An Analysis of User Experience and Web Accessibility of Government Websites in Developing Countries for the Disabled People

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Imagine navigating a bustling city blindfolded, with only the distant sounds and subtle textures to guide you. For millions of people with disabilities, this scenario mirrors their online experience as they confront the barriers of web inaccessibility. The virtual world, intended to be a realm of limitless information and connectivity, is often a labyrinth of frustration and exclusion for those with disabilities.

Approximately 16% of the global population faces significant disabilities, and virtually everyone encounters disability at some point in life. But what does disability entail exactly? “Disability is part of being human” (World Health Organization, 2024). It is a complex concept encompassing various perspectives, including medical, social, and cultural viewpoints. Medically, it's seen as a deviation from typical human function, while the social model shifts focus to societal barriers and prejudices, suggesting disability is socially constructed. Cultural beliefs also influence perspectives; some stigmatize disabilities, while others integrate individuals into communities with specific roles.

Understanding diverse perspectives is crucial, especially concerning web accessibility in developing countries. Web accessibility refers to the use of “policy and initiative to improve social inclusion through the use of technology” (Kelly et al., 2010, p.1). Technology is not just a tool but a transformative catalyst, fostering innovation, efficiency, and connectivity. It addresses global challenges and redefines the human experience, emerging as a fundamental agent of empowerment and change. Despite its transformative potential, many websites in developing countries fail to meet Web Content Accessibility Guidelines (WCAG), particularly disadvantaging the disabled population (Wang et.al, 2005).

Researching this topic is crucial in our increasingly technology-driven world, where the technological disparity for disabled individuals continues to grow. My proposed STS Research aims to analyze how government websites' user interfaces accommodate people with disabilities in developing countries, focusing on adherence to WCAG standards and current government policies. The goal is to identify gaps and suggest potential solutions to create an inclusive environment for the disabled population.

Background & Context

Disability affects over 1.3 billion of the global population, more than 80% of whom live in developing countries (World Bank, 2024). This highlights the critical need for facilities and services for disabled individuals to address the frequent violation of equal opportunities.

Today, government websites have seen a surge in popularity and serve as the electronic face of governance, aiming to boost cost efficiency and reduce direct interactions with citizens. E-government is defined as "government's use of technology, particularly web-based Internet applications to enhance the access to and delivery of government information and services to citizens, business partners, employees, other agencies and entities (Shahkooh, 2006, p. 1)." For e-Government services "the accessibility is vital" and the "ability of citizens to access government online determines the success of government initiatives" (p. 1). They serve various functions such as e-voting, e-procurement, data management, inter-agency collaboration, and e-learning. These websites also play a vital role in promoting transparency, accountability, economic growth, social inclusion, knowledge sharing, and improving health and education services.

However, many e-government websites fail to meet an acceptable level of accessibility compliance standards such as Website Accessibility Conformance Evaluation Methodology (WCAG-EM) creating significant barriers, especially for the people with disabilities. This lack of accessibility is widespread across many countries, necessitating further research into technology, user experience design, and social policies. Along with e-governance projects, there are bureaucratic processes, lack of accountability and transparency, lack of citizen participation, lack of trust, lack of resources, digital division, and poor management and legal barriers present which hinder equal accessibility (Acosta-Vargas et al., 2017). Despite advocacy efforts, government organizations show limited interest in improving internet accessibility for the disabled, deepening the digital divide, particularly within the e-government sector.

Web Accessibility and Guidelines

Many developing countries are rapidly adopting e-government; however, their ultimate success depends largely on their quality, accessibility, and performance. The World Wide Web Consortium (W3C), an international organization dedicated to standardization, established the Web Accessibility Initiative (WAI) in 1996, advocating for a more inclusive web, resulting in the widely used Web Content Accessibility Guidelines (WCAG) for creating accessible websites (Akgul, 2016).

WCAG 2.0, the current standard, is structured around four key principles (Acosta-Vargas et al., 2017):

1. Perceivability: the content is perceivable by all users.
2. Operability: the user interface components and navigation are operable.
3. Understandability: the information and the operation of the user interface are understandable.

4. Robustness: the content can be reliably interpreted by various users and assistive technologies.

These principles are further divided into three priority levels, with compliance criteria outlined in Figure 1. Level AA is the generally accepted conformance level for web pages (Baowaly, 2012).

