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Auditing the digital gateway to higher education: a reproducible, country-scale audit of university website accessibility and its distribution across Ukraine's higher-education system

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Short Report

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BRIEF REPORT

Auditing the digital gateway to higher education: a reproducible, country-scale audit of university website accessibility and its distribution across Ukraine's higher-education system

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Abstract

For prospective students in higher education – and especially for the displaced and frontline populations created by Ukraine's ongoing war – the institutional website is the primary, and sometimes the only, gateway to information about study opportunities. Whether that gateway is usable by people with disabilities is therefore a question of equitable access to higher education, not merely of institutional marketing. We reconceptualise university web presence as a set of formative composite indices that foreground web accessibility, and we audit the digital gateways of 268 Ukrainian higher-education institutions (HEIs), sourced from

the 511-institution national EDBO registry, using a fully automated and deterministic pipeline (Google Lighthouse, axe-core WCAG 2.1, and DOM/sitemap heuristics). The picture is one of pervasive exclusion: the median homepage carries 22 WCAG 2.1 violations (IQR 7–42), 62.3% present at least one *critical* barrier, and only 2.7% are free of detected violations; the most common failures – unlabelled links (76% of sites), insufficient colour contrast (60%), and missing image alternatives (39%) – directly obstruct screen-reader and low-vision users. A parallel analysis supports the nine-feature structure (KMO = 0.60, 9 components, 53.3% variance). After adjusting for institutional size, ownership and region in a negative-binomial model (n = 258), neither overall gateway quality (IRR = 1.00) nor accessibility (IRR = 0.98) predicted institutional enrolment, indicating that accessibility should be pursued as an inclusion imperative rather than an enrolment lever. Deficits were broadly shared across institution types rather than concentrated in any single region. The complete pipeline and anonymised data are openly released to support reproducible, cross-national accessibility monitoring of higher-education gateways.

Keywords: Web accessibility, WCAG 2.1, Universal access, Digital inclusion, Higher education, Automated evaluation, Ukraine

1 Introduction

The institutional website has become the principal interface between a higher-education institution (HEI) and the students it seeks to serve (Holovko, 2019; Hrechanyk, 2020). For a prospective applicant, and increasingly for enrolled students, the website is where programmes are discovered, admission requirements are read, deadlines are learned, and belonging is first imagined; it ranks among the most-used information sources in college choice, and its perceived quality shapes perceptions of the institution itself (Hidayanto, Rofalina, & Handayani, 2015; Simões & Soares, 2010). In Ukraine, where the higher-education landscape comprises more than three hundred active institutions across every region, this gateway function is especially consequential: since the full-scale invasion of February 2022, internal displacement and the destruction of campuses have forced many students from occupied or frontline territories to choose and enter institutions they can never visit in person (Glazkova et al., 2025; Nechypurenko, 2024). When the physical campus is unreachable, the digital gateway is the institution.

A gateway, however, only affords access to those who can pass through it. For users who rely on screen readers, keyboard navigation, captioning, or sufficient colour contrast, an inaccessible website is not a degraded experience but a closed door. Web accessibility – the design of digital content so that people with disabilities can perceive, operate and understand it, as codified in the Web Content Accessibility Guidelines (WCAG) 2.1 (World Wide Web Consortium, 2025) – is therefore not a technical nicety layered on top of institutional marketing. It is a precondition for the equitable exercise of the right to seek higher education, and it sits squarely within the concerns of universal access and digital inclusion. Framed through the lens of the multi-level digital

divide (Guo & Wan, 2022), an inaccessible gateway compounds first-level (access to devices and connectivity) and second-level (skills) divides with a third barrier erected by the institution itself. In wartime Ukraine that compounding is acute: institutions have had to sustain access where connectivity, devices and campus presence can no longer be assumed (Londar & Pietsch, 2023; Stepura & Kuzmak, 2023).

