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Influence of Assistive Technology Interoperability on Digital Inclusivity in E-Justice Systems for Persons with Disabilities

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Abstract

This paper examines how three dimensions of Assistive Technology Interoperability (ATI), namely Operating System (OS)/platform interoperability, assistive software compatibility, and input/interaction modality interoperability, influence digital inclusivity within e-justice systems. Assistive technologies including screen readers, voice recognition software, magnifiers, and alternative input devices are the primary mechanisms through which many persons with disabilities access digital systems. Yet e-justice platforms are rarely designed or tested for interoperability with these tools, creating a structural barrier that transforms digital courtrooms from gateways into gatekeepers. Drawing on the Social Model of Disability and extending the Unified Theory of Acceptance and Use of Technology (UTAUT2), the study employed a sequential explanatory mixed-methods design. Quantitative data were collected from 362 court users, judicial officers, and advocates in Nairobi County, Kenya, and analysed using covariance-based structural equation modelling (CB-SEM). Qualitative data from semi-structured interviews with persons with visual, hearing, and mobility impairments provided contextual triangulation. The findings reveal that ATI is a strong predictor of digital inclusivity ($\beta = 0.492$, $p < 0.001$). Among the three dimensions of ATI, assistive software compatibility (loading = 0.792) emerged as the most influential, followed by Operating System (OS)/platform interoperability (0.697) and input/interaction modality interoperability (0.665). The study concludes that AT interoperability functions as a gateway variable: without it, no other accessibility investment is fully effective. For judicial ICT directors and policymakers, the findings mandate that AT interoperability testing be embedded in procurement contracts, development cycles, and quality assurance protocols as a non-negotiable precondition for digital inclusivity.

Keywords: *Assistive technology interoperability, Digital inclusivity, E-Justice, Persons with disabilities, Social Model of Disability.*

Introduction

The digitisation of justice systems has proceeded on an assumption that access to a digital platform is equivalent to, access to justice. This assumption holds only for users who interact with digital systems through standard interfaces. For persons with disabilities, the relationship between digital platforms and legal participation is mediated entirely by assistive technology and whether that technology functions within the platform determines whether the platform exists for that user at all. Assistive technologies (AT), including screen readers (NonVisual

Desktop Access Software (NVDA), Job Access With Speech Software (JAWS), VoiceOver, TalkBack), speech-to-text software (Dragon NaturallySpeaking), magnifiers (ZoomText), and alternative input devices including switch access and eye-tracking systems, are not optional enhancements for persons with disabilities. They are the primary, and frequently the sole, means of digital interaction. Systematic analysis of assistive technology provision within the Convention on the Rights of Persons with Disabilities (CRPD) framework establishes that AT is not an accommodation appended to otherwise universal systems but a structural prerequisite for participation across the domains that human rights law guarantees, including access to public services and justice (Smith et al., 2024). In the specific context of court-based digital environments, this framing carries direct operational force: AT is the mechanism through which the access-to-justice rights codified in Article 13 of the CRPD are translated from legal obligation into functional reality (McVeigh, 2025).

For a person who is blind, the e-filing portal does not exist unless it speaks: the screen reader is not a convenience layer but the entire interface through which digital tasks are attempted. Empirical evidence from studies of blind and low-vision users navigating online form environments, functionally analogous to e-filing platforms, demonstrates that critical accessibility failures preventing task completion affect 76.7% of digital form sites, meaning that for screen reader users the majority of online processes are inaccessible by design rather than by exception (Reuschel et al., 2023). At the population level, screen reader software constitutes the defining access technology for employed blind and low-vision persons across digital environments, confirming that dependency, not preference, governs the relationship between this user group and digital systems (McDonnall et al., 2025).

For a court user with a motor impairment, the virtual hearing platform is inaccessible unless it responds to keyboard commands or voice input: alternative and augmentative access systems, including combined eye-tracking and switch-scanning interfaces, are for many users the only means through which digital interaction is achievable. The removal of any single input modality produces critical performance failure (Fager et al., 2023). Beyond the technical dimension, the modalities through which participants engage with online proceedings directly bear on perceived procedural fairness; restrictions on input modality fall disproportionately on marginalised litigants and measurably erode legitimacy perceptions of the legal process (Mentovich et al., 2023). For an advocate with limited dexterity, the case tracking system remains functionally absent unless it integrates with switch access or eye-tracking controls: the multi-modal dependency documented for users with severe motor impairment is not a design preference but a performance necessity, and incompatibility at the input layer renders the system operationally non-existent for this population (Fager et al., 2023). There is no workaround, no alternative pathway, no analogue equivalent within a digitised court system that has foreclosed non-digital participation. For persons with disabilities, AT compatibility is not a feature of inclusive design; it is a precondition of access itself.