Category	*Description*	*Symbol*
1	The developer must follow these guidelines in order to make all the information on a website accessible for all users including the persons with disabilities.	A
2	The developer should follow these guidelines to remove the important accessibility barriers in accessing the information on a website.	AA
3	The developer may follow these guidelines as these are not so important but make the website more comfortable for the use of disable person.	AAA

Figure 1. WCAG Priority with Conformance Level

The Web Design Framework for Improved Accessibility for People with Disabilities (WDFAD) presents Web accessibility guidelines into concise and Web developer-oriented format (Baguma & Lubega, 2008). This framework categorizes the primary goals of Web Accessibility, as shown in Figure 2.

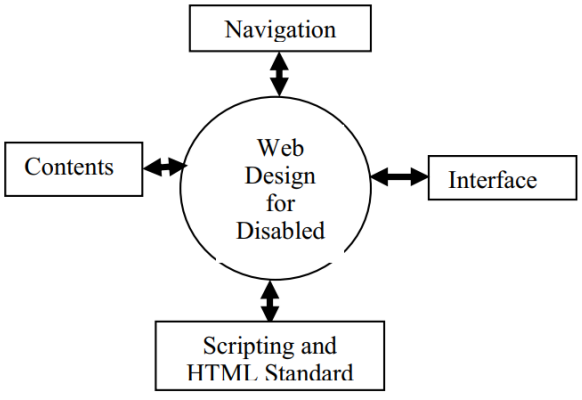

Figure 2. Web Accessibility Framework

Additionally, W3C has introduced the Website Accessibility Conformance Evaluation Methodology (WCAG-EM) to enhance the validity of accessibility standards. This methodology

evaluates various types of websites, including static and dynamic sites, as well as mobile versions, across different situations and contexts (Acosta-Vargas et al., 2017).

Several guidelines and tools are available to designers and webmasters to improve website accessibility. These include initiatives such as the US Section 508, Americans with Disabilities Act (ADA), and Australians with Disabilities Act. While automated assessment tools are valuable for initial evaluations, thorough expert revisions are essential for ensuring compliance.

Literature Review

This section of the paper will examine disability from different perspectives. Firstly, it will dive deeper into the social conceptions of disability followed by discussion of geographical context perceptions of disability using insights from already existing literature. Finally, the section will delve into challenges encountered in web development concerning disabilities.

Is there a social conception of disability? The answer to this question varies across different perspectives and contexts. Corresponding to this conception, "disabilities are not mental or physical conditions of the organism which prevent or impair function, and therefore conditions a rational agent would wish to avoid or remedy, but rather, physical and mental impairments may be positive, negative, or neutral" (Harris, 2000, p. 1). On this view, disabling features of disability are social rather than physical or "mental" as noted in a remark by Alison Davis where she states, "it is society that handicaps me, far more seriously and completely than the fact that I have spina bifida" (Layton & Steel, 2015, p. 2). Further there are suggestions that not only say that there is a coherent social conception of disability but that all non-social concepts, or "medical models" of disability are fatally flawed. It is even true to say that for the disabled people, it is the social exclusion, discrimination, ostracism, hostility which is far worse than the physical or mental impairment. This position in the arguments goes off to show how we

surely need to be able to deplore these social, political, economic, and cultural disadvantages independently of whether they are triggered by disability. They might not be the definition or conception of disability but part of "what is bad about disability." One important implication of this claim is that once the social dimensions of disability have been resolved no serious "disabling" features remain.

How do geographical contexts influence these conceptions? Disability studies have historically focused on urban, Western societies, but recent debates are expanding understanding to include developing countries' diverse and evolving landscapes. Disability varies across cultures and has been defined as "long-term impairment leading to social and economic disadvantages, denial of rights, and limited opportunities" (McEwan & Butler, 2007, p. 1). It is important to recognize that disability is not only about people and their social relationships but also about their interaction with the community and the environment. In developing countries, disability is voiceless due to institutional neglect forcing disabled population to take positions on the peripheries of their societies. Despite clear links existing between human development and disability issues, "the latter has been neglected in comparison with issues such as gender justice and sustainability" (Baylies, 2002, p. 8). Attitude in developing countries has specifically played a part in this lack of visibility as in some places issues regarding disability are considered private or a matter for the family. The United Nations notes that three-quarters of the world's disabled population resides in developing countries, where poverty, injustice, and geopolitical interventions contribute significantly to impairments, contrasting with the implications in industrialized nations.

