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Digital Accessibility of University Admission Platforms in the Arab Region Using WCAG 2.2

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Abstract

Purpose

This study evaluates the technical and structural accessibility of admission and registration platforms in Arab universities and compares their performance with an international benchmark sample using selected Web Content Accessibility Guidelines (WCAG) 2.2 criteria.

Methods

The study examines admission-related platforms of 24 Arab universities and eight international benchmark universities. Accessibility was assessed through a manual WCAG 2.2-based index covering eight criteria and automated testing using the Web Accessibility Evaluation Tool (WAVE). Descriptive statistics, group comparisons, regional analysis, and correlation tests were applied.

Results

Arab universities recorded substantially lower accessibility scores than the international benchmark universities. The largest weaknesses were observed in form labels, accessible error messages, and multi-step form guidance. Automated testing also identified higher levels of technical and contrast-related errors in the Arab sample. Gulf universities performed relatively better than universities in the Levant and Iraq and North Africa.

Conclusion

The findings demonstrate the need to integrate accessibility into the design, governance, and quality assurance of higher-education admission platforms. The proposed WCAG 2.2-based framework provides universities with a practical approach for monitoring and improving inclusive access to digital admission services.

1. Introduction

The digital transformation of higher education has made admission and registration platforms a primary gateway to university entry. For students with disabilities, these platforms are not merely administrative tools; they determine whether applicants can independently access program information, complete forms, upload documents, and track application status. Their accessibility is therefore closely connected to equity, inclusion, institutional quality, and access to human-capital formation. From this perspective, accessible admission platforms can be understood as digital gateways through which universities reduce barriers to educational participation and support more inclusive pathways into future economic and social opportunity.

International evidence highlights the scale and urgency of this issue. Around 1.3 billion people, or about 16% of the global population, live with some form of disability, making accessible digital educational services an essential requirement rather than a technical enhancement (World Health Organization, 2023). At the same time, global accessibility reports continue to show persistent WCAG failures across large-scale samples of websites, including education-related services (WebAIM, 2024; WebAIM, 2025). Prior studies of university websites also identify recurring barriers such as weak color contrast, missing alternative text, incomplete keyboard navigation, poor semantic structure, and inaccessible form components (Akgül, 2021; Campoverde-Molina et al., 2023; Macakoğlu et al., 2022; Verkijika & De Wet, 2020). When admission platforms are inaccessible, the cost is not limited to a technical failure; it may also create opportunity losses by restricting access to higher education, skills development, and future labor-market participation for students with disabilities.

In the Arab region, accessibility gaps are shaped by rapid digitalization, bilingual web environments, Arabic-language interface challenges, and developing accessibility governance. Regional reports and studies indicate continuing weaknesses in educational and public websites, particularly in relation to alternative text, contrast, semantic markup, and form-related components (Akram et al., 2023; Fakrudeen, 2024; Mada Assistive Technology Center, 2023; Mada Assistive Technology Center, 2024). These issues are especially important in admission and registration platforms because they affect the first stage of access to higher education.

Accordingly, this study evaluates the technical and structural accessibility readiness of Arab universities' admission and registration platforms as a key condition for inclusive access to higher education and human-capital development. It focuses on publicly accessible admission pages, application forms, document-upload interfaces, and application-status pages, using selected WCAG 2.2 criteria relevant to students with visual, motor, and cognitive disabilities. Rather than measuring actual user satisfaction or live task completion, the study provides a standards-based assessment that combines manual expert review with automated WAVE testing and compares Arab universities with an international benchmark sample.

On this basis, the study is guided by the following research questions:

1. To what extent do the electronic admission and registration platforms of Arab universities comply with selected WCAG 2.2 accessibility criteria at Levels A and AA?
2. What are the most common accessibility barriers in the admission and registration pages examined, particularly in relation to alternative text, color contrast, keyboard navigation, form labels, error messages, and multi-step form guidance?
3. How do Arab universities' admission and registration platforms compare with international benchmark universities in terms of manual accessibility scores and automated accessibility errors?

4. How do accessibility levels vary across Arab regions, namely the Gulf Cooperation Council countries, the Levant and Iraq, and North Africa?
5. To what extent is the presence of published digital accessibility information or policy statements observable on university websites, and how can this be interpreted as an indicator of institutional accessibility readiness?

The study makes three main contributions. First, it shifts the focus of accessibility evaluation from general university websites to admission and registration platforms, which represent a critical entry point for students with disabilities. Second, it frames accessible admission platforms as part of inclusive access to human-capital formation, linking digital inclusion with wider educational and socioeconomic opportunity. Third, it applies a WCAG 2.2-based assessment framework to Arab higher education platforms, a context that remains underrepresented in the international accessibility literature, and combines manual expert assessment with automated testing to provide standards-based and technically observable evidence of accessibility readiness.

2. Literature Review

2.1 Digital Accessibility, Inclusion, and Admission Platforms in Higher Education

Digital accessibility in higher education is now widely understood as part of educational justice and inclusion, not merely as a technical matter of interface design. UNESCO reports emphasize that inclusive education requires learners to access digital educational services across the full student journey, including pre-enrollment, admission, and registration stages (UNESCO, 2020; UNESCO, 2024). For students with disabilities, inaccessible admission platforms may prevent access to suitable programs because of inaccessible forms, missing alternative text, unclear instructions, or interfaces that cannot be used effectively with a keyboard or screen reader.

Digital inclusion also requires content and interfaces that serve diverse users, including people with disabilities, older adults, and new digital learners (WebAIM, 2024; WebAIM, 2025). In Arab countries, the issue appears within a dual context of rapid digitization and developing accessibility regulation. Regional reports show improvement in some indicators but also highlight a continuing gap between policy aspirations and observed compliance, especially in educational services (Mada Assistive Technology Center, 2024; UNESCWA, 2020). This study therefore treats admission and registration platforms as a point where rights-based inclusion and technical accessibility standards intersect.

2.2 International and National Frameworks for Digital Accessibility in Admission and Registration Platforms

The Web Content Accessibility Guidelines (WCAG), issued by the World Wide Web Consortium, are the main international reference for digital accessibility in websites and electronic services. WCAG 2.2,

adopted in 2023, is particularly relevant to admission and registration platforms because it addresses issues such as visible focus, target size, input support, and accessibility of multi-step processes (World Wide Web Consortium, 2023). These requirements align with the core WCAG principles that content should be perceivable, operable, understandable, and robust.

Other regulatory frameworks reinforce this direction. EN 301 549 and the European Web Accessibility Directive link accessibility to public digital services, procurement, monitoring, and reporting (European Telecommunications Standards Institute, 2024; European Commission, 2024). In the United States, the 2024 ADA Title II final rule extends WCAG-based obligations to websites and mobile applications of public entities, including public universities (U.S. Department of Justice, 2024).

In the Arab context, the United Arab Emirates' National Digital Accessibility Policy and Saudi Arabia's accessible digital-channel guidelines provide practical reference points for public-sector and education-related platforms (Digital Government Authority, 2022; Digital Government Authority, 2024; United Arab Emirates Government, 2021). Mada Center's ICT Accessibility and Inclusion Development framework also highlights the institutional skills needed to implement accessibility (Mada Assistive Technology Center, 2022). Together, these frameworks provide a coherent basis for evaluating whether accessibility standards are reflected in university admission and registration platforms.