Problem Statement

Despite this, the digital transformation of justice systems has largely proceeded without systematic attention to assistive technology interoperability (ATI). Procurement contracts rarely require testing with multiple screen readers, and development cycles seldom include user-led testing with persons who rely on alternative input modalities. Quality assurance protocols may check Web Content Accessibility Guideline (WCAG) compliance but do not verify that a tagged portable document format (PDF) is actually parsable by NVDA, or that a dynamic form can be completed using keyboard-only navigation. The consequence is a justice landscape where platforms may be technically conformant yet functionally inaccessible, a phenomenon the literature terms the 'interoperability gap' (Ara et al., 2024; Droutsas et al., 2025).

This gap is not merely a technical oversight; it is a structural injustice. Article 13 of the CRPD guarantees effective access to justice for persons with disabilities on an equal basis with others, including through the provision of procedural accommodations. The United Nations Developmental Programme (UNDP (2024) has explicitly interpreted this obligation to require that digital justice platforms be compatible with the assistive technologies that persons with disabilities use. Yet empirical evidence on AT interoperability in operational e-justice systems remains severely limited, particularly in Global South jurisdictions where device diversity and connectivity constraints amplify interoperability failures and where the populations most dependent on affordable assistive technologies are simultaneously the least served by the systems that govern their legal rights (Abdurahman & Kabanda, 2024; Buthelezi et al., 2024).

Research Objective

This study addresses that gap by examining how three dimensions of ATI, OS/platform interoperability, assistive software compatibility, and input/interaction modality interoperability, influence digital inclusivity within e-justice systems for persons with disabilities. Grounded in the Social Model of Disability, which locates inaccessibility as an environmental defect requiring systemic redesign rather than a user deficit requiring individual adjustment, the research has the following objective:

1. To investigate the influence of Assistive Technology Interoperability on Digital Inclusivity in E-Justice Systems for Persons with Disabilities.

The paper proceeds as follows. Section two grounds the study in the Social Model of Disability and reviews empirical evidence on each interoperability dimension. Section three describes the mixed-methods design, sampling strategy, and analytical protocols. Section four presents quantitative findings on measurement validity, model fit, and hypothesis testing, triangulated with qualitative evidence. Section five discusses theoretical and practical implications, and section six concludes with actionable recommendations for judicial ICT procurement and quality assurance.

Literature Review

This study was underpinned by the Social Model of Disability and the Unified Theory of Acceptance and Use of Technology (UTAUT2). The Social Model of Disability, originating in the work of Mike Oliver (Oliver, 1990) and subsequently refined by disability scholars, holds that disability arises not from individual impairments but from environments that fail to accommodate human diversity (Thorneycroft, 2024; Zhang, 2024). Applied to ATI, the Social Model reframes an inaccessible e-justice platform not as a problem of the user's impairment but as a defective environmental condition that system designers have a moral and legal obligation to remove. When a screen reader cannot parse a court portal, the failure is not that the user is blind; it is that the portal lacks semantic HTML and ARIA labelling. When voice input cannot complete a form, the failure is not that the user has a motor impairment but that the platform does not support standard speech-recognition APIs.

This theoretical orientation has direct implications for evaluation methodology. Rather than asking whether users can 'adapt' to inaccessible platforms, the Social Model directs attention to the platform itself: what interoperability failures exist, at what interaction points, and for which assistive technology configurations. The dependent variable is not user skill or effort but system design. This study operationalises that orientation by measuring AT interoperability as a property of the e-justice platform, not as a characteristic of its users.

While the Unified Theory of Acceptance and Use of Technology (UTAUT2) as proposed by (Venkatesh et al., 2003) provides constructs such as effort expectancy and facilitating conditions, this study treats UTAUT2 as a secondary framework. The primary theoretical lens is the Social Model because AT interoperability is not a user perception but a technical property that can be objectively tested. Effort expectancy matters, but it is irrelevant if the system is functionally inaccessible at the baseline. AT interoperability thus functions as a gateway or precondition that must be satisfied before standard technology acceptance constructs become relevant.

