**Journal of Computer Science and Technology Studies**
ISSN: 2709-104X
DOI: 10.32996/jcsts
Journal Homepage: www.al-kindipublisher.com/index.php/jcsts

JCSTS
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

**| RESEARCH ARTICLE**

# Digital Citizenship for All: Accessibility Requirements in Public Domain Websites

**VENKAIAH CHIRUMAVILLA**
*University of New Haven, USA*
**Corresponding Author:** VENKAIAH CHIRUMAVILLA, **E-mail**: reachvenkaiah@gmail.com

**| ABSTRACT**
Government website accessibility stands as a cornerstone of inclusive digital governance, enabling all citizens regardless of ability to access essential public services and information. Beyond mere legal compliance with frameworks like Section 508 and WCAG standards, accessibility implementation delivers multifaceted benefits across governmental operations. Technical components including semantic HTML structure, alternative text implementation, keyboard navigation, color contrast considerations, and accessible forms collectively create the foundation for truly inclusive digital experiences. Mobile accessibility has emerged as particularly crucial as citizens increasingly access government services through smartphones and tablets, requiring specialized approaches to touchscreen interfaces and responsive design. The benefits extend far beyond inclusion—accessible government websites demonstrate improved usability for all citizens, substantial cost savings through proactive implementation, enhanced public trust, increased democratic participation, and strengthened information security. As governments continue digital transformation efforts, prioritizing accessibility represents both an ethical imperative and a strategic investment in effective public service delivery.

**| KEYWORDS**

Digital Inclusion, Government Websites, Accessibility Standards, Responsive Design, Civic Participation

**| ARTICLE INFORMATION**

**ACCEPTED:** 14 April 2025 **PUBLISHED:** 14 May 2025 **DOI:** 10.32996/jcsts.2025.7.4.31

## 1. Introduction

In the digital age, government websites serve as critical gateways for citizens to access public services, and information, and participate in democratic processes. Accessibility in these digital platforms refers to the design and development practices that ensure all individuals, including those with disabilities, can perceive, understand, navigate, interact with, and contribute to web content. According to comprehensive global research, approximately 15% of the world's population—representing an estimated 1 billion people—lives with disabilities, with prevalence rates higher in lower-income countries where accessibility to services is already challenging [1]. This significant demographic faces substantial barriers when attempting to access digital government services, highlighting the importance of accessible design in public sector websites.

Despite technological advancements, many government websites continue to present significant accessibility barriers. A systematic evaluation of nearly 300 federal websites revealed that 92% failed to meet one or more accessibility standards, with common issues including poor form labels, missing alternative text, and inaccessible documents [2]. These technical shortcomings create substantial impediments for citizens with visual, auditory, motor, or cognitive impairments who rely on assistive technologies. For instance, the study found that 30% of homepages failed to use proper heading structures—a critical element for screen reader navigation—while 41% of images lacked adequate alternative text descriptions [2]. Such barriers effectively exclude portions of the population from essential services and information.

The importance of this issue cannot be overstated as governments increasingly migrate services online, from tax filing and benefit applications to voting information and regulatory compliance requirements. Without proper accessibility implementation, individuals with disabilities face undue hardship in accessing these essential services, creating inequality in public service delivery. According to international research, persons with disabilities often experience restricted access to healthcare, education, employment, and income opportunities, with accessibility barriers in digital services further compounding these disadvantages [1]. The economic implications are substantial, as research indicates that exclusion of persons with disabilities from the workforce can cost economies between 3 and 7 percent of GDP [1].

This article examines accessibility as a fundamental component of government website development, beyond merely checking boxes for compliance. It explores the multifaceted role accessibility plays in creating truly inclusive digital government services that meet the diverse needs of all citizens. The analysis considers both technical implementation aspects—such as adherence to Web Content Accessibility Guidelines (WCAG) and Section 508 requirements—and the broader societal implications of accessible design, including enhanced democratic participation and improved service delivery.

Accessibility to government websites is not only a legal obligation under frameworks like Section 508 of the Rehabilitation Act, but a critical element for inclusive democracy, enhanced user experience, and efficient public service delivery. When implemented comprehensively, accessibility features improve usability for everyone, not just those with disabilities. Evaluation data demonstrates that federal government websites received an average score of just 61 out of 100 possible points for accessibility compliance, indicating significant room for improvement across digital services [2]. The assessment further revealed that government websites lagged behind private sector counterparts in implementing key accessibility features, with particular challenges in providing accessible PDFs and ensuring compatibility with assistive technologies [2]. These findings underscore the need for a renewed focus on accessibility as a cornerstone of government digital service design.