2.3 Prior Studies on University Website and Admission-Platform Accessibility

Applied research consistently shows a gap between accessibility standards and observed compliance on university websites. Large-scale evidence from the WebAIM Million reports identifies recurring problems such as missing alternative text, insufficient contrast, unclear links, and weak semantic structure (WebAIM, 2024; WebAIM, 2025). A systematic review of university website accessibility similarly found that most studies report only partial WCAG compliance and that research often focuses on home pages, institutional pages, or libraries rather than specialized student-service platforms (Campoverde-Molina et al., 2023).

Empirical studies across different contexts confirm these patterns. Research on university websites in Turkey, South Africa, and other contexts reports recurring failures in alternative text, color contrast, keyboard navigation, and heading structure, even among institutions with stronger digital infrastructures (Akgül, 2021; Verkijika & De Wet, 2020). Studies of prospective-student pages and online forms are particularly relevant because they show that many barriers occur in interactive components, such as input fields without clear labels, inaccessible error messages, missing focus indicators, and form workflows that are difficult to complete with assistive technologies (Macakoğlu et al., 2022).

In the Arab region, recent studies and reports show gradual progress but continuing weaknesses in educational and public websites, especially in Arabic-language interfaces, bilingual page structures, alternative text, contrast, semantic markup, and form components (Akram et al., 2023; Fakrudeen, 2024; Mada Assistive Technology Center, 2024). However, few studies examine admission and registration

platforms in Arab universities directly and in depth. Most research assesses general university websites or home pages. This leaves an important gap concerning electronic forms, document-upload processes, and application-status tracking in Arab higher education.

2.4 Research Gap

The literature reveals a clear gap between the growing recognition of digital accessibility as part of inclusive higher education and the limited empirical assessment of admission and registration platforms. Although WCAG 2.2 and related policy frameworks provide clear standards, applied studies rarely examine the form-based and workflow-based components that are central to admission processes.

Most studies of university website accessibility focus on home pages, college pages, libraries, or general design quality. By contrast, this study focuses specifically on publicly accessible admission and registration platforms in Arab universities. It applies selected WCAG 2.2 criteria to admission information pages, electronic forms, document-upload functions, and application-status pages, compares Arab universities with an international benchmark sample, and examines regional variation within the Arab sample. In doing so, it provides both empirical evidence and a practical framework for improving digital inclusion in higher education.

2.5 Conceptual Framework

The conceptual framework treats the accessibility of admission and registration platforms as a component of educational equity and digital inclusion in higher education. The dependent variable is the level of digital accessibility, measured through a WCAG 2.2-based accessibility index applied to key admission-related pages and functions, including information pages, application forms, document-upload pages, and application-status tracking.

The study also considers contextual variables that may help explain variation in accessibility performance, including the Arab region, university type where identifiable, and the availability of published accessibility-related information. International ranking status is used only as a broad contextual indicator of institutional visibility and digital maturity, not as a causal explanation of accessibility performance.

3. Research Hypotheses and Objectives

The study assumes that Arab universities' admission and registration platforms do not yet achieve the level of digital accessibility required to provide barrier-reduced access for students with disabilities and that a measurable gap exists when compared with international benchmark universities. Four hypotheses are tested:

- H1. Arab universities differ significantly from international benchmark universities in the overall accessibility index, in favor of the benchmark universities.

- H2. Arab universities record significantly higher automated accessibility errors than international benchmark universities.
- H3. Accessibility performance differs across Arab regions.
- H4. The weakest accessibility areas are concentrated in interactive form-related components, particularly form labels, error messages, and multi-step form guidance.

The study aims to measure the accessibility of admission and registration platforms in Arab universities using a WCAG 2.2-based checklist and automated testing; compare Arab universities with an international benchmark sample; identify the most common accessibility barriers; examine regional variation; and derive practical recommendations for admissions offices, information-technology units, and quality assurance bodies.

4. Scope of the Study

The study is limited to publicly accessible admission and registration platforms, including new-student portals, application forms, document-completion pages, and application-status tracking pages. It does not cover all university digital services, such as e-libraries, learning management systems, or internal academic systems. Geographically, it includes a purposive sample of Arab universities and an international benchmark sample selected for ranking status, geographic diversity, and availability of comparable public admission platforms. Methodologically, the study assesses technical and structural accessibility readiness using automated testing and manual expert assessment. It does not measure student satisfaction, lived experience, or real-time task completion.

5. Research Methodology

The study adopts a descriptive, analytical, and comparative approach. It aims to diagnose the level of digital accessibility in Arab universities' admission and registration platforms and compare them with those of international benchmark universities with reference to WCAG 2.2 criteria.

5.1 Study Sample

The study measures accessibility compliance in a university sample, analyzes the most common error and barrier patterns, and compares two groups:

1. Arab universities that operate electronic admission and registration platforms for new students.
2. International benchmark universities outside the Arab world, selected on the basis of high international ranking status, geographic diversity, and publicly accessible admission platforms.

5.2 Sample-Selection Criteria

The Arab university sample was selected purposively according to clear and controlled criteria:

1. An active electronic admission and registration platform, including a publicly accessible undergraduate admission portal available through the official university website.
2. An identifiable Arabic interface, whether full or partial, because the study focuses on digital accessibility for Arab students.
3. Geographic representation across the Arab world, covering Gulf Cooperation Council countries, the Levant and Iraq, and North Africa, to avoid restricting the findings to a single region.
4. Diversity in university type, including both public and private/non-governmental universities, because funding and governance models may influence investment in digital transformation and accessibility.
5. Variation in university size and institutional age, including large, medium-sized, and relatively new institutions, as accessibility priorities may differ between established and emerging universities.
6. Attention to digital transparency and the availability of published accessibility-related information or student-support policies, as such information provides a descriptive indicator of institutional accessibility readiness.
7. Website stability, excluding experimental sites or those under construction and focusing on sites that remained operational during data collection.

The international benchmark universities were selected according to the following criteria:

1. The availability of a publicly accessible electronic admission platform that provides sufficient information and interactive components for assessment.
2. Strong international ranking status, used as a proxy for institutional visibility and digital maturity rather than as a direct indicator of accessibility excellence.
3. Geographic diversity across North America, Europe, Oceania, and Asia to avoid limiting the comparison to a single legal, cultural, or technical environment.
4. The availability of admission content in English or another language that could be reliably assessed by the researchers.
5. The presence of admission-related pages or workflows that are functionally comparable to those examined in the Arab university sample.

The international benchmark sample was not intended to represent a universal gold standard of accessibility. Rather, it was used as a comparative reference group consisting of high-ranking universities with publicly accessible admission platforms and sufficient functional comparability with the Arab sample. This approach allows the study to contextualize Arab universities' accessibility performance against institutions with strong international visibility and relatively mature digital service environments, while avoiding claims that the benchmark universities represent complete or ideal accessibility practice.