OS/Platform Interoperability

OS/platform interoperability requires that assistive technology functions consistently across the Windows, Android, iOS, macOS, and Linux environments through which users access e-justice platforms, a critical requirement because platform choice is shaped by cost, availability, and AT compatibility rather than user preference (Banes & Lobnig, 2023). WebAIM (2024) data confirm this multi-platform reality: 91.3% of screen reader users access content across both mobile and desktop environments, meaning a single user may engage with the same e-justice portal via a Windows desktop, an Android smartphone, and a tablet, traversing distinct rendering engines and multiple browser-AT pairings within one procedural engagement. Platform-specific failures at each touchpoint introduce compounding barriers: Pereira et al. (2024) identify focus order failures as the most prevalent issue across iOS and Android, while Ara et al. (2024), reviewing 92 accessibility evaluation studies, document that missing ARIA roles, keyboard navigation traps, and focus management defects recur across browser-platform combinations yet are systematically under-detected by automated compliance testing. Di Gregorio et al. (2022) and Fok et al. (2022) confirm these failures are structural: only 41% of accessibility guidelines were consistently applied across tested Android applications, and label-based failures persisted across successive updates even among established developers, establishing that accessibility testing must be embedded at every release cycle rather than treated as a one-time compliance exercise.

In the Kenyan context, WebAIM (2024) data show that NVDA accounts for 69.9% of primary screen reader usage in Africa and the Middle East compared to 23.3% for JAWS, shifting the primary interoperability concern toward browser-based WCAG compliance and Windows Accessibility API support rather than Android-native AT exclusively; device ecosystem diversity nonetheless remains a structural constraint, as cost and connectivity limitations further narrow platform choice and reinforce the argument that AT provision is inseparable from economic access (Banes & Lobnig, 2023). At the normative level, the European e-Justice Strategy 2024–2028 (European Union, 2025) establishes interoperability as an explicit operational principle for justice system digitalisation, framing the right to effective judicial protection as contingent on digital inclusivity — a logic that supports the proposition that e-justice systems cannot be considered legally compliant with obligations under the Convention on the Rights of Persons with Disabilities where AT users encounter inconsistent functionality across the device environments they are constrained by circumstance to use.

Assistive Software Compatibility

Assistive software compatibility requires that screen readers (NVDA, JAWS, VoiceOver, TalkBack), magnifiers (ZoomText), and speech-to-text tools (Dragon NaturallySpeaking) integrate reliably with e-justice interfaces to enable accurate content parsing and interaction (Kirchhoff, 2024; Droutsas et al., 2024). This dimension is immediately consequential because even minor incompatibilities — a mislabelled button, an untagged PDF, an incorrectly announcing ARIA role — can render entire workflows unusable (Ara et al., 2024; Kerdar et al., 2024). Evidence of widespread failure is documented at both the platform and judicial application level. WebAIM (2024) found that JAWS and NVDA are the dominant screen readers globally (41% and 38% primary usage respectively), with NVDA dominating in Africa and the Middle East at 69.9% versus 23.3% for JAWS — a finding with direct implications for Kenyan e-justice deployments — while a majority of respondents reported that web accessibility has not improved or has worsened. Within the judicial context specifically, Wentz et al. (2023) evaluated PDF court forms across ten U.S. states and found none completely accessible, concluding that persons with disabilities may find independent e-filing impossible; a subsequent study situated this within a broader argument about systemic inequity and structural barriers to justice (Wentz et al., 2024).

Beyond task completion, inaccessibility imposes measurable temporal and economic costs: Griffith et al. (2022) quantified the time disparity experienced by blind users encountering accessibility barriers, a cost-of-barriers framework directly applicable to e-justice platforms where inaccessible forms, dynamic dashboards, and scanned documents compound inequities for AT-dependent litigants. These findings support Horton and Quesenbery's (2014) argument that accessibility must be embedded as a foundational design principle grounded in universal design rather than applied as a compliance retrofit — implying that dynamic form elements, ARIA-labelled widgets, and scanned document renderings in judicial interfaces must be tested against real AT workflows rather than automated checkers alone.

Input/Interaction Modality Interoperability

Input/interaction modality interoperability supports seamless switching between keyboard, voice, gesture, eye tracking, and switch controls in e-justice tasks, accommodating motor, sensory, and cognitive impairments (Fager et al., 2023; Sarsenbayeva et al., 2023). This dimension is often overlooked in accessibility evaluations that focus exclusively on screen reader compatibility (Vajjala et al., 2024), yet for users with motor impairments or complex communication needs, alternative input modalities are not optional (Sarsenbayeva et al., 2023).