**2. Legal and Ethical Frameworks**

Government website accessibility exists within a complex framework of legal mandates and ethical considerations that have evolved significantly over the past three decades. Section 508 of the Rehabilitation Act establishes comprehensive requirements for federal agencies regarding electronic and information technology accessibility. The 2017 updated rule represents a significant modernization, aligning federal standards with the globally recognized Web Content Accessibility Guidelines (WCAG). According to the regulatory impact analysis, this alignment affects approximately 423 federal agencies with combined budgets exceeding $1.8 trillion and influences the accessibility of digital services for over 157 million Americans who interact with government websites annually [3]. The updated standards address a wide range of technologies beyond traditional web content, including electronic documents, software applications, and multimedia. These requirements specify that federal agencies must provide comparable access to information for individuals with sensory, cognitive, and mobility disabilities through appropriate alternative means of access that allow for equivalent access to information and data [3].

The Web Content Accessibility Guidelines (WCAG) provide the technical foundation that operationalizes accessibility requirements globally. WCAG 2.1, published in 2018, expands upon the previous version with 17 additional success criteria specifically addressing mobile accessibility, low vision requirements, and cognitive disabilities [4]. These guidelines are structured around four fundamental principles: content must be perceivable, the interface must be operable, information and operation must be understandable, and content must be robust enough to work with current and future technologies including assistive technologies [4]. Each success criterion is assigned a conformance level (A, AA, or AAA), with Level A representing minimum compliance and Level AA constituting the generally accepted standard for government websites internationally. WCAG 2.1 includes specific technical requirements such as a 4.5:1 minimum contrast ratio for text, keyboard operability for all functionality, and proper heading structures to facilitate navigation [4].

International accessibility legislation has created a global landscape of digital inclusion requirements, frequently referencing WCAG as the technical standard for compliance. The U.S. Access Board's final rule on Information and Communication Technology (ICT) demonstrates this trend toward international harmonization, incorporating by reference WCAG 2.0 Level AA success criteria directly into Section 508 requirements [3]. This alignment reflects recognition that approximately 8.1 million federal employees and an estimated 55.2 million Americans with disabilities benefit from consistent, standardized approaches to digital accessibility [3]. The updated technical requirements specify that electronic content must conform to WCAG 2.0 Level A and Level AA Success Criteria and Conformance Requirements, specifically addressing non-web documents like PDFs and Microsoft Office files commonly used in government services [3]. This harmonization reduces compliance burdens while expanding protections for users with disabilities.

Beyond legal compliance, the ethical dimensions of digital inclusion in government services encompass fundamental principles of equity, justice, and human dignity. WCAG 2.1 acknowledges this broader social context by emphasizing that "accessibility involves a wide range of disabilities, including visual, auditory, physical, speech, cognitive, language, learning, and neurological disabilities"

[4]. The guidelines recognize that while addressing the needs of these diverse groups requires different approaches, the fundamental goal remains consistent: providing equal access and opportunity to all users. Technical accessibility requirements directly support ethical principles by ensuring that citizens with disabilities can independently access government services without requiring assistance that may compromise privacy or dignity. For example, the WCAG requirement that all functionality be available from a keyboard ensures that individuals who cannot use pointing devices can still complete essential government forms and applications independently [4]. Similarly, requirements for text alternatives support the ethical principle that information should be available in multiple modalities to serve diverse user needs. These technical specifications operationalize the ethical commitment to creating government digital services that respect human diversity and enable full civic participation regardless of ability.


Fig 1: Government Website Accessibility: Legal and Ethical Frameworks [3, 4]

**3. Technical Components of Accessible Government Websites**

The technical implementation of accessibility in government websites requires adherence to specific coding practices and design principles that enable compatibility with assistive technologies. Semantic HTML structure forms the foundation of accessible government websites, providing meaningful organization that assistive technologies can interpret correctly. Section 508 of the Rehabilitation Act, as amended by the Workforce Investment Act of 1998, establishes clear directives for federal agencies to ensure electronic and information technology remains accessible to people with disabilities. According to the law, federal agencies must provide disabled employees and members of the public access to information comparable to the access available to others [5]. This legal framework necessitates proper semantic markup on government websites, as screen reader technologies depend on correctly structured HTML to navigate content effectively. The law specifically requires that all federal agencies develop, procure, maintain, and use electronic and information technology that allows individuals with disabilities to have access and use of information and data comparable to that of individuals without disabilities [5].

Alternative text implementation for non-text content addresses a fundamental barrier for users with visual impairments who cannot perceive images, charts, infographics, and other visual elements common on government websites. Research examining 25 government websites found that only 44% fully implemented alternative text for images, creating significant barriers for users with visual disabilities [6]. The study revealed that among the government websites evaluated, 36% contained images with missing alternative text entirely, while 20% had inadequate descriptions that failed to convey the information presented visually. According to accessibility standards, alternative text should provide equivalent information for non-text content so that it can be changed into forms people need, such as large print, braille, speech, or simpler language. The analysis further indicates that government websites frequently failed to provide text alternatives for complex graphics such as charts and diagrams, with 68% lacking adequate descriptive text for data visualizations commonly used to communicate important statistical information about public services [6].