5.3 Sample Description

The Arab sample consists of 24 universities selected through a purposive stratified design: eight from the Gulf Cooperation Council, eight from the Levant and Iraq, and eight from North Africa. This equal

regional distribution supports comparison across Arab regions while maintaining a manageable sample for manual and automated assessment of multiple admission-related pages. The sample size is consistent with applied website-accessibility studies that often evaluate a limited number of institutions because each site requires page-level inspection. The inclusion of eight international benchmark universities provides a comparative reference without expanding the study beyond a feasible assessment scope. Appendix 1 lists the Arab and international universities included in the study.

5.4 Study Instruments

The study uses two complementary assessment components to measure digital accessibility in admission and registration platforms:

1. A checklist derived from WCAG 2.2 at levels A and AA, adapted to the context of admission platforms. It includes items related to alternative text, color contrast, heading structure, keyboard navigation, visible focus, form labels, error messages, and support for multi-step forms. The criteria were converted into measurable items scored as fully met, partially met, or not met. To calculate a digital-accessibility index for each page, the achieved item scores are summed, divided by the maximum possible score (number of items × 2), and multiplied by 100. The average across the pages of each university's admission and registration platform then represents the overall digital-accessibility index for that university.
2. Automated digital-accessibility testing. In addition to the manual checklist, the study used WAVE as the automated accessibility-testing tool to examine selected URLs in each university’s admission platform. The automated tools provide quantitative indicators such as the number of critical errors per page, warnings, and errors classified by criterion type, including contrast, alternative text, heading structure, and forms. These results support the manually derived accessibility index and help compare common error patterns across Arab and international benchmark universities.

Manual expert assessment. The manual assessment was conducted using a predefined checklist and a standardized scoring rubric to reduce evaluator subjectivity. Each criterion was operationalized into observable indicators and scored consistently across all universities. The scoring protocol was designed to ensure that each item could be evaluated according to clear 0–1–2 criteria: non-achieved, partially achieved, or fully achieved. Because the manual assessment was not independently replicated by a second reviewer, inter-rater reliability was not calculated. This limitation is acknowledged explicitly in the limitations section, and future research should replicate the assessment using multiple reviewers and report inter-rater agreement using Cohen’s kappa or the intraclass correlation coefficient. The detailed scoring rubric used for the manual assessment is provided in Appendix 2.

The combined use of manual and automated assessment was intended to balance the strengths and limitations of each method. Automated testing provides reproducible technical indicators, such as WAVE-detected errors and contrast-related errors, but it cannot fully assess the meaningfulness of labels, the clarity of instructions, or the logic of multi-step admission workflows. Manual assessment was therefore used to evaluate accessibility dimensions that require contextual judgment. The scoring

rubric was standardized to reduce evaluator subjectivity, and the limitations of not calculating inter-rater reliability are acknowledged in the study limitations.

5.5 Data Collection

Data collection followed a structured procedure. First, admission and registration URLs were identified for each university, including admission information pages, requirements pages, publicly accessible application forms, document-upload or document-completion pages, and application-status pages where available. Second, each URL was tested using WAVE to identify total accessibility errors and contrast-related errors, which were coded at page level and aggregated at the university level. Third, each page was manually assessed using the WCAG 2.2-based checklist across eight dimensions: alternative text, color contrast, heading structure, keyboard navigation, visible focus, form labels, error messages, and multi-step form guidance. Fourth, the researchers recorded whether each website included an accessibility statement, digital accessibility policy, or accessibility-related support information. All assessments were conducted between March and May 2025, and the findings reflect the status of the platforms during that period.

5.6 Statistical Analysis and Ethical Considerations

The study used descriptive and inferential statistical methods. Descriptive statistics included means, standard deviations, medians, quartiles, and minimum and maximum values for the overall accessibility index and automated-error indicators. Results were reported at both the university-group level and, where appropriate, by Arab region. Inferential analysis included independent-samples t-tests to compare Arab universities with international benchmark universities in terms of the overall accessibility index and automated-error indicators. Because some benchmark scores showed very limited variance, Welch's t-test was used where equality of variance could not be assumed. Effect sizes were reported using Cohen's d to assess the practical magnitude of group differences. One-way ANOVA was used to compare accessibility-index averages across the three Arab regions. Because some groups showed limited variance and the sample size was relatively small, the parametric results were interpreted cautiously. The analysis therefore emphasized the direction of group differences, effect sizes, and consistency between manual and automated indicators. Future studies with larger page-level datasets should complement these analyses with non-parametric robustness checks, such as the Mann–Whitney U test for two-group comparisons and the Kruskal–Wallis test for regional comparisons. Pearson's correlation coefficient was used to examine the relationship between the overall accessibility index and automated-error indicators, including WAVE-detected errors and contrast errors. Statistical significance was interpreted at $\alpha = 0.05$.

Ethically, the study relied only on publicly available information from official university websites. No personal data were collected, and no students, applicants, or staff members were involved as research participants. The results are presented for scientific and improvement purposes and are not intended to harm institutional reputation. The study acknowledges that website accessibility may change after the assessment period as platforms are updated.

6. Results

The quantitative analysis is based on a sample of 32 Arab and international universities: 24 Arab universities distributed across three regions—the Gulf Cooperation Council countries, the Levant and Iraq, and North Africa—and eight international benchmark universities. The analysis integrates the results of manual assessment based on WCAG 2.2 with automated testing using WAVE.

6.1 Manual Assessment Based on WCAG 2.2

The manual assessment converted selected WCAG 2.2 criteria into a practical checklist applicable to admission and registration pages. The assessment focused on eight items representing minimum accessibility requirements in the context of electronic admission forms:

1. Alternative text for essential images.
2. Sufficient color contrast between text and background.
3. Clear and sequential main and subheadings.
4. Ability to navigate using the keyboard only, without relying on a mouse.
5. Clear focus indicators on interactive elements.
6. Clear labels for all form fields.
7. Error messages that are clear and readable by screen readers.
8. Clear guidance in multi-step forms.

Each item was scored on a scale from 0 to 2, where 2 indicates full achievement, 1 partial achievement, and 0 non-achievement. Table 1 presents the general item averages for Arab and international benchmark universities.

Table 1
Mean manual-assessment results for the university sample

Item	Mean: Arab universities (n = 24)	Mean: international benchmark universities (n = 8)
Alternative text for essential images	1.25	2.00
Sufficient color contrast between text and background	1.25	2.00
Clear and sequential main and subheadings	1.72	2.00
Keyboard-only navigation	1.25	2.00
Clear focus indicator on interactive elements	1.25	2.00
Clear labels for all form fields	0.79	1.20
Screen-reader-readable error messages	0.73	1.40
Guidance in multi-step forms	0.92	1.60

Source: Calculated by the authors.

Alternative text remains a critical accessibility criterion for students with visual disabilities. Arab universities scored approximately 1.25, indicating partial provision of alternative text, whereas the benchmark universities achieved 2.00, reflecting more consistent use of meaningful descriptions for functional images.

Color contrast showed a similar pattern. Arab universities averaged 1.25 out of 2, reflecting partial compliance, while benchmark universities scored 2.00. This indicates more consistent attention in the benchmark sample to readable text, links, and buttons for users with low vision.

Heading structure was the strongest item for Arab universities, with an average of 1.72 out of 2. This suggests relatively good content organization, although some platforms still showed hierarchy problems or relied on visual formatting rather than semantic headings. Benchmark universities achieved full compliance.