Despite this, the accessibility of HEI websites has been studied mostly at small scale, and empirical studies of educational websites consistently find poor conformance. Campoverde-Molina, Luján-Mora, and Valverde García (2020), reviewing accessibility evaluations of educational websites, report that the great majority rely on automated tools and that conformance failures are the norm rather than the exception. Ismail, Kuppusamy, and Paiva (2020) documented widespread violations in axe-based audits of university websites; Laamanen, Ladonlahti, Puupponen, and Kärkkäinen (2024) found persistent barriers at Finnish HEIs even after accessibility legislation; AlMeraj, Boujarwah, Alhuwail, and Qadri (2021), Akgül (2021) and Ismailova and Inal (2017) report similar patterns for Kuwaiti and Turkish institutions. What this literature shares – and what limits it – is scale: evaluations typically cover tens of institutions, so they cannot speak to how accessibility is distributed across an entire national system, nor to whether the least accessible gateways belong to the institutions serving the most vulnerable students.

At the same time, a parallel literature evaluates university websites as marketing instruments, ranking them on aesthetic and promotional criteria (Loiacono, Watson, & Goodhue, 2002; Mentes & Turan, 2012; Ulutaş, 2019) or on opaque web-impact indices such as Webometrics (Kvitka, Starushenko, Koval, Deforzh, & Prokopenko, 2019; Shehatta, Al-Rubaish, & Mahmood, 2020), largely bypassing the question of who is excluded. Because such multi-criterion evaluations depend on expert raters or user panels (Barnes & Vidgen, 2002; Manzoor, Hussain, Sohaib, Hussain, & Alkhalaf, 2019), they are also confined to small and rater-dependent samples. Open, browser-based instrumentation removes that constraint: Google Lighthouse and the axe-core WCAG engine yield deterministic, repeatable measurements of accessibility, and recent work has begun to apply such tooling to academic websites at scale (Król, 2026; Rashida et al., 2021).

We take up that opportunity. We reconceptualise the assessment of university web presence around accessibility and inclusion, operationalising nine web-quality dimensions – foregrounding a web-accessibility construct built from WCAG 2.1 conformance – as *formative* composite indices computed entirely from code. We apply this indicator suite to the digital gateways of 268 Ukrainian HEIs drawn from the national EDBO open-data registry, characterise the distribution of (in)accessibility across the system, test whether gateway quality relates to the reach institutions achieve, and corroborate the framing with a single-institution student survey. We ask four research questions, of which the first two carry the contribution and the last two situate it:

RQ1. **Measurement.** Can the accessibility and inclusiveness of HEI digital gateways be validly operationalised as reproducible formative composite indices from automated indicators?

RQ2. **Inclusion gap.** How accessible are Ukrainian HEI gateways against WCAG 2.1, and how is accessibility distributed across institution ownership, region, size and war-exposure – that is, who is systematically excluded?

RQ3. **Reach.** Net of institutional size, age and region, is gateway quality (and specifically accessibility) associated with the enrolment an institution achieves, and does any such association hold out of sample?

RQ4. **User corroboration.** At one institution, do students' information-source profiles and their perceptions of website quality corroborate the gateway framing?

Our contribution is threefold: a theory-grounded, formative operationalisation of gateway accessibility; the first country-scale, fully reproducible WCAG audit of a national HEI system, with an openly released pipeline; and evidence that accessibility deficits are systemic rather than idiosyncratic, reframing accessibility as a matter of inclusion policy rather than competitive advantage.

2 Method

2.1 Sample and automated indicator suite

The EDBO (*Yedyna Derzhavna Elektronna Baza z Pytan Osvity*) is Ukraine's official open registry of higher-education institutions, maintained by the Ministry of Education and Science and accessible without authentication. Querying the registry in 2026 returned 511 institutional records. Of these, 307 had active programme and structural records in EDBO (the remainder being closed institutions, branch campuses that inherit a parent's web presence, or entries without active enrolment); this active frame spans all 25 regions (24 oblasts and the city of Kyiv), comprising 233 state, 245 private and 33 municipally-owned institutions across the full registry. Each institution's listed URL was checked for reachability; 268 returned valid HTML and constitute the crawled sample for indicator extraction. All figures reported in this paper are regenerated from a single analysis run and reconciled automatically, so the sample counts are internally consistent by construction.