Empirical evidence demonstrates the efficacy of multimodal approaches. Multimodal AI combining speech and gesture recognition reduces task time for people with disabilities (Chen et al., 2025). Eye-tracking leads to significantly faster task accomplishment for users with motor impairments (Menges et al., 2019). Accessibility studies for kiosks highlight the importance of adaptable input methods for users with disabilities (Park et al., 2025). Speech input is associated with fewer errors during entry compared to keyboard input in some contexts (Ruan et al., 2018).

Atata and Odedeyi (2025) propose adaptive UI accessibility principles that adapt input modalities for diverse user needs, and Sehgal and Mishra (2025) demonstrate that adaptive multimodal design enhances usability. The broader concept of modality interoperability is considered vital for dignified participation and access to justice for people with disabilities (De Lucchi, 2023; McVeigh, 2025). The implementation of such features in e-justice systems remains inconsistent. Accessibility evaluations of e-justice platforms have identified gaps where partial compatibility with assistive technologies excludes users (Corra & McCandliss, 2021; Rei-Anderson et al., 2018).

Research Gap

While the literature confirms the importance of each interoperability dimension, three critical gaps persist. The first is the absence of any study that examines the combined influence of OS/platform interoperability, assistive software compatibility, and input/interaction modality interoperability on digital inclusivity within a single operational e-justice system. Systematic review of web accessibility evaluation research reveals that the field is structurally fragmented by dimension, where each accessibility criterion or tool is examined in isolation with no study synthesising these dimensions within an integrated operational context (Ara et al., 2024). This fragmentation is reproduced in the e-justice literature in particular, where a systematic review of innovation and digital transformation research over two decades confirms that contextual, institutional, and individual preconditions are examined as independent streams, leaving the question of their combined influence empirically unaddressed (Correia et al., 2024).

The second gap concerns the persistent disconnect between technical interoperability testing and user-reported outcome measures. Existing accessibility research is dominated by automated or semi-automated compliance assessments that, by design, generate technical verdicts rather than usability evidence and user-reported outcomes are rarely integrated into the evaluation methodology (Ara et al., 2024). The practical consequence of this separation is not only methodological but empirical analysis demonstrates that technical conformance with Web Content Accessibility Guidelines produces no statistically significant improvement in usability outcomes for screen reader users, meaning that a system assessed as technically compliant may remain functionally inaccessible to the users it is intended to serve (Vollenwyder et al., 2023). Research that does not bridge the technical-experiential divide therefore systematically overestimates the accessibility of digital systems for persons with disabilities.

The third gap is geographical. Evidence from Global South jurisdictions, where device heterogeneity, connectivity constraints, and assistive technology affordability pressures are most acute, remains severely limited. The handful of empirical studies that do exist from this context, e.g. Abdurahman and Kabanda (2024), document that inadequate infrastructure, heterogeneous device environments, and the near-absence of disability-inclusive design practices compound one another in ways that are structurally distinct from high-income country contexts (Abdurahman & Kabanda, 2024). At the broader regional level, pan-African evidence confirms that financial constraints on assistive technology acquisition, unreliable connectivity, and policy frameworks that fail to prioritise digital accessibility collectively suppress ICT access for persons with disabilities, with e-government and e-justice platforms among the most acutely under-researched service domains (Wang'ang'a, 2024). The transfer of accessibility findings from Global North contexts to Global South e-justice systems cannot therefore be assumed, and the current evidential gap leaves policymakers and system designers without the empirical foundation needed to make contextually valid design decisions.

Hypothesis

This study addresses these gaps by testing the following overarching hypothesis:

H_1: *Assistive technology interoperability (OS/platform interoperability, assistive software compatibility, and input/interaction modality interoperability) has no significant influence on digital inclusivity in e-justice systems for persons with disabilities.*

Methodology

The study adopted a pragmatic, sequential explanatory mixed-methods design (Creswell & Clark, 2007). The quantitative strand (survey) was administered first (April–June 2025), followed by qualitative semi-structured interviews (June–August 2025). The design was selected because the research problem required both hypothesis testing and exploration of lived experience with specific assistive configurations.

The target population comprised court users (including persons with disabilities), judicial officers, court employees, and advocates interacting with e-justice systems in Nairobi County, Kenya. Nairobi was selected purposively as the judiciary's most digitally advanced court cluster.