Keyboard-only navigation and visible focus indicators averaged around 1.25 in the Arab sample, indicating partial accessibility of interactive elements. Benchmark universities scored approximately 2.00, suggesting more consistent keyboard access and visible focus across links, buttons, and input fields.

The weakest items in the Arab sample were form labels, error messages, and multi-step form guidance. Form labels averaged 0.79, indicating frequent problems in programmatically linking labels to input fields. Error messages averaged 0.73, often because feedback was unclear, poorly located, or not

detectable by screen readers. Multi-step guidance averaged 0.92, reflecting limited use of progress indicators, step numbers, or clear navigation cues. Benchmark universities performed better on all three items, although they did not reach full compliance in these form-related components. This pattern shows that Arab platforms are stronger in content display and basic navigation than in the interactive elements required to complete admission procedures independently.

Figure 1 illustrates the differences between the eight manual-assessment criteria for Arab and international benchmark universities. The benchmark universities form a nearly circular shape close to the maximum value of 2 across almost all dimensions, with only a minor decline in form labels, error messages, and multi-step forms. The Arab universities form a more irregular polygon, ranging roughly between 1.0 and 1.6 in display and navigation items and dropping below 1.0 in form-related items. This visual pattern supports the conclusion that the gap between the two groups is both quantitative and qualitative.

6.2 Automated Assessment Using WAVE

Automated WAVE testing confirmed a clear technical-accessibility gap. Across the full sample, the average number of technical errors was 13.93 per university, with high dispersion, indicating substantial variation across institutions. Arab universities recorded higher average WAVE-detected errors than benchmark universities (17.73 versus 2.53) and higher contrast errors (18.66 versus 2.55). Some Arab universities recorded relatively few errors, while others showed substantial technical barriers, particularly in contrast-related issues. Benchmark universities showed lower error levels and greater consistency. The group-level automated accessibility results are summarized in Table 2, which reports the mean WAVE-detected errors and mean contrast errors for Arab universities and international benchmark universities.

Table 2
Automated-error averages in Arab and international benchmark universities

Sample	N	Mean WAVE-detected errors (Mean ± SD)	Mean contrast errors (Mean ± SD)
Arab universities	24	17.73 ± 22.26	18.66 ± 30.39
International benchmark universities	8	2.53 ± 3.45	2.55 ± 3.76

Source: Calculated by the authors.

Figure 2 shows that some Arab universities, especially in the Levant and North Africa, approach 80 average errors, while other Gulf universities cluster between approximately 5 and 15 errors. This reflects substantial internal variation in technical accessibility across the Arab sample. In contrast, the benchmark universities remain within a low range of approximately 0 to 10 errors, offering a clear visual representation of the gap between the two groups.

6.3 Overall Accessibility Index

An overall accessibility index was calculated for each university from the five admission-related pages assessed. The index ranges from 0 to 100 and reflects combined compliance across admission information, requirements, online application forms, document-upload pages, and application-status pages where available. Across the 32 universities, the mean index was 57.23 (SD = 20.14), with values ranging from 35.00 to 88.75. The distribution shows a clear separation between Arab universities, which clustered between 35 and 53.75, and benchmark universities, which consistently scored 88.75. The restricted dispersion in the benchmark group reflects the scoring design: eight high-priority criteria were scored on a 0–2 scale to capture core accessibility readiness rather than fine-grained usability variation. Future studies should extend the index using more WCAG 2.2 criteria, page-level modeling, and user-based task measures. Table 3 presents the descriptive statistics for the overall accessibility index and the automated-error indicators across the full university sample.

Table 3
Descriptive statistics for accessibility and automated-error indicators

Indicator	Mean	SD	Minimum	Q1	Median	Q3	Maximum
Overall accessibility index	57.23	20.14	35.0	35.0	53.8	62.5	88.8
Average WAVE-detected errors	13.93	20.37	0.0	1.9	6.2	13.5	80.0
Average contrast errors	14.63	27.18	0.0	1.3	4.8	14.7	141.0

Source: Calculated by the authors.

Figure 3 presents the overall accessibility index by university. Arab universities show lower and more varied scores, particularly in the Levant and North Africa, while benchmark universities cluster at 88.75. This pattern illustrates both the gap between Arab and benchmark universities and the internal variation across Arab regions.

6.4 Correlation Between Manual and Automated Assessment

To examine the relationship between manual accessibility assessment and automated testing results, Pearson correlations were calculated between the overall accessibility index and both the average number of WAVE-detected errors and average number of contrast errors across all universities (n = 32). The results show a moderately strong negative relationship between the accessibility index and the number of WAVE-detected errors, $r = -0.53$, $df = 30$, $p \approx 0.0018$. A weaker but statistically significant negative correlation was found between the accessibility index and contrast errors, $r = -0.36$, $df = 30$, $p \approx 0.043$. The Pearson correlation results are reported in Table 4, showing the relationship between the overall accessibility index and the automated-error indicators.

Table 4
Pearson correlations between the accessibility index and automated-error indicators

Correlation	r	df	p-value
Accessibility index – average WAVE-detected errors	–0.53	30	0.0018
Accessibility index – average contrast errors	–0.36	30	0.0426

Source: Calculated by the authors.

These results indicate that universities with higher manual accessibility scores tend to record fewer automated errors in WAVE. However, the relationship is not perfect, which means that each assessment type captures a different dimension of accessibility. Manual assessment is more sensitive to content meaning, user experience, and logical sequencing, while automated tools are more effective in identifying technical code-level errors, contrast problems, and semantic markup issues.

Figure 4 shows that benchmark universities are concentrated in the lower-right section, where accessibility scores are high and error counts are low. Arab universities are spread across lower or moderate accessibility levels and a wide range of error counts. The downward-sloping regression line confirms the inverse relationship between accessibility and automated errors: as accessibility improves, the number of detected errors tends to decline.

6.5 Comparison Between Arab Universities and International Benchmark Universities

To examine the difference in the overall accessibility index between Arab universities and international benchmark universities, group comparisons were conducted using independent-samples testing. The Arab universities (n = 24) recorded a mean accessibility index of 46.72 (SD = 9.27), whereas the international benchmark universities (n = 8) recorded a mean of 88.75. The benchmark group showed very limited dispersion because the selected benchmark universities achieved consistently high scores on the manual checklist. Given this restricted variance, the results were interpreted with caution and supplemented by effect-size interpretation and robustness checks where appropriate. Table 5 reports the independent-samples comparison between Arab universities and international benchmark universities in terms of the overall accessibility index.

Table 5
t-test results for the accessibility index by university group

Sample	N	Mean AI	SD	
Arab universities	24	46.72	9.27	
International benchmark universities	8	88.75	0.00	
Test	t	df	p-value	Cohen's d
Arab vs. benchmark	–22.21	23.0	< 0.001	–5.18

Source: Calculated by the authors.

The comparison shows a substantial accessibility gap in favor of benchmark universities. The difference is large in practical terms and is supported by both manual and automated indicators. Welch tests also showed that Arab universities recorded higher average WAVE-detected errors and contrast errors than benchmark universities. Although the restricted variance in the benchmark group requires cautious interpretation of parametric statistics, the direction and magnitude of the results are consistent.