Furthermore, in developing countries, dominant web accessibility standards such as W3C, WCAG fail to account for disability as a complex and culturally contingent interaction.

Regarding Web development, “significant inroads are being made through legislation, education and advocacy, but aversive disablism can and does persist at many levels” (Kelly et al., 2010, p. 2). Builders and developers are creating disabling barriers such as when builders might build doorways too narrow for a wheelchair user. These obstacles for people with disabilities manifest in various forms and are present at multiple levels of society, including government policies and regulations. These obstacles can either be physical, attitudinal, or systematic. While various accessibility resources exist, a lack of awareness impedes their use in developing countries. Governments have yet to recognize the importance of e-government services for the population with special needs.

Methods

The evidence for this paper primarily derives from scholarly sources that address the injustices experienced by the disabled population. Case studies from various developing countries, including Pakistan, Turkey, and Bangladesh, were selected for content analysis of web inaccessibility. These countries were chosen due to their comparatively higher levels of web inaccessibility. To gain deeper insights into web inaccessibility and e-government websites, a comprehensive selection of literature articles was examined, focusing on different guidelines and standards. These sources collectively provided valuable insights into understanding the stigma surrounding this issue, diverse viewpoints, social conceptions, and existing gaps for the disabled population. The literature review was meticulously conducted to ensure a comprehensive understanding and facilitate the subsequent analysis.

Within this analysis, we explore two crucial theories: Appropriate Design & Technology and Technological Imperative. These theoretical frameworks are fundamental to the design of government websites, ensuring accessibility and usability for all users. Appropriate Design &

Technology emphasizes the need for designs that are suitable, relevant, and effective for the intended users, considering their diverse needs and abilities (Long, 1980; Nieusma, 2004). On the other hand, the Technological Imperative theory shows the importance of leveraging technology to address societal needs and challenges, advocating for the use of advanced technologies to enhance accessibility and functionality (Hertz, 1970). By examining these theories, we aim to gain deeper insights into the principles guiding the design and development of government websites, ultimately striving for inclusivity and equitable access to digital services for all citizens.

Results & Discussion

Despite the United States creating largest e-Government network globally, a stark reality persists— "92% of the most popular federal websites" fail to meet basic WCAG standards (Cudd, 2023). A study conducted on 66 government websites in the United States, based on W3C accessibility guidelines using automatic evaluation tools and criteria such as font size, navigation, and general usability, revealed that 86% of the websites fail to pass the accessibility standards. This indicates a substantial gap in addressing the needs of people with disabilities on U.S. e-government websites. This situation is exacerbated in developing countries like Turkey, Pakistan, and Bangladesh where disabled individuals are often the most neglected segment of society. Widespread discrimination and their isolation from the broader community have led to significant financial hardships and a loss of creative abilities, further exacerbating the challenges of web inaccessibility (Baowaly, 2012).

The following analysis would be centered around three countries: Turkey, Pakistan, and Bangladesh. Through the studies on web accessibility conducted on government websites in these countries, we will explore the findings and discuss the identified gaps.

Exhibit A: Turkey

In a study conducted in Turkey, 25 official government websites were analyzed. The focus of the study was on the home pages of these websites, which serve as the initial point of interaction for users. The analysis encompassed three key perspectives: HTML and CSS validity, web accessibility, and the current utilization of HTML5 and ARIA (Akgul, 2016). These critical aspects ensure that a website is accessible to all users, including those with disabilities.

1. *HTML and CSS Validity*

Valid HTML and CSS code ensure that web content is properly structured and formatted. Among the websites examined, notable findings emerged regarding HTML and CSS validity. For instance, the Republic of Turkey Ministry of Youth and Sports exhibited the highest number of HTML errors, totaling 525, followed by the Ministry of Economy with 306 errors. Remarkably, the website of the Republic of Turkey Ministry of Justice stood out with zero validation errors.

In terms of CSS validity, certain websites such as the Presidency of the Republic of Turkey and the Ministry of Justice demonstrated flawless performance with zero errors. Conversely, the Ministry of Development's website presented a considerable number of errors, totaling 353.