We operationalise nine web-quality features as deterministic combinations of automated indicators (Table 1). Following the logic of formative measurement (Cenfetelli & Bassellier, 2009; Diamantopoulos, Riefler, & Roth, 2008; Jarvis, MacKenzie, & Podsakoff, 2003), each feature is a composite *defined by* its indicators rather than a reflection of a single latent trait; consequently the indicators within a feature need not be mutually correlated. We group the nine features into an *access/inclusion* cluster – web accessibility, mobile responsiveness, navigation clarity, applicant content, and content freshness – which carries the study's argument, and a *marketing/signalling* cluster – visual modernity, branding, social proof, and calls to action – retained as descriptive context. The web-accessibility feature is built from the Lighthouse accessibility score together with axe-core WCAG 2.1 violation counts by severity (critical, serious, moderate, minor) and the count of passing checks.

For each reachable HEI the homepage was fetched and parsed with BeautifulSoup4; sitemaps were parsed where present. Google Lighthouse was run three times per site in

Table 1 Operationalisation of the nine web-quality features. The access/inclusion cluster carries the study's argument; the marketing cluster is descriptive.

Cluster	Feature	Automated indicators
Access	Web accessibility	Lighthouse accessibility score; axe-core WCAG 2.1 violations (critical, serious, moderate, minor); axe passes
Access	Mobile responsiveness	Viewport meta; media-query count; mobile-friendly meta; CLS; TBT; TTI
Access	Navigation clarity	Nav elements; nav items; search box; breadcrumbs; sitemap URL count; SEO score
Access	Applicant content	Admission link count; admission keyword hits
Access	Content freshness	Median sitemap `lastmod` age (days)
Marketing	Visual modernity	Best-practices score; HTML5 tags; CSS framework; transitions; web fonts; inline-style weight; performance; LCP; FCP; SI
Marketing	Branding	Favicon; `og:image`; schema.org JSON-LD count
Marketing	Social proof	Social-link count; platform diversity; schema.org Organization
Marketing	Calls to action	Visible button count; CTA-keyword hits

headless Chromium and the median reported to dampen run-to-run volatility (Heričko, Šumak, & Brdnik, 2021). The axe-core WCAG 2.1 engine (Deque Systems, 2026) was run at levels A and AA, with violations aggregated by impact and, for the accessibility analysis, retained at rule level from the raw audit output. Lighthouse accessibility scores were available for 266 sites and axe-core audits for 255. All crawling respected `robots.txt` and applied a one-request-per-second rate limit; no human scoring was involved at any stage.

2.2 Composite construction and validity

Each indicator was standardised, direction-inverted where lower values are better (violations, load times, sitemap age), and averaged with equal a priori weights into its feature score. Because the composites use theory-specified equal weights rather than empirically estimated weights, indicator collinearity does not destabilise the index; nevertheless we screened for redundancy using the variance inflation factor (VIF) and removed deterministic aggregates (the axe "total violations" field, which is the sum of the severity counts, and a near-duplicate sitemap-age percentile). We assessed the factor-analytic adequacy of the indicator matrix with the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity, and determined the number of empirically supported dimensions by Horn's parallel analysis, contrasting it with the nine theory-specified features. Discriminant separation among features was examined through their inter-correlations.

2.3 Accessibility analysis and modelling

We characterised the national distribution of accessibility using the axe-core violation count and the Lighthouse accessibility score, and ranked the most frequently failed WCAG rules by the proportion of sites affected (RQ2). We then tested whether

accessibility differs by institution ownership, macro-region, size (faculty-count tertiles) and war-exposure using Kruskal–Wallis tests with ε^2 effect sizes, and fitted covariate-adjusted models (negative binomial for violation counts, linear for the accessibility score) with oblast cluster-robust standard errors to ask whether any group is systematically disadvantaged once size is held constant.

To ask whether gateway quality is associated with the reach an institution achieves (RQ3), we modelled active student enrolment as a negative-binomial outcome with log(active programmes) as offset, on the 258 institutions with positive enrolment and programme counts, with standard errors clustered by oblast. Rather than selecting predictors by their correlation with the outcome – a practice that invalidates inference – we specified a fixed model ladder: a structural baseline (ownership, institution age, faculty count), then successively adding overall gateway quality (M1), the focal accessibility index (M2), and all nine features simultaneously (M3).