6.6 One-Way ANOVA: Regional Differences Within the Arab Sample

The ANOVA results indicate statistically significant differences among the three Arab regions in the overall accessibility index, $F(2, 21) = 4.74$, $p \approx 0.020$. However, because the Gulf group showed very limited internal variance, the regional comparison should be interpreted as indicative rather than definitive. Tukey post-hoc comparisons suggested that the most visible difference was between the Gulf and North Africa, in favor of the Gulf, while differences between the Gulf and the Levant and between the Levant and North Africa did not reach statistical significance. This pattern suggests that Gulf universities may be relatively more consistent in their accessibility performance, whereas the Levant and North Africa show wider variation and include universities at lower levels of accessibility readiness. Future studies should expand the regional sample and apply page-level analysis to capture within-university and within-region variation more precisely. Table 6 presents the mean accessibility index by Arab region, including the Gulf, the Levant and Iraq, and North Africa.

Table 6
Mean accessibility index by Arab region

Region	N	Mean AI	SD	Min	Max
Gulf (1)	8	53.75	0.00	53.75	53.75
Levant and Iraq (2)	8	44.38	10.02	35.0	53.75
North Africa (3)	8	42.03	9.70	35.0	53.75

Source: Calculated by the authors.

Figure 5 shows that Gulf universities cluster near 53.75, while the Levant and North Africa show wider dispersion, ranging from 35.0 to 53.75. These findings support the revised hypotheses by showing that Arab admission and registration platforms remain below the benchmark level. The accessibility index averaged 46.72 among Arab universities compared with 88.75 among benchmark universities, and WAVE results further confirm the gap in technical errors.

6.7 Additional Robustness Consideration

Although the main analysis was reported at the university level, the index was constructed from page-level assessments across several admission-related pages. This reduces reliance on a single page and reflects the multi-component nature of the admission journey. However, page-level variation was not modeled statistically. Future research should use page-level datasets to identify which page types contribute most to accessibility weaknesses.

7. Discussion

The findings show a clear gap between the formal availability of digital admission platforms and their accessibility readiness. While most Arab universities provide online admission and registration pages, these platforms do not consistently meet the conditions required for independent use by students with disabilities. The strongest Arab performance was in heading structure, while the weakest areas were form labels, error messages, and multi-step form guidance. This suggests that accessibility problems are most acute where applicants must interact with the system, enter information, upload documents, correct errors, and move across application stages.

The comparison with international benchmark universities further demonstrates that the accessibility gap is not limited to isolated technical errors. Benchmark universities showed stronger consistency across manual and automated indicators, suggesting that accessibility is more likely to be embedded in their digital governance, design workflows, and quality assurance processes. By contrast, the Arab sample displayed greater dispersion, with some universities performing relatively better and others recording high numbers of automated errors. This variation suggests that accessibility maturity is uneven across the region and may depend on institutional governance, digital-transformation capacity, and the existence of clear accessibility responsibilities within universities.

The regional results also require careful interpretation. Gulf universities performed relatively better than universities in North Africa and showed higher internal consistency. This may reflect stronger investment in digital government services, national accessibility policies, and broader digital-transformation agendas in several Gulf countries. However, the absence of full compliance even among the better-performing universities indicates that policy environments alone are insufficient unless translated into platform-level design, procurement, development, and testing practices.

The findings are consistent with prior research showing that automated accessibility tools identify only part of the problem. Automated testing is useful for detecting errors such as contrast failures, missing

labels, or structural problems in markup, but it cannot fully determine whether instructions are understandable, whether form guidance is meaningful, or whether a multi-step process is logically accessible. The moderate negative correlation between manual accessibility scores and automated errors confirms that the two methods are complementary. For this reason, universities should not rely solely on automated accessibility tools; they should combine automated scanning with expert manual review and, ideally, usability testing involving persons with disabilities.

From a higher education quality perspective, the results suggest that accessibility should be treated as part of institutional effectiveness rather than as a purely technical web-development issue. Admission and registration platforms are among the first institutional touchpoints encountered by prospective students. Their accessibility therefore affects not only compliance with international standards but also institutional reputation, student equity, and the credibility of inclusive education policies. Quality assurance units, admissions offices, and information-technology departments should work jointly to ensure that accessibility is embedded in admission-platform design, periodic review, and continuous improvement cycles.

Overall, the study shows that Arab universities need to move from partial and reactive accessibility correction toward proactive accessibility governance. This includes adopting clear institutional policies, assigning responsibilities, training technical and content teams, testing admission workflows before publication, and monitoring accessibility indicators over time. Such measures would help transform admission platforms from digital service channels into genuinely inclusive gateways to higher education.

8. Conclusion, Limitations, and Recommendations

This study assessed the technical and structural accessibility of Arab universities' admission and registration platforms using a WCAG 2.2-based manual checklist and automated WAVE testing. The findings show that Arab universities remain at an intermediate level of accessibility readiness when compared with international benchmark universities. Arab platforms generally perform better in content-display and navigation-related criteria, such as heading structure, alternative text, contrast, and keyboard navigation. However, they show more serious weaknesses in the interactive components that are essential to completing online admission procedures, particularly form labels, error messages, and guidance in multi-step forms.

The study contributes a practical and standards-based framework for evaluating admission-platform accessibility in Arab higher education. It also demonstrates that the accessibility of admission platforms should be understood as part of institutional quality, digital transformation, and educational inclusion. Improving accessibility is therefore not only a technical matter but also a strategic institutional responsibility connected to equity, reputation, and the right of students with disabilities to access higher education services independently.

Several limitations should be acknowledged. First, the study used a purposive rather than random sample, so the findings should not be generalized to all Arab universities without caution. Second, the

study is cross-sectional and reflects the status of the platforms during the assessment period only. Third, it assessed technical and structural accessibility readiness rather than actual user experience; it did not involve students with disabilities or measure task completion, satisfaction, or perceived barriers. Fourth, although the manual assessment used a standardized scoring protocol, inter-rater reliability was not calculated. Fifth, automated tools such as WAVE cannot fully evaluate the quality of alternative text, instructions, or multi-step form logic. Finally, some admission functions may require authentication, so the assessment was limited to publicly accessible pages.

Future research should expand the sample, use page-level and task-level analysis, involve multiple trained reviewers, and include students with disabilities in usability testing. It should also examine the relationship between institutional accessibility policies, governance structures, and actual platform-level compliance.

The study offers the following recommendations:

1. Adopt a clear institutional digital-accessibility policy that explicitly covers admission and registration platforms; defines the responsibilities of information technology, admissions and registration, quality assurance, and communication units; and sets performance indicators and implementation timelines for WCAG compliance.
2. Redesign online application forms as the main weakness identified by the study. This should include programmatic association of labels with fields, consistent indication of required fields, accessible error messages that can be detected by screen readers, and explicit guidance in multi-step forms showing the number of stages and the user's current position.
3. Improve core visual and technical elements such as text-background contrast, visible focus indicators, and full keyboard navigation. Any change to admission interfaces should be subjected to accessibility testing before publication to avoid introducing new barriers.
4. Establish a periodic manual and automated testing mechanism, such as monthly or quarterly WAVE testing combined with manual review by a trained team. Results should be recorded in a monitoring dashboard and used to guide short- and medium-term improvement plans.
5. Build the capacity of technical and editorial teams through specialized training in digital accessibility, targeting web designers, system developers, content writers, and admissions staff, so that accessibility considerations become part of content and system development rather than a post-publication correction process.
6. Involve students with disabilities in periodic usability testing of admission and registration platforms. Their feedback should be used to validate whether technical compliance translates into actual usability, independence, and ease of application completion.
7. Integrate accessibility indicators into institutional quality assurance and digital transformation dashboards. Admission-platform accessibility should be monitored as a measurable performance area rather than treated as an occasional technical correction.