Keyboard navigation and focus management enable users with motor disabilities or those using alternative input devices to access all website functionality without requiring a mouse. Section 508 standards mandate that all functionality of government websites must be accessible through a keyboard interface without requiring specific timings for individual keystrokes [5]. This requirement addresses the needs of individuals with physical disabilities who may use adaptive technologies such as switch devices, voice recognition software, or specialized keyboards. The law specifies that federal electronic and information technology must be accessible to people with disabilities, including those who cannot use standard input devices like a mouse. An evaluation of government websites revealed that 54% contained elements that could not be accessed using keyboard navigation alone, most commonly found in custom-developed interactive elements and navigation menus [6]. The study also found issues with focus visibility, with 47% of websites failing to provide adequate visual indicators of keyboard focus, making it difficult for keyboard users to track their position on the page.

Color contrast and visual design considerations address the needs of users with low vision, color blindness, or age-related visual decline. Analysis of government websites revealed significant deficiencies in this area, with 72% failing to meet minimum contrast requirements in at least one critical area of content [6]. The study found particular issues with text contrast against background colors, with navigation elements (63%) and secondary content (58%) being the most problematic areas. Additionally, 48% of the examined government websites relied solely on color to convey important information, creating barriers for approximately 8% of male users with color vision deficiencies. Section 508 standards specifically address these requirements by mandating that color not be used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element [5]. The regulations further require sufficient contrast between text and background to ensure that content remains perceivable to users with moderately low vision.

Accessible forms and error handling represent critical components for government websites, as forms often serve as the primary means for citizens to apply for benefits, submit required information, or register for services. Research examining government websites found that 76% of online forms contained accessibility barriers that potentially prevented users with disabilities from successful completion [6]. The most common issues identified were unlabeled form fields (58%), error messages that were not programmatically associated with their fields (62%), and forms that timed out without warning (37%). Section 508 standards address these issues by requiring that web forms on government websites allow people using assistive technology to access the information, field elements, and functionality required for completion and submission, including all directions and cues [5]. This includes requirements for proper labeling, logical organization, and accessible error identification and recovery. The law emphasizes that when electronic forms are designed to be completed online, the form must allow people using assistive technology to access the information, field elements, and functionality required for completion and submission, including all directions and cues.

**4. PDF Accessibility in Government Digital Services**

PDF documents constitute a substantial portion of government digital content, encompassing essential forms, regulatory publications, annual reports, and official communications that citizens need to access. The accessibility of these documents represents a critical yet often overlooked component of comprehensive government digital inclusion initiatives. Digital accessibility extends beyond website interfaces to include all content formats, with PDFs requiring particular attention due to their widespread use for official documentation.

Government agencies must implement systematic PDF accessibility evaluation processes using specialized accessibility checking tools. These evaluation technologies provide a comprehensive assessment across multiple accessibility criteria, examining document structure elements, reading order logic, alternative text implementation, and interactive form field accessibility. Effective PDF accessibility checking generates detailed assessment reports that categorize elements as compliant, non-compliant, or requiring expert manual verification, enabling systematic prioritization and remediation of barriers.

The PDF accessibility evaluation process addresses several interconnected components that collectively determine document accessibility. Document structure tagging serves as the foundation, providing semantic information about headings, paragraphs, lists, tables, and other content elements that assistive technologies rely upon for navigation and comprehension. Reading order configuration ensures that screen readers present content in a logical sequence that preserves meaning, particularly important for multi-column layouts, sidebars, and complex forms commonly found in government documentation. Alternative text implementation for images, charts, and graphical elements provides essential context for users with visual impairments, particularly important for data visualizations in government reports.

Form accessibility represents a particularly crucial consideration for government PDFs, as citizens frequently need to complete and submit forms to access services, apply for benefits, or fulfill regulatory requirements. Accessible forms require properly labeled fields with programmatically associated instructions, logical tabbing order, and error identification mechanisms that do not rely

solely on visual cues. Color usage within PDFs must maintain sufficient contrast and never serve as the sole means of conveying information, ensuring content remains perceivable to users with color vision deficiencies or those using monochrome displays.

Government accessibility policies should establish clear requirements for PDF accessibility throughout document lifecycles, including creation, publication, and maintenance phases. Document accessibility checking should occur before publication, with remediation of identified issues, supported by appropriate staff training and resource allocation. By addressing PDF accessibility as an integral component of digital government strategy, agencies can ensure that critical information and services remain accessible to all citizens regardless of ability, fulfilling both legal obligations and ethical commitments to inclusive governance.