2. *Web Accessibility*

The assessment revealed widespread accessibility issues across all home pages, as depicted. Notably, every website exhibited at least one known error from AChecker’s assessment. The eXaminator tool provided a global accessibility score ranging from 1 to 10,

with scores lower than 6 observed in several instances. Moreover, metrics such as TAW 1.0 and TV recommended several corrective actions to align with WCAG 1.0 and 2.0 Priority Level 1 standards. The most favorable accessibility outcomes were observed in the Turkish Armed Forces/Turkish General Staff, Ministry of Justice, and Ministry of Defense websites.

3. *HTML5 and ARIA*

Regarding HTML5 and ARIA implementation, the findings indicated limited adoption. HTML 5 introduces several features and elements such as <footer>, <header>, etc., which are aimed at improving web accessibility. DOCTYPE is a declaration to appear at the top of every HTML document which tells the browser what element to expect as the top-level element. "Only 16% of the websites featured the HTML5 DOCTYPE declaration," while a mere "20% utilized ARIA" (p. 7). By testing for ARIA compliance, developers can ensure that the web applications are accessible to users who rely on assistive technologies to navigate and interact with web content.

Overall, the study failed to address the issue of disability-accessibility across Turkish e-government websites. Further, it revealed a general failure of e-government websites to meet minimum web accessibility standards. Notably, issues such as the "absence of text equivalents for non-text elements and the failure to update static equivalents for dynamic content" were identified as primary accessibility challenges. Despite variations in evaluation methodologies, it remains challenging to determine the rankings for these websites (Akgul, 2016).

Exhibit B: Pakistan

In Pakistan, a comprehensive study of 45 government websites revealed significant deviations from WCAG standards 1.0 and 2.0, utilizing two readily available online evaluation

tools: Total Validator and Functional Accessibility Evaluator 1.0.2. Prior to this study, no such evaluation had been conducted.

The results obtained from this study are summarized as following:

1. *Navigation Implementation:* Notably 100% of central government websites failed to achieve complete implementation in navigation. A mere "2.63% websites had almost complete implementation" and "93.37% had partial implementation" as shown in Figure 3 (Bakhsh, 2012, p. 3).

2. *Interface and Text Equivalent Implementation*: Approximately "28.95% websites exhibited partial implementation," while "71.05% achieved complete implementation" as shown in Figure 4 (p. 3).

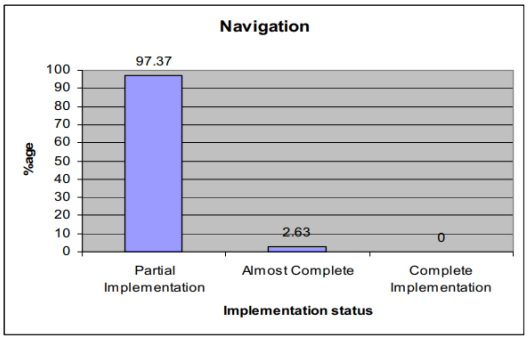

Figure 3. Navigation

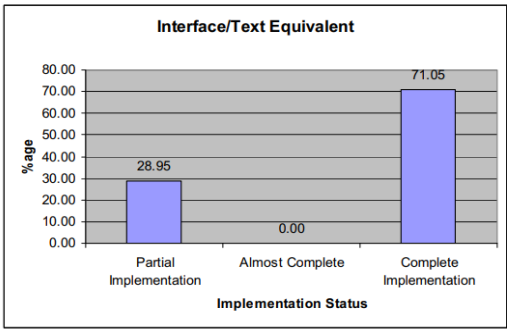

Figure 4. Implementation

3. *Content Evaluation*: Better-performing results were observed for content accessibility aimed at visually disabled individuals with "71.05% of websites having full implementation status" as shown in Figure 5 (p. 4).

4. *Scripting and HTML standards:* Results indicated that "71.05% completely follow the scripting & HTML standards" while the remaining 28.95% demonstrated nearly complete implementation as shown in Figure 6 (p.4).