Abbreviations

ANOVA
Analysis of Variance
ICT
Information and Communication Technology
UNESCO
United Nations Educational, Scientific and Cultural Organization
UNESCWA
United Nations Economic and Social Commission for Western Asia
W3C
World Wide Web Consortium
WAVE
Web Accessibility Evaluation Tool
WCAG
Web Content Accessibility Guidelines
WHO
World Health Organization

Declarations

Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Ethics Approval

Not applicable. The study relied exclusively on publicly accessible university websites.

Clinical trial number

not applicable.

Consent to Publish

declaration: not applicable.

Consent to Participate

declaration: not applicable.

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Author Contribution

O.M.A. conceptualized the study, developed the research design, constructed the accessibility assessment framework, designed the methodology, conducted the main data collection and analysis, interpreted the findings, and drafted the manuscript. B.M. contributed to a specific part of the literature review related to digital communication and platform accessibility and reviewed the recommendations from a communication and platform-design perspective. Both authors reviewed and approved the final manuscript.

Data Availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

References

1. Akgül Y. Accessibility, usability, quality performance, and readability evaluation of university websites of Turkey: A comparative study of state and private universities. Univ Access Inf Soc. 2021;20(1):157–70. https://doi.org/10.1007/s10209-020-00715-w.
2. Akram M, Ali GA, Sulaiman A, Hassan M. Accessibility evaluation of Arabic university websites for compliance with success criteria of WCAG 1.0 and WCAG 2.0. Univ Access Inf Soc. 2023;22(4):1199–214. https://doi.org/10.1007/s10209-022-00921-8.
3. Campoverde-Molina MA, Luján-Mora S, Valverde L. Accessibility of university websites worldwide: A systematic literature review. Univ Access Inf Soc. 2023;22(1):133–68. https://doi.org/10.1007/s10209-021-00825-z.
4. Digital Government Authority. (2022). Government website accessibility guide in the Kingdom of Saudi Arabia. Riyadh, Saudi Arabia. https://www.dga.gov.sa
5. Digital Government Authority. (2024). Guide to accessible digital channels for persons with disabilities and older persons (Version 2.0). Riyadh, Saudi Arabia. https://www.dga.gov.sa
6. European Commission. (2024). Web Accessibility Directive: Monitoring and reporting 2021–2023. Publications Office of the European Union. https://digital-strategy.ec.europa.eu/en/policies/web-accessibility
7. European Telecommunications Standards Institute. (2024). EN 301 549 V4.1.1: Accessibility requirements for ICT products and services. ETSI. https://www.etsi.org/standards/en-301-549
8. Fakrudeen M. (2024). Evaluation of the accessibility and usability of university websites: A comparative study of the Gulf region. Universal Access in the Information Society. Advance online

publication. https://doi.org/10.1007/s10209-024-01160-9

9. Macakoğlu ŞS, Peker S, Medeni İT. Accessibility, usability, and security evaluation of universities' prospective student web pages: A comparative study of Europe, North America, and Oceania. Univ Access Inf Soc. 2022;22(2):671–83. https://doi.org/10.1007/s10209-022-00869-9.
10. Mada Assistive Technology Center, Qatar. ICT accessibility and inclusion development framework (ICT-AID) for capacity building in digital accessibility. Doha; 2022. https://mada.org.qa.
11. Mada Assistive Technology Center. ICT accessibility in the Arab region: Status and recommendations. Qatar: Doha; 2023.
12. Mada Assistive Technology Center. Web accessibility in the Arab world 2024: Report on digital accessibility in government and educational websites and services. Qatar: Doha; 2024. https://mada.org.qa.
13. U.S. Department of Justice. Nondiscrimination on the basis of disability; Accessibility of web information and services of state and local government entities (ADA Title II Final Rule). Fed Reg. 2024;89(70):22174–276. https://www.federalregister.gov.
14. UNESCO. (2020). Global education monitoring report 2020: Inclusion and education—All means all. Paris, France. https://unesdoc.unesco.org
15. UNESCO. (2024). Global education monitoring report 2024/5: Leadership in education—Lead for learning. Paris, France. https://www.unesco.org/reports/gem-report/en/2024
16. UNESCWA & Arab Administrative Development Organization. National e-accessibility policy template for the Arab region. Lebanon: Beirut; 2020. https://www.unescwa.org.
17. United Arab Emirates Government. (2021). National digital accessibility policy. Abu Dhabi, United Arab Emirates. https://u.ae/en/about-the-uae/digital-uae/digital-accessibility-policy
18. Verkijika SF, De Wet L. Accessibility of South African university websites. Univ Access Inf Soc. 2020;19(1):201–10. https://doi.org/10.1007/s10209-018-0632-6.
19. WebAIM. (2024, March). The WebAIM Million: 2024 report on the accessibility of the top 1,000,000 home pages. https://webaim.org/projects/million/2024/
20. WebAIM. (2025, March). The WebAIM Million: 2025 report on the accessibility of the top 1,000,000 home pages. https://webaim.org/projects/million/2025/
21. World Health Organization. (2023). Disability and health. https://www.who.int/news-room/fact-sheets/detail/disability-and-health
22. World Wide Web Consortium. (2023). Web Content Accessibility Guidelines (WCAG) 2.2. https://www.w3.org/TR/WCAG22/