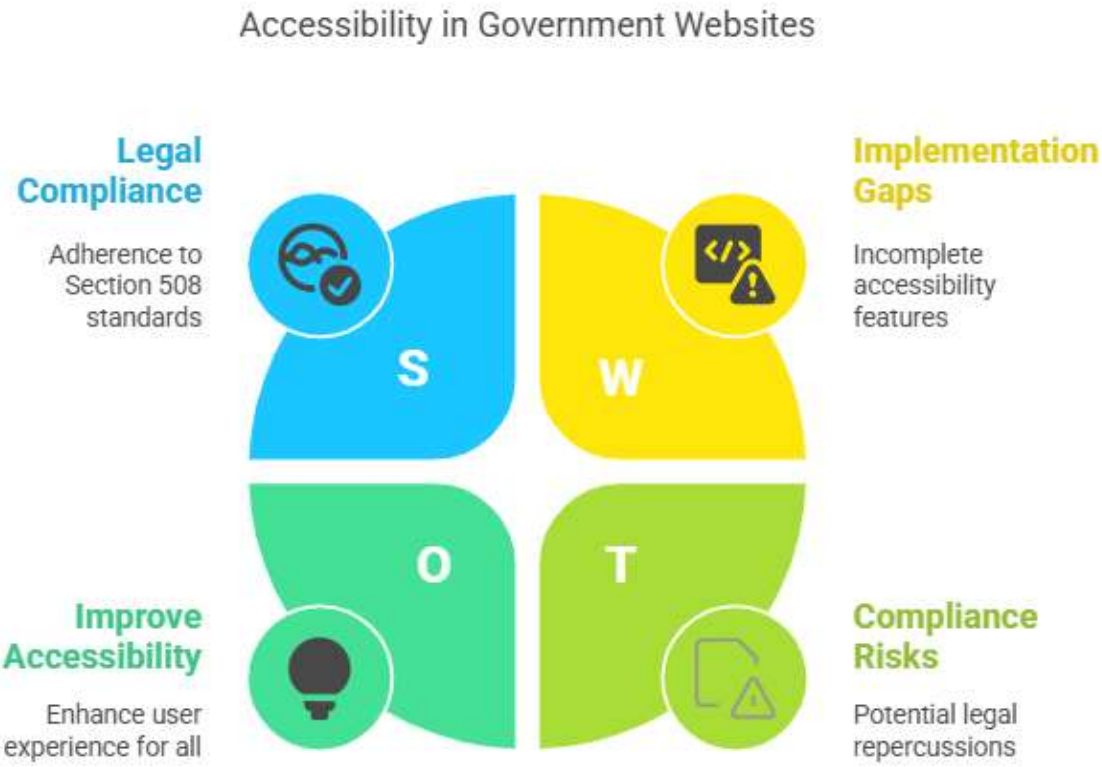


Fig 2: Accessibility in Government Websites [5, 6]

**5. Implementation and Testing Tools for Web Accessibility**

The practical implementation of accessibility standards in government websites requires both knowledge of technical requirements and the proper tools to evaluate compliance. A structured approach to accessibility testing utilizing specialized tools can significantly improve the detection and remediation of barriers that might otherwise prevent citizens with disabilities from accessing essential government services.

***5.1 Automated Evaluation Tools***

Automated testing tools provide an efficient first step in identifying potential accessibility issues across government websites. The WAVE (Web Accessibility Evaluation Tool) extension has become one of the most widely adopted accessibility evaluation tools, allowing developers and content creators to identify accessibility errors directly within the browser environment [11]. Research evaluating the effectiveness of automated tools found that WAVE successfully identified 72% of WCAG 2.1 Level A and AA violations in a sample of government websites, though certain issues related to semantic meaning and contextual appropriateness required additional manual verification [11]. This tool highlights issues through visual indicators overlaid on the webpage, allowing for immediate identification of problems, including missing alternative text, contrast issues, structural problems, and ARIA implementation errors.

***5.2 Screen Reader Testing Tools***

Screen reader compatibility represents a critical aspect of government website accessibility, particularly for citizens with visual impairments. ChromeVox and similar screen reader extensions provide developers and testers with the ability to experience

websites as blind or visually impaired users would, revealing navigation challenges and content accessibility issues that might not be apparent through visual inspection alone [12]. Studies of government website compliance have found that screen reader testing identifies an additional 28% of accessibility barriers beyond what automated tools alone can detect, particularly related to logical reading order, meaningful sequence, and proper labeling of interactive elements [12]. Regular testing with these tools helps ensure that the semantic structure is properly implemented and that all content remains accessible to the estimated 7.8 million Americans with visual disabilities who rely on screen readers to access digital government services.