Finally, a survey at Kryvyi Rih State Pedagogical University (KDPU; $n = 84$) recorded a five-item importance battery, perceived site quality and use, and eleven information-source-priority items (RQ4). We assessed the battery's reliability as a reflective scale, identified information-source profiles by latent-profile analysis, and tested whether profile membership moderates the perceived-quality $\rightarrow$ website-use relationship using a single interaction model rather than comparing within-group correlations. Because all respondents rate a single institution, this evidence is corroborative and not generalisable across HEIs.

All indicators derive from publicly accessible web pages and the EDBO open-data API, and no personal data were collected from institutions. The KDPU survey was conducted under the university's internal ethics procedures and is reported in anonymised, k-anonymous form; the complete pipeline, raw crawl artefacts and anonymised data are openly deposited to permit exact reproduction and reuse.

3 Results

3.1 Coverage and gateway measurement (RQ1)

Of the 307 active HEIs with listed websites, 268 (87%) were reachable and yielded valid HTML. Lighthouse accessibility scores were obtained for 266 sites and complete axe-core WCAG audits for 255; the predictive analysis of enrolment used the 258 institutions with positive enrolment and programme counts. The unreachable minority skewed towards small private colleges, a limitation we return to in Section 5.

The indicator matrix was adequate for dimensional analysis: KMO = 0.60 (above the 0.60 threshold) and Bartlett's test of sphericity was significant ($\chi^2 = 3929$, $p < 0.001$). Horn's parallel analysis retained 9 components – exactly matching the nine theory-specified features – which together explain 53.3% of indicator variance. After removing deterministic redundancies, indicator collinearity within features was acceptable for the access-cluster composites, with residual collinearity confined to multi-indicator marketing composites whose indicators measure facets of one construct (for example, the several load-speed metrics within visual modernity); because features use equal a priori weights, this does not affect the composites. Features were largely distinct, the only substantial inter-feature correlation being between applicant

content and calls to action ($r = 0.70$), both of which capture admission-oriented content. The nine-feature operationalisation is therefore empirically supported as a set of formative indices.

3.2 The national inclusion gap (RQ2)

Ukrainian HEI digital gateways are pervasively inaccessible (Table 2). The median homepage carried 22 distinct WCAG 2.1 violations (IQR 7–42); 62.3% of sites presented at least one *critical* barrier, and only 2.7% were free of detected violations. The Lighthouse accessibility score had a median of 82, with 80.5% of sites scoring below 90.

Table 2 Most frequently failed axe-core / WCAG 2.1 rules across 255 audited HEI homepages.

Rule	Impact	% sites	Barrier (affected users)
`link-name`	serious	76	Links without discernible text (screen-reader users)
`color-contrast`	serious	60	Insufficient text contrast (low-vision users)
`image-alt`	critical	39	Images without alternatives (screen-reader users)
`button-name`	critical	37	Buttons without accessible names (screen-reader users)
`meta-viewport`	moderate	19	Zoom disabled (low-vision users)
`html-has-lang`	serious	18	Missing page language (screen-reader pronunciation)

The most common failures are precisely those that obstruct assistive-technology users: unlabelled links (76% of sites), insufficient colour contrast (60%), missing image alternatives (39%), and unnamed buttons (37%). These are not exotic edge cases but foundational, easily remediable requirements.

Turning to distribution, bivariate tests showed state institutions carrying more violations than private ones (median 25 vs. 13; Kruskal–Wallis $p = 0.023$), with weak or non-significant gradients by size and region. However, this ownership gap attenuated to non-significance once site size was held constant (adjusted violation-count IRR for private vs. state $= 0.92$, $p = 0.44$), indicating that it is largely explained by the greater size and complexity of public institutions' sites rather than by ownership per se. No robust regional or war-exposure gradient survived adjustment. The inaccessibility is thus best read not as a gap between advantaged and disadvantaged institution types but as a *systemic, near-universal* deficit spanning the entire national system.

3.3 Institutional reach: an enrolment null (RQ3)

The dominant predictor of institutional reach was size (faculty count: IRR $= 1.20$, $p < 0.001$); larger institutions enrol more students per programme, as expected. Crucially, neither overall gateway quality (M1: IRR $= 1.00$, $p = 0.886$) nor the focal web-accessibility index (M2: IRR $= 0.98$, $p = 0.762$) was associated with enrolment once size, ownership, age and region were controlled. The accessibility null was robust to an oblast fixed-effects specification and to alternative enrolment outcomes, and no feature in the fully decomposed model (M3) survived as a robust effect once the nine simultaneous tests are taken into account. The model nonetheless predicted enrolment

well out of sample (five-fold Spearman $\rho = 0.87$), confirming that reach is driven by institutional size and structure, not by gateway quality or accessibility.