Figures

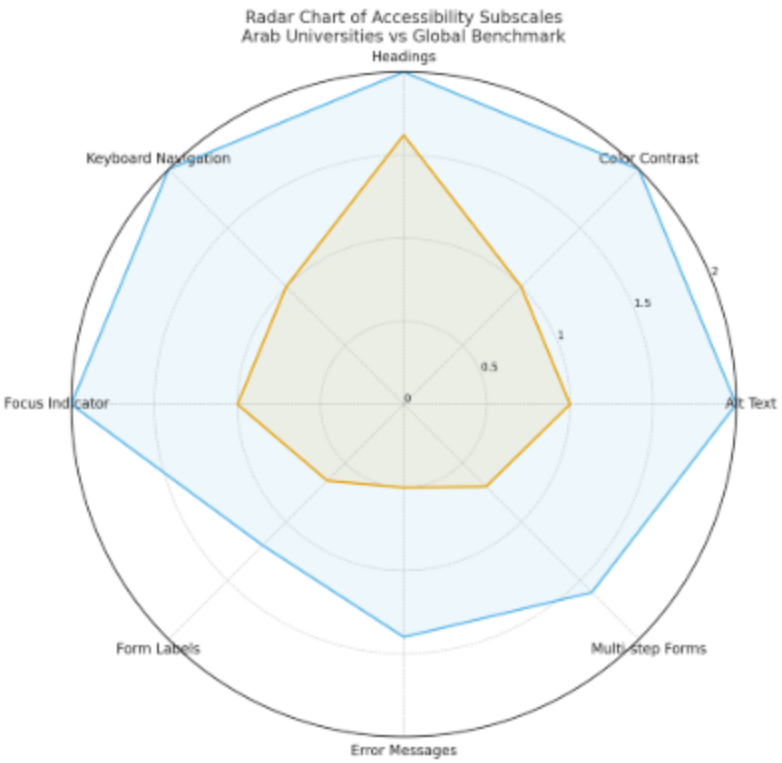


Figure 1

Radar chart of manual-assessment criteria

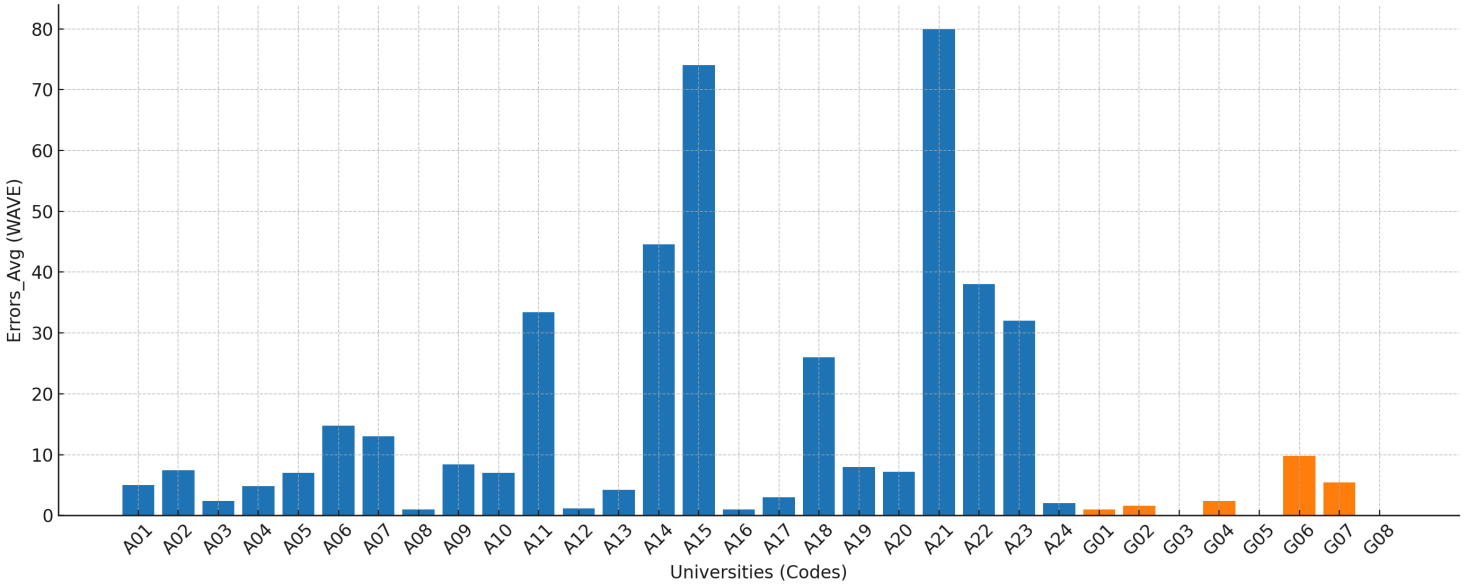


Figure 2

Bar chart of automated errors by university

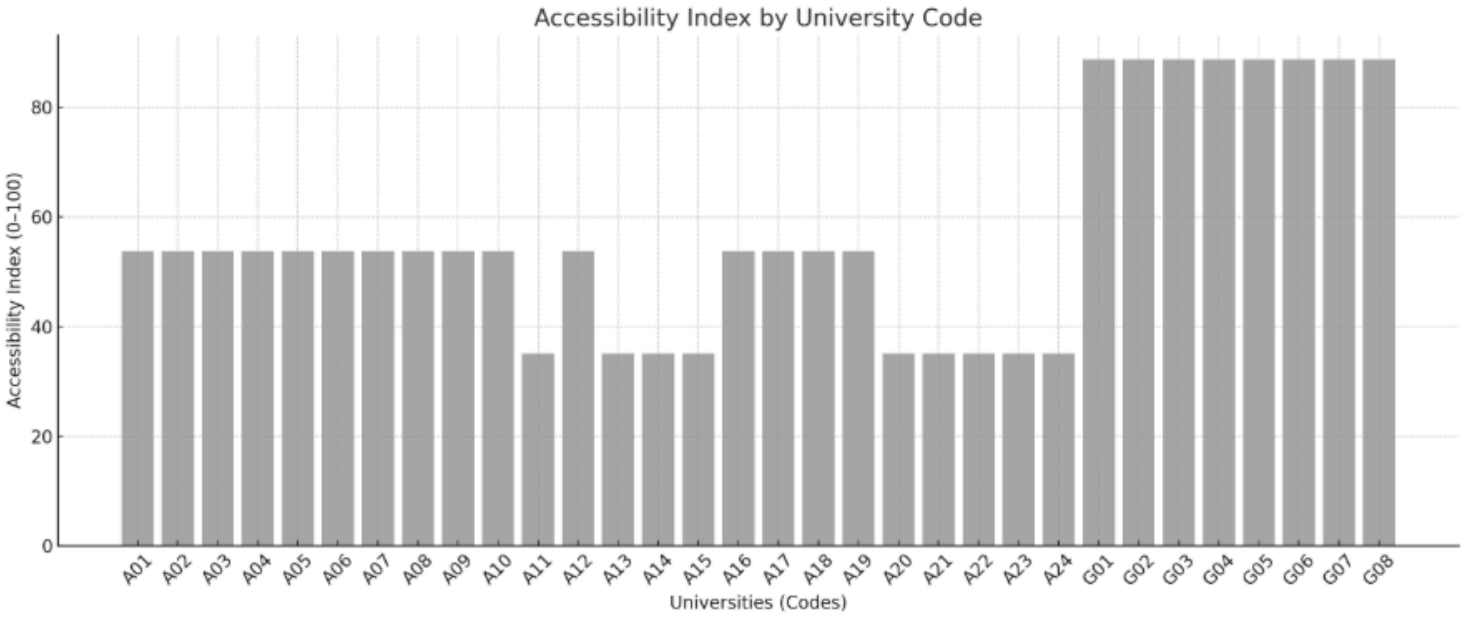


Figure 3

Overall accessibility index by university (A01–A24, G01–G08)