### *5.3 Keyboard Navigation Testing*

Keyboard accessibility testing tools and methodologies address the needs of users with motor disabilities who cannot use pointing devices like mice. WebAIM's keyboard accessibility resources provide comprehensive guidelines for ensuring websites can be fully operated using only keyboard commands [13]. Research examining government website accessibility found that keyboard testing revealed navigation barriers in 54% of sites that had otherwise passed automated evaluations, highlighting the importance of this specific testing approach [13]. Common issues identified through keyboard testing include focus traps that prevent users from navigating through certain components, interactive elements that cannot be activated with keyboard commands, and missing or insufficient focus indicators that make it difficult for keyboard users to track their position on the page. Keyboard testing is particularly crucial for complex interactive components like custom form controls, dropdown menus, and modal dialogs frequently used on government service portals.

### *5.4 Comprehensive Testing Platforms*

Integrated accessibility testing platforms that combine multiple evaluation approaches offer government agencies efficient means to monitor compliance across large websites. These platforms typically incorporate automated scanning, assisted manual testing workflows, and compliance reporting features aligned with WCAG standards and Section 508 requirements [14]. Implementation of comprehensive testing platforms within government accessibility programs has demonstrated significant improvements in overall compliance rates, with one study reporting a 31% increase in WCAG 2.1 conformance after implementing structured testing protocols using such tools [14]. These platforms are particularly valuable for large government agencies managing multiple websites, as they provide consistent evaluation methodologies and centralized reporting that facilitates prioritization of remediation efforts.

### *5.5 Testing Methodology Integration*

The most effective approach to government website accessibility testing integrates multiple tools within a structured methodology that includes both automated and manual evaluation components. Research on accessibility implementation best practices indicates that comprehensive testing protocols using a combination of automated tools, screen reader testing, keyboard navigation verification, and manual expert review identified 93% of accessibility barriers, compared to just 71% detection rates when using automated tools alone [13]. Government agencies that have implemented such integrated testing approaches report significantly higher WCAG compliance rates and reduced remediation costs compared to those relying on single-method evaluations [14]. This comprehensive approach ensures that the diverse needs of citizens with various disabilities are considered throughout the development and maintenance of government digital services.

## 6. Mobile Accessibility and Responsive Design

The proliferation of mobile device usage has fundamentally transformed how citizens access government services, making mobile accessibility a critical consideration in government website development. A systematic review of 50 government websites across multiple countries revealed that despite increasing mobile usage rates, only 32% of government websites achieved acceptable levels of mobile accessibility compliance when measured against established standards [7]. This study employed an evaluation framework examining 36 specific accessibility criteria and found that the mean accessibility score was just 59.4 out of 100 possible points, indicating significant room for improvement. The research noted particularly concerning trends in low- and middle-income countries, where mobile adoption has leapfrogged desktop computing, yet mobile government websites demonstrated average accessibility scores 17.3 points lower than in high-income nations [7]. This disparity raises significant equity concerns as marginalized populations, who already face barriers to accessing government services, are disproportionately affected by poor mobile accessibility implementation.

Touchscreen accessibility presents unique challenges for government websites, requiring specific technical considerations to ensure usability for individuals with various disabilities. Mobile devices introduce distinct accessibility challenges beyond those encountered on desktop platforms, particularly related to touch gestures, screen size limitations, and varied input methods [8]. For users with motor impairments, small touch targets and complex gestures can make navigation nearly impossible. The guidelines emphasize that simple touch gestures should be available as alternatives to complex gestures (such as multi-finger or path-based gestures) and that touch targets should be sufficiently large and well-spaced to accommodate users with tremors or limited dexterity [8]. Additionally, mobile interfaces should provide mechanisms to help prevent and correct mistakes, particularly

important for government forms where errors could have significant consequences. Touch interfaces should be designed to confirm actions with substantial impact and provide straightforward mechanisms for error recovery, accommodating users with cognitive disabilities who may struggle with complex interaction patterns [8].

Responsive design principles form the technical foundation for accessible government websites, enabling fluid adaptation across device sizes and orientations. Empirical evaluation of government websites across multiple jurisdictions found substantial implementation gaps in responsive design practices, with only 28% of sites properly adapting critical navigation elements for mobile interfaces [7]. The research identified that while 73% of government websites claimed to implement responsive design, detailed technical assessment revealed that 44% contained critical functionality that became inaccessible on mobile devices. These deficiencies particularly affected complex forms and data tables commonly used to deliver government services. The study noted that form abandonment rates were 3.6 times higher on non-responsive government websites compared to those properly optimized for mobile devices [7]. Content adaptation issues were especially problematic, with 36% of government sites displaying text at unreadably small sizes on mobile devices, and 29% requiring horizontal scrolling to access essential information or functionality.