3.4 Student corroboration (RQ4)

Among KDPU respondents ($n = 84$), the five-item importance battery was reliable as a reflective scale ($\alpha = 0.85$, 95% CI [0.79, 0.89]). Latent-profile analysis of the eleven information-source items identified 3 profiles: an interpersonal-dominant group ($n = 45$), a website-oriented group ($n = 24$), and a uniformly high-engagement group ($n = 15$). Perceived website quality predicted self-reported website use overall (slope = 0.43, $p < 0.001$), and this relationship did *not* differ across profiles (interaction $F = 0.32$, $p = 0.725$).

4 Discussion

4.1 A systemic accessibility deficit

The central finding is stark and system-wide: across an entire national higher-education system, digital gateways fail basic accessibility. With a median of 22 WCAG violations per homepage, critical barriers on 62.3% of sites, and fewer than three in a hundred sites clean, the population of Ukrainian HEI websites does not meet the minimum conditions for equitable access by users with disabilities. The specific failures – unlabelled links and buttons, low contrast, missing image alternatives, disabled zoom – map directly onto the everyday obstacles faced by screen-reader and low-vision users, and they are among the most tractable to fix. That the deficit is broadly shared across ownership, size and region, rather than concentrated in under-resourced institutions, points to a common cause in prevailing web-development practice and the absence of enforced accessibility requirements, echoing findings that even legislation does not quickly close such gaps (Laamanen et al., 2024).

4.2 Accessibility as inclusion, not marketing

Our predictive analysis matters precisely because it returns a null. Net of institutional size and region, neither gateway quality nor accessibility predicts the enrolment an institution achieves. Read carelessly, this might seem to weaken the case for investing in accessibility; read correctly, it strengthens it. If accessibility conferred an enrolment advantage, institutions might pursue it for competitive reasons and the least accessible gateways would tend to belong to institutions that could "afford" their inaccessibility. Because there is no such market signal, inaccessibility persists uncorrected, and the case for remediation cannot rest on institutional self-interest. Accessibility is a matter of rights and inclusion – of who can pass through the gateway – not a lever for enrolment, and it therefore requires policy and standards rather than market incentives to advance. This reframing is the study's principal contribution to the universal-access agenda in higher education. The single-institution survey corroborates the premise that gateway quality shapes engagement, but it also marks the boundary of what our data can establish: it cannot speak for students with disabilities specifically, whose

experience of the barriers we measure would be the most direct test of the inclusion argument.

4.3 Implications for practice and policy

For institutional web teams, the results identify a small set of high-frequency, high-impact, low-effort fixes – accessible names for links and buttons, adequate colour contrast, image alternatives, and page-language declarations – that would remediate the most common barriers on the majority of sites. For ministries and accreditation bodies, the systemic nature of the deficit argues for accessibility conformance as an explicit, monitored requirement of institutional web presence, of the kind our automated pipeline makes cheap to audit at national scale. For the universal-access research community, the study offers a reusable instrument and an open dataset for cross-national comparison and longitudinal monitoring.

5 Limitations and conclusion

Three limitations bound our claims. First, the accessibility audit is automated, homepage-level, and a single snapshot: axe-core and Lighthouse detect an important but partial subset of WCAG success criteria and cannot substitute for manual testing with assistive technologies, and deeper pages and dynamic states are not covered. The audit is best understood as a scalable screen, not a conformance certification. Second, the design is cross-sectional, so the reach analysis is associational; we make no causal claim that gateway quality affects enrolment, and enrolment itself is a capacity-confounded proxy for reach. Third, the user survey is single-institution and does not include students with disabilities, whose perspective is central to the inclusion question. These limitations chart a clear agenda: manual and assistive-technology audits on a stratified subsample, longitudinal monitoring, and accessibility-focused user research with disabled students across institutions.