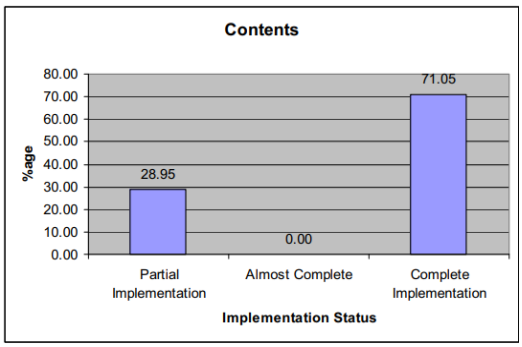

Figure 5. Contents

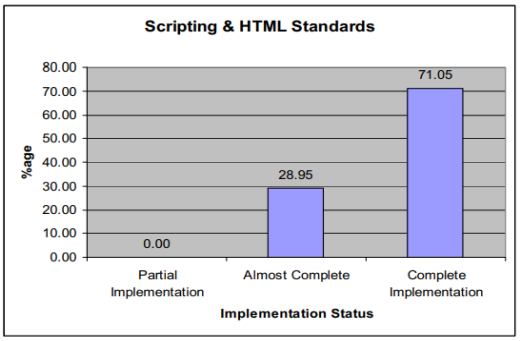

Figure 6. Scripting & HTML Standards

5. *Error Analysis:* Figures 7 and 8 highlighted the top five ministries with the highest number of errors or failures based on WCAG 1.0 criteria. Notably, the Central Board of Revenue ranked at the top, with over 300-page errors and an average of nearly 110 errors per website.

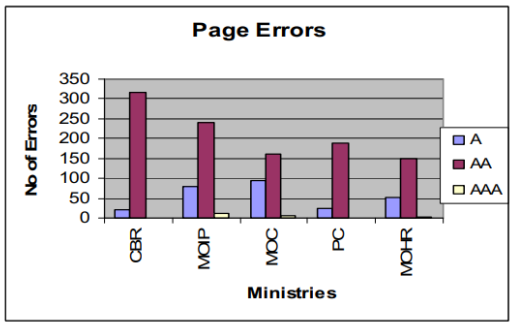

Figure 7. Page Errors

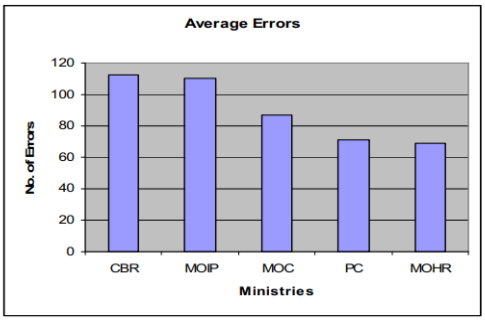

Figure 8. Average Errors

Notably, all government websites failed to meet the Web Accessibility Framework for the disabled, including criteria such as content accessibility, navigation accessibility, user interface accessibility, as well as adherence to Scripting & HTML standards. Most of the websites "missed the category 2 AA" as this category deals with the removal of accessibility barriers for the disabled people (p. 5). This deficiency is particularly problematic given that 6.2% of the population is disabled, and only a 2% fixed job quota exists for people with disabilities.

To address these issues, the government of Pakistan must review existing policies and align them with international standards, drawing inspiration from the accessibility policies of

countries like the USA, UK, and Germany, as well as guidelines from W3C. This study shows that in this area of subcontinent no importance is given to disabled in providing the information and services and there is a lack of awareness present. This ignorance not only makes the disabled to cut off from the society but also pressurizes them to use unfair means for the survival in the community.

Renaming the Science and Technology Commission to the e-Government Directorate signifies a step towards by Pakistan in prioritizing web accessibility. With this establishment, the directorate staff will be responsible for implementing e-government projects. They will also initiate policy drafts for web accessibility of government websites making sure that the accessibility is implemented at the developmental level compared to the completion of the project. Additionally, dedicated awareness programs within all ministries and divisions are essential for fostering an environment where government websites are accessible to all, including those with disabilities. This concerted effort is crucial to combatting societal exclusion and promoting equality and fairness for all citizens.

Exhibit C: Bangladesh

In Bangladesh, an estimated 10% of the total population comprises persons with disabilities, who often face neglect despite the existence of the Disabled Welfare Act 2001 (Baowaly, 2012).

A study was conducted to evaluate the accessibility of 10 government websites' home pages in Bangladesh, aligning with W3C standards. The evaluation utilized both manual and automated testing with accessibility tools and involved 10 participants with various visual disabilities. Post-evaluation interviews were conducted with the participants and web designers to enhance result accuracy (Baowaly, 2012).