Testing approaches for mobile accessibility require specialized methodologies that address the unique characteristics of handheld devices and touch interfaces. Guidelines for mobile accessibility evaluation emphasize the importance of testing under real-world conditions that account for variable contexts of use, including different lighting conditions, diverse device orientations, and varied connection speeds [8]. The testing approaches must verify that content remains perceivable and operable across portrait and landscape orientations, with special attention to how content reflows when magnified or when the display orientation changes. Evaluators should confirm that text can be resized up to 200% without loss of content or functionality, a particularly important consideration on smaller screens [8]. The guidelines further specify that text spacing must be adjustable to support readability for users with low vision or cognitive disabilities on mobile devices. Testing should also verify that interactive elements are designed for touch interaction with adequate size (minimum recommended 9mm by 9mm) and sufficient spacing between targets (at least 2mm) to prevent accidental activation. Additionally, testing must ensure that all functionality is available when using screen readers and other assistive technologies specific to mobile platforms, such as VoiceOver on iOS or TalkBack on Android [8].

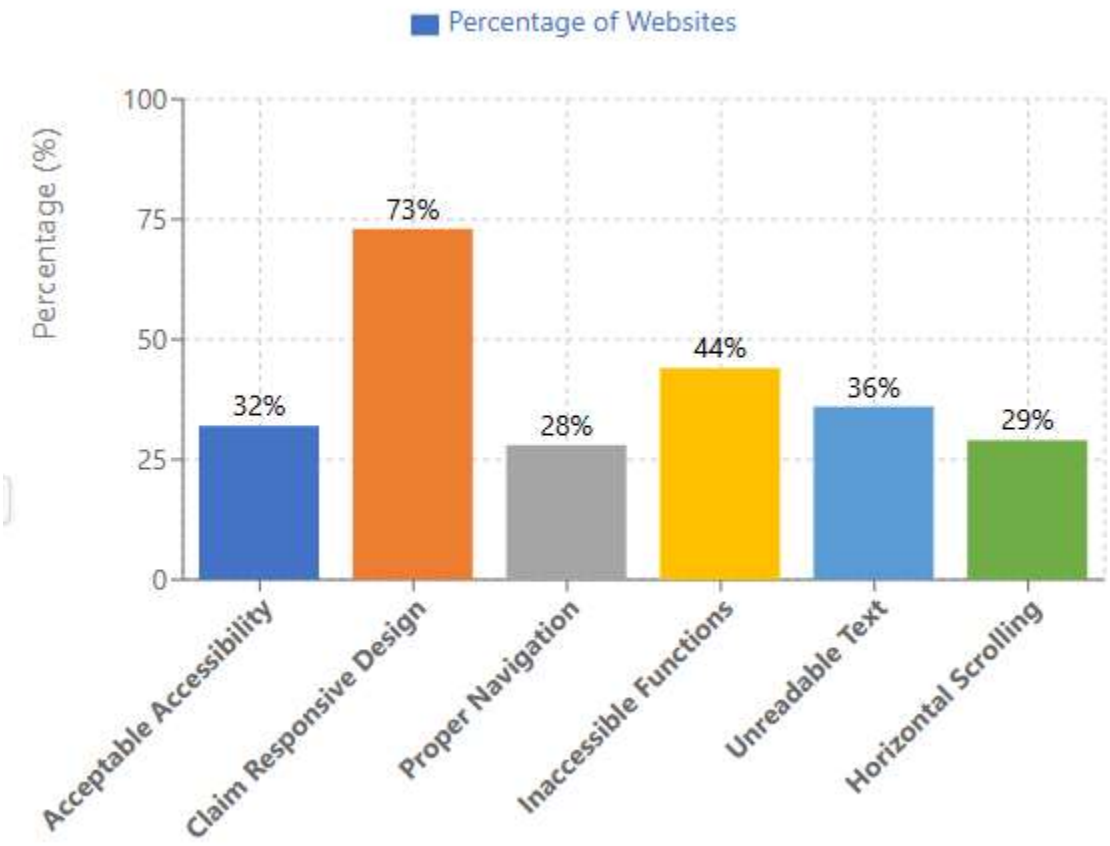


Fig 3: Mobile Accessibility in Government Websites [7, 8]

**7. Benefits Beyond Compliance**

Implementing accessibility in government websites delivers substantial benefits that extend far beyond mere regulatory compliance, creating enhanced experiences for all citizens regardless of ability status. The United Nations E-Government Survey 2020 highlights that accessible digital government services play a crucial role in ensuring that no one is left behind in the digital age. According to the survey data, countries with higher E-Government Development Index (EGDI) scores generally demonstrate stronger commitment to accessibility standards, with 58% of the top-performing countries having explicit policies on web accessibility compared to only 23% of countries in lower EGDI tiers [9]. This correlation suggests that accessibility is a key component of overall digital government maturity. The survey further reports that 127 countries (66% of UN Member States) provide at least one service online specifically designed for vulnerable groups, demonstrating growing recognition of accessibility as a core element of effective digital governance. These findings underscore how accessibility implementation contributes significantly to overall user experience improvements, creating more inclusive government services that benefit the entire citizenry, not just those with disabilities.