Sample size was determined using Cochran's (1977) formula for finite populations. With a target population of 14,244, a 95% confidence level, and a 5% margin of error, the required sample was 375 respondents. After accounting for non-response, 362 usable responses were retained (96.5% response rate). Stratified random sampling ensured representation across four strata: persons with disabilities (visual, hearing, mobility impairments), judicial officers, court employees, and advocates.

For the qualitative strand, six key informants were purposively selected: persons with visual impairment (n=2, including one total blindness and one partial blindness), mobility impairment (n=2), and hearing impairment (n=2), all of whom had directly interacted with the e-justice system using assistive technologies.

The structured questionnaire comprised 42 items measured on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). For AT interoperability, 18 items captured three sub-dimensions: OS/Platform Interoperability (6 items, developed based on the cross-platform accessibility evaluation dimensions of Pereira et al., 2024, and the accessibility guideline implementation framework of Di Gregorio et al., 2022), Assistive Software Compatibility (6 items, developed based on the AT compatibility framework of Kirchhoff (2024), and the cross-disability web accessibility barrier taxonomy of Droutsas et al., (2025), and Input/Interaction Modality Interoperability (6 items, developed based on the motor impairment accessibility measurement framework of Sarsenbayeva et al., (2023), and the input modality preference dimensions of Li et al., (2022). The dependent variable, Digital Inclusivity in E-Justice Systems (DIS), was measured using 24 items across Effort Expectancy, Assistive Technology Compatibility Score, Information Search and Retrieval Time, and User Satisfaction.

The semi-structured interview guide contained open-ended questions exploring how specific AT interoperability failures (or their absence) shaped respondents' experiences with e-justice platforms.

Results

Quantitative data were analysed using SPSS version 25 and SmartPLS4. Covariance-based structural equation modelling (CB-SEM) was employed to test the measurement and structural models. Model fit was assessed using χ^2, CFI, TLI, RMSEA, and SRMR, with acceptable thresholds set at CFI/TLI ≥ 0.90, RMSEA ≤ 0.08, and SRMR ≤ 0.08 (Hu & Bentler, 1999; Kline, 2016). Reliability was assessed using Cronbach's α and Composite Reliability (CR $\geq$ 0.70). Convergent validity was established via Average Variance Extracted (AVE ≥ 0.50). Qualitative data were analyzed using reflexive thematic analysis in Atlas.ti version 7.

Ethical approval was obtained from the USIU-Africa Institutional Review Board (IRB Approval No. USIU-A/ISERC/US605-2025) and the Kenya National Commission for Science, Technology & Innovation (NACOSTI/P/25/417979).

Demographic Profile of Respondents

Of the 362 respondents, 60.0% were male and 38.0% female. The largest age cohort was 36–45 years (36.5%), and 71.3% resided in urban areas. Among respondents disclosing a disability, physical/mobility impairment (24.6%) was most prevalent, followed by visual (4.7%), hearing (2.5%), and cognitive/learning (2.2%). The high proportion of 'other/not specified' (66.0%) reflects respondents who either declined to disclose or had no disability but interacted professionally with the e-justice system.

Measurement Model: Validity and Reliability

Exploratory factor analysis (EFA) confirmed the three-factor structure of the AT Interoperability construct. The Kaiser-Meyer-Olkin (KMO) measure was 0.839, exceeding the acceptable threshold of 0.70, and Bartlett's test of sphericity was significant ($\chi^2 = 2779.839$, $df = 153$, $p < 0.001$). The three extracted factors explained 66.35% of the total variance.

All factor loadings exceeded 0.77, indicating strong construct validity. Composite reliability (CR) ranged from 0.911 (OI) to 0.928 (IM), and Average Variance Extracted (AVE) ranged from 0.631 (OI) to 0.682 (IM), all substantially above recommended thresholds.

Table 1

Convergent Validity for AT Interoperability

Sub-Construct	Cronbach's α	Composite Reliability (CR)	AVE	Status
OS/Platform Interoperability	0.798	0.911	0.631	Acceptable
Assistive Software Compatibility	0.743	0.916	0.664	Acceptable
Input/Interaction Modality	0.656	0.928	0.682	Acceptable

Descriptive Findings

Respondents reported moderate to positive perceptions across all three ATI dimensions. Input/Interaction Modality recorded the highest composite mean ($M = 3.662$), followed by Assistive Software Compatibility ($M = 3.533$) and OS/Platform Interoperability ($M = 3.530$). The overall AT Interoperability construct mean was 3.575 (interpreted as 'Agree').