Findings revealed “significant number of errors and warnings” in website validation against W3C standards, rendering some websites completely inaccessible to assistive technology users (p. 3). While 20% of the websites were entirely inaccessible, 80% exhibited multiple errors and warnings during markup validity testing of web documents (HTML, XHTML, SMIL, etc.) as shown in figure 9.

Website (Single Page)	Able to check?	Errors	Warnings
www.bangladesh.gov.bd	Yes	98	29
www.bangabhaban.gov.bd	No	NA	NA
www.pmo.gov.bd	Yes	45	43
www.moedu.gov.bd	Yes	215	196
www.mosict.gov.bd	Yes	123	105
www.lged.gov.bd	Yes	20	10
www.mohfw.gov.bd	Yes	84	17
www.moi.gov.bd	Yes	8	0
www.mofa.gov.bd	Yes	22	11
www.mha.gov.bd	No	NA	NA

Figure 9. Markup Validity Check Result

Evaluation tools like AChecker and EvalAccess yielded differing results despite being used for the same purpose. AChecker found none of the websites meeting conformance levels A, AA, or AAA, indicating a lack of mandatory accessibility requirements. EvalAccess showed 50% of websites achieving conformance level A, but none meeting levels AA or AAA showing the severity of this issue. Assistive technologies and participant interviews showed similar results, highlighting accessibility challenges. Survey results from the web designers revealed a lack of awareness regarding web accessibility and the absence of government policies addressing this issue.

In conclusion, these diverse case studies reveal a stark reality: developing countries are falling short of basic standards, leaving the disabled population marginalized and underserved. This shows a deficiency in both the qualifications of web designers and a broader lack of

awareness regarding the needs of individuals with disabilities. It is evident that governments have yet to recognize the critical importance of providing adequate services for this segment of the population.

Limitations and Future Work

Various limitations emerged from the case studies across different countries. First, there is exclusive reliance of accessibility analysis on automated tools rather than expert inspections. Expert inspections are crucial for understanding web content interactions with assistive technology. Additionally, the use of multiple evaluation tools is recommended to ensure reliable results, given discrepancies in completeness and correctness scores (Akgul, 2016).

Another limitation found in these studies was testing being restricted to the home page. To get an accurate representation of the situation, it is important to extend the studies to hundreds or thousands of web pages on each website to get a precise view of the web accessibility. Further, the metrics derived from automated approaches may overlook significant accessibility issues experienced by individuals with disabilities.

Future efforts should employ diverse evaluation tools to assess e-government website effectiveness and conduct real assessments involving disabled populations for valuable insights. Considering the contextual and cultural differences among developing countries, the government should adopt either the existing web accessibility guidelines or develop context appropriate ones for equitable access. Proactive government policies mandating web accessibility as an important requirement in these countries. Furthermore, organizations advocating for disabled individuals should raise awareness among government bodies about the importance of accessible e-government websites. Successful implementation of e-government website accessibility not only

benefits disabled individuals but also fosters community inclusion and overall societal improvement.

Conclusion

Developments in Information Technology (IT) are profoundly reshaping society, particularly in public services and government sectors despite the developing countries experiencing a lag. Since the Internet's expansion in the 1990s, governments worldwide have witnessed a rapid transformation in service delivery, communication efficiency, and accessibility. However, many countries still face challenges in adopting these e-government practices due to inadequate infrastructure, organizational culture, understanding, and resources while simultaneously failing to include the needs of all the social groups in the implemented technology. Therefore, it is crucial to prioritize the inclusion of the disabled population during the planning and implementation phases of e-government projects, emphasizing appropriate design to address social needs through technology integration.

One significant challenge posed by IT advancements is the digital divide, exacerbated by the exclusion of disabled individuals from e-government initiatives, particularly pronounced in developing countries. To bridge this gap, e-governmental organizations must adhere to W3C standards and recommendations for web design. Compliance with these standards will broaden the audience reach while enhancing usability for disabled users, streamlining resource discovery, and boosting overall efficiency.

Website development demands expertise across various domains, including accessibility, usability, security, programming, and user interface design. Governments must expedite the acquisition of these skills by prioritizing IT education and increasing the enrollment of students

trained in relevant fields with modern technologies. Implementing accessibility measures in website development is essential to solve any existing issues comprehensively despite being a time-consuming process.

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