For students who cannot visit a campus – and, in wartime Ukraine, for many who have lost theirs – the university website is the gateway to higher education, and its accessibility is a condition of equitable access. Auditing an entire national system with a fully reproducible automated pipeline, we found that gateway pervasively inaccessible: most institutions fail basic, easily remediable WCAG requirements, and the deficit is systemic rather than confined to particular regions or institution types. Because accessibility carries no enrolment premium, it will not be fixed by competition; it must be advanced as inclusion policy. We release the pipeline and data so that this gateway can be monitored – and, we hope, opened – at national scale and across borders.

Data availability. The anonymised datasets and complete analysis pipeline supporting this study are openly available in the accompanying repository deposit: https://zenodo.org/records/20377232.

Code availability. The full crawling and analysis pipeline (Python, R) is openly released at https://zenodo.org/records/20377232, including the deterministic indicator suite and the scripts that regenerate every reported statistic.

Declarations

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Conflict of interest. The authors declare no competing interests.

Ethics approval. The KDPU student survey was conducted under the university's internal ethics procedures; data are reported in anonymised, k-anonymous form.

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References

Akgül, Y. (2021). Accessibility, usability, quality performance, and readability evaluation of university websites of Turkey: a comparative study of state and private universities. *Universal Access in the Information Society*, *20*(1), 157–170, https://doi.org/10.1007/s10209-020-00715-w

AlMeraj, Z., Boujarwah, F., Alhuwail, D., Qadri, R. (2021). Evaluating the accessibility of higher education institution websites in the State of Kuwait: empirical evidence. *Universal Access in the Information Society*, *20*, 121–138, https://doi.org/10.1007/s10209-020-00717-8

Barnes, S.J., & Vidgen, R.T. (2002). An Integrative Approach to the Assessment of E-Commerce Quality. *Journal of Electronic Commerce Research*, *3*(3), 114–127, Retrieved from http://www.jecr.org/sites/default/files/03_3_p02_0.pdf

Campoverde-Molina, M., Luján-Mora, S., Valverde García, L. (2020). Empirical Studies on Web Accessibility of Educational Websites: A Systematic Literature Review. *IEEE Access*, *8*, 91676–91700, https://doi.org/10.1109/ACCESS.2020.2994288

Cenfetelli, R.T., & Bassellier, G. (2009). Interpretation of Formative Measurement in Information Systems Research. *MIS Quarterly*, *33*(4), 689–708, https://doi.org/10.2307/20650323

Deque Systems (2026). *axe-core: Accessibility engine for automated Web UI testing.* Retrieved from https://github.com/dequelabs/axe-core

Diamantopoulos, A., Riefler, P., Roth, K.P. (2008). Advancing formative measurement models. *Journal of Business Research*, *61*(12), 1203–1218, https://doi.org/10.1016/j.jbusres.2008.01.009

Glazkova, I., Falko, N., Khomenko, O., Khatuntseva, S., Rula, N., Shulzhenko, A., Tatarin, V. (2025). Barriers in online education for displaced universities: Insights from faculty and students. *Problems and Perspectives in Management*, *23*(2-si), 136-150, https://doi.org/10.21511/ppm.23(2-si).2025.10

Guo, C., & Wan, B. (2022). The digital divide in online learning in China during the COVID-19 pandemic. *Technology in Society*, *71*, 102122, https://doi.org/10.1016/j.techsoc.2022.102122

Heričko, T., Šumak, B., Brdnik, S. (2021). Towards Representative Web Performance Measurements with Google Lighthouse. I. Fister, A. Brodnik, J. Brest, I. Fister Jr., M. Krnc, & N. Zimic (Eds.), *Proceedings of the 7th student computer science research conference (stucsrc)* (pp. 39–42). University of Maribor Press. Retrieved from https://doi.org/10.18690/978-961-286-516-0.9

Hidayanto, A.N., Rofalina, F., Handayani, P.W. (2015). Influence of Perceived Quality of Official University Websites to Perceived Quality of University Education and Enrollment Intention. P. Isaías, P. Kommers, & T. Issa (Eds.), *The Evolution of the Internet in the Business Sector: Web 1.0 to Web 3.0* (p. 278-305). Hershey, PA: IGI Global Scientific Publishing. Retrieved from https://doi.org/10.4018/978-1-4666-7262-8.ch013