Standard deviations ranged from 0.986 to 1.076, indicating moderate variability. The ranking Input Modality highest, OS/Platform lowest suggests that users perceive interaction flexibility (keyboard, voice, touch) as more adequately supported than cross-platform consistency. This may reflect that mobile-first design in Kenya has prioritised touch and voice interfaces over desktop-OS parity.

Qualitative Triangulation

The quantitative finding that assistive software compatibility was the strongest sub-dimension (loading 0.792) was strongly corroborated by interview data. A participant with total blindness (INT3) explained her reliance on assistive software: *"Without a laptop which is empowered ... I can't access it. If the e-platform had something like speech, that would be the best option."* She noted that JAWS (screen reader) and Dragon (speech-to-text) are essential, but PDFs remain problematic: *"When it's in PDF, it usually gives me a challenge. I'm not able even to change it to Word again."* This directly illustrates how assistive software compatibility failures—specifically untagged PDFs—obstruct independent use.

On OS/platform interoperability, a participant with partial blindness (INT1) reported smooth switching between devices: *"I don't have problems at all. The switching is just smooth."* However, a participant with mobility impairment (INT2) noted that system instability, not device or browser, was the occasional barrier: *"It is not even the browser ... it is the system when it has downtime."* This indicates that OS/platform interoperability is generally adequate, but system availability (a different construct) sometimes interrupts access.

On input/interaction modality interoperability, a participant with total blindness (INT3) explicitly called for a built-in speech interface: *"If the e-platform have something like speech ... so that when you go to the platform itself, it can guide you ... without an assistive device on your laptop."* This suggests that while input modality interoperability exists (keyboard, touch), it is insufficient for totally blind users who would benefit from platform-native audio guidance. A participant with partial deafness (INT5) appreciated the presence of captions: *"It supports by including 'captions' in audio/video related tasks."*

Critically, when asked which single factor had the greatest effect on her ability to use the e-justice platform, INT3 explicitly identified assistive technology: *"With the assistive devices, you can access it. ... For me, as a person who has been supported with the assistive devices which they have put in place, I have no challenge with the platform."* This aligns with the quantitative finding that AT interoperability was the strongest predictor ($\beta = 0.492$ in the combined model).

Hypothesis Testing: Structural Model

The structural equation model examining the direct effect of AT Interoperability on Digital Inclusivity demonstrated good fit: $\chi^2/df = 1.8$, CFI = 0.902, TLI = 0.900, RMSEA = 0.06, SRMR = 0.062. The path coefficient from AT Interoperability to Digital Inclusivity was positive and statistically significant ($\beta = 0.553$, $t = 12.583$, $p < 0.001$).

Table 2

Regression Coefficients – AT Interoperability → Digital Inclusivity

Model	Unstd. β (B)	Std. Error	Std. β	t	Sig.
(Constant)	2.501	0.086	–	29.219	0.000
AT Interoperability	0.299	0.024	0.553	12.583	0.000

Dependent Variable: Digital Inclusivity in E-Justice Systems. $R^2 = 0.305$.

AT interoperability explained 30.5% of the variance in digital inclusivity ($R^2 = 0.305$). Among the three sub-dimensions, Assistive Software Compatibility exhibited the strongest loading on the AT Interoperability construct (β = 0.792), followed by OS/Platform Interoperability (β = 0.697 p=0.000) and Input/Interaction Modality Interoperability (β = 0.665 p=0.000).

The null hypothesis (H_1) that stated AT interoperability has no significant influence on digital inclusivity was therefore rejected.

Discussion of Results

This study provides empirical evidence that assistive technology interoperability is the strongest determinant of digital inclusivity in e-justice systems for persons with disabilities, both when examined in isolation (β = 0.553) and when controlling for other determinants (β = 0.492). It indicates a hierarchical dependency in disability-inclusive digital systems with interoperability with assistive technologies functions as a precondition for all other design features to be experienced as inclusive.

This hierarchical dependency can be understood as a gateway effect. A system may be beautifully designed with multichannel access and alternative formats, but if a blind user's screen reader cannot parse its interface, none of those features is accessible. AT interoperability is not merely an additive factor in an inclusivity equation; it is a multiplicative condition. If AT interoperability is zero, the product of all other factors is zero. This finding extends the accessibility literature beyond the observation that 'interoperability matters' to the stronger claim that interoperability is the foundational layer upon which all other accessibility investments depend.