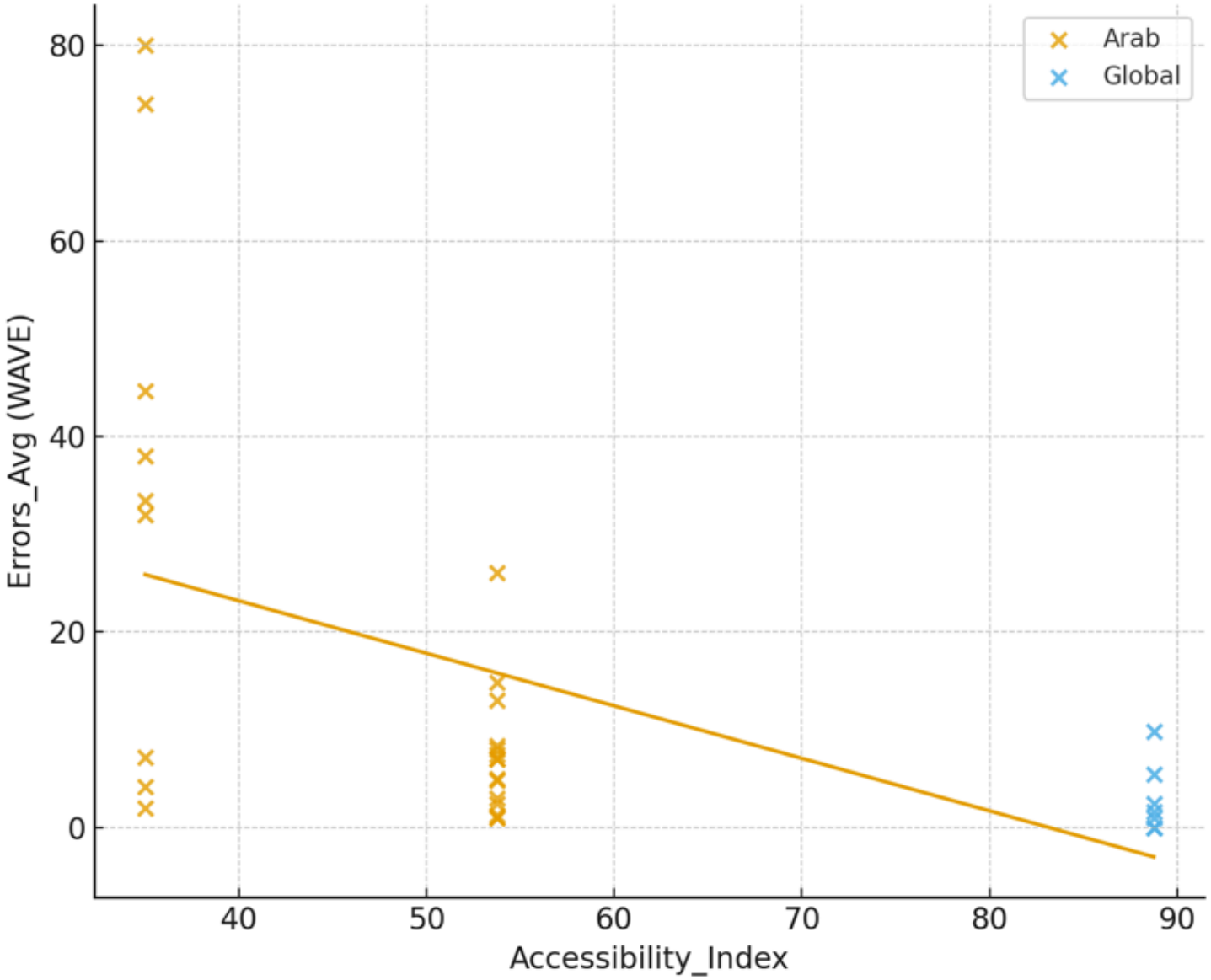


Figure 4

Accessibility index versus automated errors

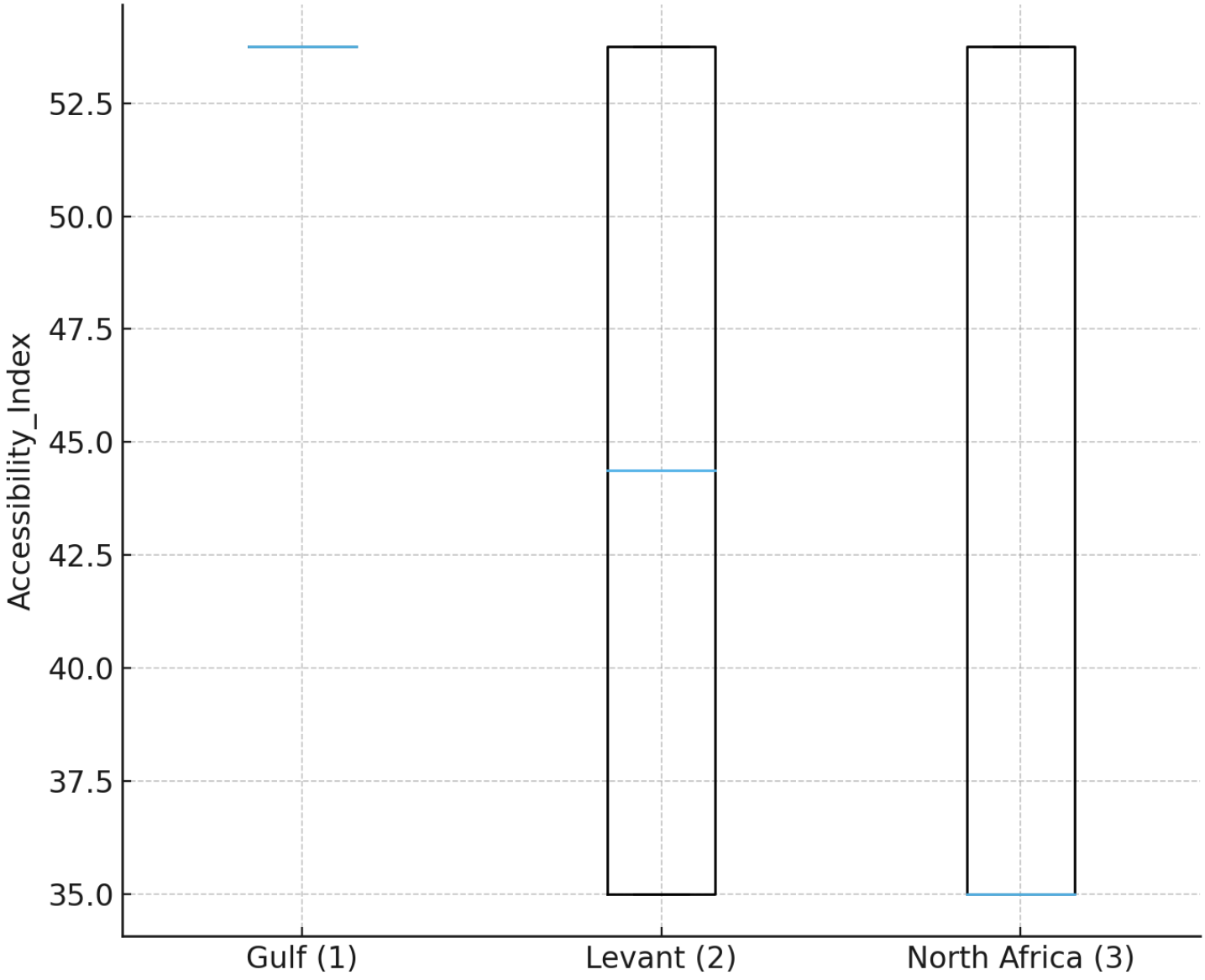


Figure 5

Accessibility index by Arab region

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Appendix1.docx
- Appendix2.docx