Orbán-Mihálykó and Sik-Lany (2019), evaluated the accessibility of European health-related websites in 48 EU countries and found that the percentage of elderly does not affect the software testing results in any of the respective countries. Fernandes et al. (2023) and Mason et al. (2021) and Alajarmeh (2021) evaluated the web accessibility of international and popular health websites, in which they identified different inaccessibility challenges and suggested recommendations and evaluation tools for all challenged groups, including the elderly.

Since the start of the WAI-AGE initiative (WAI, (<https://www.w3.org/WAI/WAI-AGE/>)), Abou-Zahra et. al. (2008), highlighted the need to consider the accessibility of aging web users as important as it is for people with disabilities. Their recommendations are for developers, researchers, and users to review and develop better accessibility practices that are based on the real needs of the aging Web users. The study highlighted the five main objectives of the initiative to overcome the digital divide for those with age-related needs. These objectives have influenced research directions for the next two decades. The set of objectives focused on developing

guidelines to include older people and to create a continuing exchange of ideas between all accessibility stakeholders, mainly developers.

Many studies since, focused on the different needs, challenges, and problems facing elderly web users Junqueira, (2023), Ran et al. (2024), Martin-Hammond et al. (2021) and Sayago and Blat, (2009). For example, Lara et al., (2010) proposed a set of 30 success criteria based on the four accessibility principles that address older users' accessibility WCAG2.0 standard. None of these success criteria focus on multilingual or bilingual websites. However, Vázquez and Bolfin (2013), observed common gaps in multilingual websites by not following a standardized pattern in lingual and culture-related settings. The study also emphasized the need for localization rather than only the translation of terms and abbreviations. Other studies addressed multilingual website usability (Miraz et al., 2013), bilingual user interface challenges (Goldenberg & Tractinsky, 2021), and localization (Gupta et al., 2012).

Survey and Key Findings

To identify specific accessibility issues for older users in bilingual websites (Arabic and English), we conducted a survey, analyzed our findings, and reported the main outcomes of the survey. The questions focused on six important accessibility issues. The first is on the suitability of the website URL, and the second is related to pop-up windows. The next two issues investigate the use of localized Icons, measurement units, abbreviations, and symbols. The last two topics address filling forms and error messages, and alerts. The main contribution is to derive appropriate accessibility guidelines that could be amended to the current WCAG standards, based on needs as they relate to elderly users of bilingual webpages.

The survey was distributed to 50 old web users aged 60+, 35 attempted the survey questions, and only 30 responses were used. All persons surveyed describe themselves as frequent web users who are fluent in Arabic but English illiterate. We suggested a few bilingual websites in the areas of news, healthcare, and telecommunication, in addition to their regularly visited websites.

Almost all surveyed (90%) believe that if the URL were in Arabic, and not in English, abbreviated letters, the site would be easier to remember and track, particularly when accessing other pages on the same site. On the question of pop-up windows, all respondents feel confused and annoyed when pop-ups appear. Pop-ups are confusing, particularly if accompanied by English audio, and do not offer the option of closing the window. Many think either an error has occurred or they did something wrong, and often react by closing the main page rather than the pop-up window. On the questions of localized icons, units, abbreviations, and symbols, 90% of respondents are not familiar with localized icons, and 70% do not prefer abbreviations and measurement units even in their native language. For example, the lack of standardized Icons requires knowing the different Icons on different sites, and many times leads to confusion and mistakes.

Filling forms presents a challenge for 90% of respondents, mainly when some information is required in the second language, such as medical information like medicine names and laboratory information, or when filling forms for travel. The confusion comes from having to fill in forms in bi-directional text and the need to change keyboard settings to do so.

Proposed New Success Criteria

In this section, we propose a set of new success criteria that could be integrated into the latest WCAG 2.2 guidelines to ensure better accessibility for older people in bilingual web pages. The proposed success criteria are derived from the survey and are designed to align with the four WCAG principles of Perceivable, Operable, Understandable, and Robust. Each criterion will have a suggested level, description, rationale, and to whom it is intended.

- *Success Criteria* (Level AAA): The URL of the main page and all pages in the preferred language.

Rationale: The main web page and all other pages must have the URL in the preferred language with no abbreviations to prevent confusion and distraction.

Intent: Reading disabilities and language literacy.

- *Success Criteria* (Level A): No pop-up windows

Rationale: Pop-up windows tend to distract old users and give the impression of wrong action.

Intent: For old people who are technically challenged.

- *Success Criteria* (Level AA): All units and abbreviations are localized

Rationale: Old users find it hard to convert between metric and non-metric systems like temperature, weight units, and measurements.

Intent: For old people who are technically challenged.

- *Success Criteria* (Level AA): Form filling forms accept only the language of the page

Rationale: Old users might get confused if two languages are required to fill a form more apparent in languages with right-to-left text directions.

Intent: For old people with impaired vision or with learning disabilities.

- *Success Criteria* (level AA): Errors and alerts in the language of the page

Rationale: This makes it easier to recognize what went wrong to prevent confusion and to be able to correct.

Intent: Suitable for all users.

Conclusion

Web accessibility is of great importance not only for people with disabilities but also for the elderly. As the world is increasingly digital, more aging users rely on services and information provided by different electronic means and applications. While WCAG guidelines are designed to overcome accessibility barriers, new guidelines are still needed due to technological advancements and to accommodate ever-changing needs. In this study, we proposed to help aging users who are English illiterate overcome accessibility barriers that arise when using bilingual websites. The proposed success criteria could be extended to popular Apps and digital platforms. Our future work will focus on using AI tools to dynamically make website content more accessible based on users' age and their knowledge of technology.

Scientific Ethics Declaration

* The authors declare that the scientific ethical and legal responsibility of this article published in EPSTEM Journal belongs to the authors.

Conflict of Interest

* The authors declare that they have no conflicts of interest

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