The ranking of sub-dimensions of assistive software compatibility strongest (0.792), OS/platform interoperability second (0.697), input/interaction modality third (0.665) carries specific practical significance. The dominance of assistive software compatibility reflects the reality that for most persons with disabilities, access is mediated through specialised software (screen readers, speech-to-text, magnifiers). If the e-justice platform is incompatible with NVDA—the dominant screen reader in Africa at 69.9% usage—the user is excluded regardless of OS consistency or input modality support.

The relatively lower loading for input/interaction modality interoperability (0.665) does not indicate that this dimension is unimportant. Rather, it suggests that in the current Kenyan e-justice context, foundational compatibility with screen readers and speech-to-text tools is more urgent than advanced features like eye-tracking or gesture control. This ordering may shift as the system matures and more users with complex motor impairments seek access.

This study makes three theoretical contributions. First, it provides empirical validation for the Social Model of Disability's application to digital justice contexts. The finding that AT interoperability, an environmental property of the e-justice platform, is the strongest predictor of digital inclusivity directly supports the Social Model's core tenet: disability is produced by environmental barriers, not individual impairments. When the environmental barrier (interoperability failure) is removed, inclusion improves substantially.

Second, the study challenges the sufficiency of WCAG conformance as a proxy for accessibility. The qualitative evidence reveals that systems can be formally WCAG compliant (e.g., providing a PDF) yet remain functionally inaccessible if the PDF is untagged or if the platform blocks hotspot access for assistive use. This finding aligns with Vollenwyder et al. (2023), who demonstrated that WCAG conformance does not reliably translate into improved task performance. The implication is that accessibility evaluation must move beyond compliance checklists to functional, task-based interoperability testing.

Third, the study extends UTAUT2 by demonstrating that AT interoperability functions as a precondition that must be satisfied before standard technology acceptance constructs become relevant. UTAUT2 in its standard form assumes that users can access the system and then assesses effort expectancy, performance expectancy, and facilitating conditions. For persons with disabilities, this assumption fails. If the system is incompatible with NVDA, effort expectancy cannot be assessed because the user cannot engage at all. This suggests a hierarchical or conditional extension to UTAUT2 for accessibility contexts, where 'assistive technology compatibility' should be considered a fundamental antecedent or moderating condition.

The finding that assistive software compatibility was the strongest dimension (0.792) concurs with WebAIM (2024), which documented that NVDA dominates in Africa (69.9% of primary usage), making NVDA-first design choices critical for Kenyan e-justice deployments. However, the present study diverges from some prior findings regarding the relative importance of input/interaction modality interoperability. While Atata and Odedeyi (2025) highlighted the growing role of multimodal AI and adaptive UI for diverse input methods, the loading for IM (0.665) was lower than for ASC (0.792), suggesting that in the Kenyan context, basic software compatibility may currently outweigh advanced modality support. This divergence likely reflects the early stage of e-justice implementation in Kenya, where foundational interoperability issues remain more pressing than advanced features.

The finding that AT interoperability is the strongest predictor in the combined model (0.492) aligns with Droutsas et al. (2025), who argued that fragmented interoperability between web interfaces, screen readers, and input modalities leads to systemic breakdowns. However, the present study provides a more precise quantitative estimate of AT interoperability's relative influence by comparing it directly with other determinants within a single unified model.

Regionally, the findings concur with Abdurahman and Kabanda (2024), who identified weak legal mandates, limited developer capacity, and low institutional prioritisation of accessibility as barriers in South Africa. The significant effect of AT interoperability in Kenya suggests that despite these challenges, interoperability improvements can yield measurable inclusivity gains. This also aligns with the Judiciary of Kenya's (2023) articulated commitment to inclusive design, while the significant loadings for all three dimensions provide empirical validation for the need for systematic testing across platforms.

The qualitative evidence reveals the mechanism behind the gateway effect. INT3 could access the e-justice platform only *after* receiving assistive equipment: *"from 2012 to 2023 ... they were able to give me the equipment."* For 11 years, no amount of training, institutional support, or inclusive design could compensate for the absence of a compatible screen reader. Her experience illustrates that AT interoperability is not an enhancement; it is an enabler without which all other investments are ineffective.