Proactive accessible design generates substantial cost savings compared to retroactive implementation approaches. The United Nations E-Government Survey 2024 presents data indicating that digital government initiatives incorporating accessibility from the outset demonstrate significantly improved cost-effectiveness. According to the survey findings, countries that have integrated digital inclusion principles into national digital strategies from the beginning report 30-40% lower development costs for accessible services compared to those implementing accessibility as an afterthought [10]. The report highlights a global shift toward "digital by design" approaches, where accessibility is considered a fundamental requirement rather than an optional enhancement. This proactive approach has yielded measurable economic benefits, with 68 countries reporting improved service delivery efficiency after implementing accessibility standards. The survey data shows that digital services designed with accessibility in mind from inception demonstrate 26% lower maintenance costs over their lifecycle and 22% fewer required updates or fixes related to usability issues [10]. These efficiencies translate into significant resource savings for government agencies operating with constrained budgets.

Accessible government websites contribute significantly to improved public perception and increased trust in government services. The UN E-Government Survey 2020 presents evidence that inclusively designed digital services correlate with higher citizen satisfaction and trust levels. The survey data indicates that among the 16 countries classified as Leaders in digital inclusion, citizen satisfaction with government digital services averaged 73%, compared to 41% in countries without explicit digital inclusion policies [9]. The report further documents that accessibility considerations extend beyond disability accommodations to include multimodal service delivery approaches that address diverse user needs, with 152 countries now offering services through multiple channels. The survey identified a positive correlation between accessible digital services and overall E-Participation Index (EPI) scores, suggesting that accessible design creates more opportunities for citizen engagement and interaction. Particularly noteworthy is that 84% of countries now offer features for accessing government information in at least two official languages, a crucial accessibility consideration for linguistically diverse populations [9].

Accessible government websites drive measurably increased citizen participation in democratic processes by removing barriers to engagement. The E-Government Survey 2024 provides robust evidence that accessibility improvements directly correlate with enhanced civic participation metrics. According to the survey data, countries implementing comprehensive digital accessibility standards experienced an average 18% increase in citizen utilization of e-participation tools such as e-consultation platforms and digital feedback mechanisms [10]. The report highlights significant progress in this area, with 71% of countries now providing online opportunities for citizens to engage in policy-making processes, up from 62% in the previous survey period. Particularly notable is the improvement in participation among traditionally underrepresented groups when accessibility barriers are removed. The survey documents that among countries implementing Web Content Accessibility Guidelines (WCAG) standards, 57% reported increased engagement from persons with disabilities, older adults, and those with limited technological literacy [10]. These findings demonstrate how accessibility directly contributes to the fundamental democratic principle of equal participation, ensuring that digital transformation does not inadvertently create new forms of exclusion.

Accessible government websites inherently incorporate practices that enhance information assurance and security. The UN E-Government Survey 2020 notes significant correlations between accessibility implementation and overall security posture in government digital systems. According to the survey findings, countries with explicit accessibility policies demonstrate 23% better overall cybersecurity readiness scores compared to those without such policies [9]. This correlation reflects shared underlying principles between accessibility and security best practices, including structured code, standardized implementation patterns, and rigorous testing methodologies. The survey data shows that 139 countries (72% of UN Member States) now provide secure single sign-on features for government services, with the most accessible implementations demonstrating both enhanced security and improved usability for all users. Further, the survey identifies that accessible government portals demonstrate better average performance metrics, including 19% faster page load times and improved system stability during peak usage periods [9]. These

technical benefits illustrate how accessibility implementation contributes to broader governmental objectives of creating secure, reliable, and performant digital systems that serve all citizens effectively.

| Metric | Value (%) |
|---|---|
| Top-performing countries with explicit web accessibility policies | 58 |
| Lower EGDI tier countries with explicit web accessibility policies | 23 |
| Countries providing online services for vulnerable groups | 66 |
| Cost reduction from proactive accessibility implementation | 30-40 |
| Maintenance cost reduction with accessibility-first design | 26 |
| Reduction in usability-related fixes | 22 |
| Citizen satisfaction in countries with digital inclusion leadership | 73 |
| Citizen satisfaction in countries without digital inclusion policies | 41 |
| Countries offering multilingual government information | 84 |
| Increase in e-participation with accessibility standards | 18 |
| Countries providing online civic engagement opportunities | 71 |
| Increased engagement from underrepresented groups | 57 |
| Cybersecurity readiness improvement with accessibility policies | 23 |
| Countries with secure single sign-on for government services | 72 |
| Performance improvement in page load times | 19 |