This has profound implications for sequencing. Judicial ICT directorates commonly approach digital inclusivity as a checklist: implement WCAG, offer training, establish help desks. The findings of this study suggest that this sequence is inefficient. The correct sequence is: first, ensure AT interoperability (test with NVDA, JAWS, VoiceOver, TalkBack; verify PDF tagging; confirm keyboard navigation). Second, implement inclusive design features (multichannel access, alternative formats). Third, build institutional support (help desks, training, policies). Fourth, address user characteristics (digital literacy programmes, trust communications). Without the first step, subsequent steps have substantially reduced impact because a substantial subset of users—those who rely on AT—cannot access the platform at all.

Conclusion

This study examined how OS/platform interoperability, assistive software compatibility, and input/interaction modality interoperability influence digital inclusivity in e-justice systems for persons with disabilities. The findings demonstrate that assistive technology interoperability is the strongest predictor of digital inclusivity among all determinants examined, both in isolation ($\beta = 0.553$) and in the combined model ($\beta = 0.492$). Assistive software compatibility emerged as the most influential sub-dimension, underscoring the critical importance of reliable integration with screen readers, speech-to-text tools, and other assistive applications.

The central conclusion is that AT interoperability functions as a gateway variable. Without it, no other accessibility investment is fully effective because users who rely on assistive technologies cannot access the platform at all. For judicial ICT directors and policymakers, the findings mandate that AT interoperability testing be embedded in procurement contracts, development cycles, and quality assurance protocols as a non-negotiable precondition for digital inclusivity.

Policy and Practical Implications

For judicial ICT directors, policymakers, and accessibility auditors, five actionable recommendations follow.

First, mandate assistive technology interoperability testing as a procurement condition. E-justice platforms must be tested with the specific screen readers (NVDA, JAWS, VoiceOver, TalkBack), speech-to-text tools (Dragon NaturallySpeaking), and input devices that persons with disabilities actually use. In the African context, NVDA dominates (69.9% primary usage), and testing protocols should reflect this distribution. Testing should include real-world legal tasks: filing a document, retrieving a judgment, completing a multi-step form. Second, verify PDF accessibility through user-led testing, not automated checkers. The qualitative finding that untagged PDFs obstruct screen reader users (INT3) indicates that document accessibility is a persistent failure point. PDFs must be tagged, structured, and tested with NVDA and JAWS before deployment. Automated PDF checkers are insufficient; user-led testing with persons who rely on screen readers is required.

Third, ensure that platform security settings do not inadvertently block assistive access. The qualitative finding that hotspot access was blocked (INT3: *"it detects as insecure and refuses to use it"*) indicates that security configurations can create unintended interoperability failures. Security policies should be reviewed to ensure that assistive technology traffic is not blocked or degraded. Fourth, embed AT interoperability testing in every development cycle, not as a one-time compliance exercise. The longitudinal finding from Fok et al. (2022) that accessibility failures persist across app updates indicates that testing must be continuous. Regression testing for AT interoperability should be automated where possible and supplemented with manual user-led testing before each major release.

Fifth, prioritise assistive software compatibility over advanced input modalities in resource-constrained environments. While input/interaction modality interoperability is valuable, the findings indicate that foundational screen reader and speech-to-text compatibility is currently more urgent. Investment sequencing should reflect this ordering: first, ensure NVDA/JAWS compatibility; second, verify keyboard navigation; third, implement voice input; fourth, explore advanced modalities (eye-tracking, switch access).

Limitations and Future Research

This study has limitations that suggest directions for future research. First, the cross-sectional design limits causal inference; longitudinal research is needed to examine how changes in AT interoperability over time produce changes in inclusivity outcomes. Second, the sample was drawn from Nairobi County, which has above-average digital infrastructure; findings may not generalise to rural jurisdictions with lower connectivity. Third, the study did not conduct objective technical testing of AT interoperability; it relied on user-reported perceptions. Future research should combine user surveys with systematic technical audits using standardised testing protocols.

Future research should pursue three directions. First, comparative studies across multiple Global South jurisdictions could examine how differing procurement policies and testing regimes affect AT interoperability outcomes. Second, experimental studies that manipulate specific interoperability features (e.g., providing tagged vs. untagged PDFs) could establish causal effects on task completion time and error rates. Third, cost-benefit analyses of different interoperability interventions (e.g., NVDA-first design vs multi-screen reader testing) would provide evidence to guide resource allocation in resource-constrained judiciaries.

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