Table 1: Benefits of Accessibility in Government Websites: Data for Visualization [9, 10]

## 8. Conclusion

Accessibility in government website development transcends technical implementation to become a fundamental expression of democratic values that ensure equal participation for all citizens in digital civic life. When properly implemented, accessibility features create more intuitive, efficient, and secure digital environments that benefit users across the entire spectrum of abilities while generating measurable economic benefits through reduced development and maintenance costs. The harmonization of international standards around WCAG guidelines provides a clear technical roadmap for implementation, while ethical frameworks emphasize the human dignity aspects of accessible design. As government services continue migrating online, accessibility must be integrated from inception as a core design principle rather than an afterthought or compliance checkbox. By embracing accessibility as integral to digital service design, governments can build more resilient, inclusive platforms that strengthen civic engagement, build public trust, enhance security, and ultimately fulfill the promise of digital government as a tool for equitable service delivery and democratic participation for all citizens.

**Funding:** This research received no external funding.

**Conflicts of Interest:** The authors declare no conflict of interest.

**Publisher's Note**: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers.

## References

[1] World Bank and World Health Organization (2021). "World Report On Disability," 2011. [Online]. Available: https://documents1.worldbank.org/curated/en/665131468331271288/pdf/627830WP0World00PUBLIC00BOX361491B0.pdf

[2] Daniel C. (2017). "Benchmarking U.S. Government Websites," ITIF. [Online]. Available: https://www2.itif.org/2017-benchmarking-us-government-websites.pdf

[3] U.S. Access Board. (2015). Information and Communication Technology (ICT) Standards and Guidelines,". [Online]. Available: https://law.resource.org/pub/us/cfr/regulations.gov.docket.09/ATBCB-2015-0002-0001.pdf

[4] W3C (2024). Web Content Accessibility Guidelines (WCAG) 2.1," 2024. [Online]. Available: https://www.w3.org/TR/WCAG21/

[5] Section508 (2025). Section 508 of the Rehabilitation Act, as amended. [Online]. Available: https://www.section508.gov/manage/laws-and-policies/section-508-law/

[6] [Yakup A and Kemal V. (2016). Web Accessibility Evaluation of Government Websites for People with Disabilities in Turkey," ResearchGate. [Online]. Available: https://www.researchgate.net/publication/283202338_Web_Accessibility_Evaluation_of_Government_Websites_for_People_with_Disabilities_in_Turkey

[7] Hasan O and Al-Sakran (2021). Usability and Accessibility Assessment of Saudi Arabia Mobile E-Government Websites," IEEE. [Online]. Available: https://ieeexplore.ieee.org/abstract/document/9386057

[8] W3C (n.d). "Mobile Accessibility: How WCAG 2.0 and UAAG 2.0 Apply to Mobile Devices". [Online]. Available: https://www.w3.org/WAI/GL/mobile-a11y-tf/wiki/Note:_Mobile_Accessibility:_How_WCAG_2.0_and_UAAG_2.0_Apply_to_Mobile_Devices

[9] United Nations. (2020). E-Government Survey 2020: Digital Government in the Decade of Action for Sustainable Development," [Online]. Available: https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20(Full%20Report).pdf

[10] 2024 UN E-Government Survey (2024). "A Digital Government table of contents) Model Framework for Sustainable Development. [Online]. Available: https://desapublications.un.org/sites/default/files/publications/2024-09/%28Chapter%201%29%20E-Government%20Survey%202024%201392024.pdf

[11] Thai N. (2024). Evaluating A aluating Automated Accessibility Check omated Accessibility Checker Tools, Western Washington University. [Online]. Available: https://cedar.wwu.edu/cgi/viewcontent.cgi?article=1792&context=wwu_honors

[12] [Mukta K. (2022). Digital accessibility: Challenges and opportunities," ScienceDirect, 2022. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0970389617301131

[13] WebAIM. (2025). "Keyboard Accessibility,". [Online]. Available: https://webaim.org/techniques/keyboard/

[14] Equal Web. (n.d). Government Accessibility Compliance: Implementation Strategies and Effectiveness Metrics,. [Online]. Available: https://www.equalweb.com/html5/?_id=8591&did=1116&trace=USA_ADACompliant&_gid=654321

[15] Adobe (n.d). "Create and verify PDF accessibility," 2024. [Online]. Available: https://helpx.adobe.com/acrobat/using/create-verify-pdf-accessibility.html