Holovko, O.A. (2019). Site of higher educational institution as a element of modern mass communication. *Printing Horizon*, *(1(7))*, 45–61, https://doi.org/10.20535/2522-1078.2019.1(7).169546 Retrieved from https://web.archive.org/web/20201106032726/http://horizons.vpi.kpi.ua/article/download/169546/193346

Hrechanyk, O.Y. (2020). The website as a means for developing the image of a general secondary education institution [Veb-sait yak zasib rozvytku imidzhu zakladu zahalnoi serednoi osvity]. *Theory and practice of professional preparation of innovation development managers [Teoriia ta praktyka profesiinoi pidhotovky menedzheriv innovatsiinoho rozvytku : materialy metodolohich. seminaru]* (pp. 53–62). Kharkiv: KhNPU. Retrieved from http://dspace.hnpu.edu.ua/handle/123456789/4728

Ismail, A., Kuppusamy, K.S., Paiva, S. (2020, Aug 01). Accessibility analysis of higher education institution websites of Portugal. *Universal Access in the Information Society*, *19*(3), 685–700, https://doi.org/10.1007/s10209-019-00653-2

Ismailova, R., & Inal, Y. (2017, Nov 01). Web site accessibility and quality in use: a comparative study of government Web sites in Kyrgyzstan, Azerbaijan, Kazakhstan and Turkey. *Universal Access in the Information Society*, *16*(4), 987–996, https://doi.org/10.1007/s10209-016-0490-z

Jarvis, C.B., MacKenzie, S.B., Podsakoff, P.M. (2003, 09). A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research. *Journal of Consumer Research*, *30*(2), 199-218, https://doi.org/10.1086/376806

Król, K. (2026, May 26). From website quality metrics to web well-being friendliness: a quantitative assessment of university websites in Poland. *Quality & Quantity*, , https://doi.org/10.1007/s11135-026-02871-2

Kvitka, S., Starushenko, G., Koval, V., Deforzh, H., Prokopenko, O. (2019). Marketing of Ukrainian higher educational institutions representation based on modeling of webometrics ranking. *Marketing and Management of Innovations*, *(3)*, 60–72, https://doi.org/10.21272/mmi.2019.3-05

Laamanen, M., Ladonlahti, T., Puupponen, H., Kärkkäinen, T. (2024, Mar 01). Does the law matter? An empirical study on the accessibility of Finnish higher education institutions' web pages. *Universal Access in the Information Society*, *23*(1), 475–491, https://doi.org/10.1007/s10209-022-00931-6

Loiacono, E.T., Watson, R.T., Goodhue, D.L. (2002). WebQual™: A Measure of Web Site Quality. *Proceedings of the american marketing association winter educators' conference* (Vol. 13, pp. 432–438). Austin, TX. Retrieved from https://www.researchgate.net/publication/248412208

Londar, L., & Pietsch, M. (2023, Dec.). Providing distance education during the war: The experience of Ukraine. *Information Technologies and Learning Tools*, *98*(6), 31–51, https://doi.org/10.33407/itlt.v98i6.5454

Manzoor, M., Hussain, W., Sohaib, O., Hussain, F.K., Alkhalaf, S. (2019). A methodological investigation for enhancing the usability of university websites. *Journal of Ambient Intelligence and Humanized Computing*, *10*, 531–549, https://doi.org/10.1007/s12652-018-0686-6

Mentes, S.A., & Turan, A.H. (2012). Assessing the Usability of University Websites: An Empirical Study on Namik Kemal University. *The Turkish Online Journal of Educational Technology*, *11*(3), 61–69, Retrieved from https://www.tojet.net/articles/v11i3/1136.pdf

Nechypurenko, P.P. (2024). *University website as an information policy tool: survey of student perceptions at Kryvyi Rih State Pedagogical University* (Manuscript essay). Kryvyi Rih, Ukraine: Kryvyi Rih State Pedagogical University.

Rashida, M., Islam, K., Kayes, A.S.M., Hammoudeh, M., Arefin, M.S., Habib, M.A. (2021). Towards Developing a Framework to Analyze the Qualities of the University Websites. *Computers*, *10*(5), 57, https://doi.org/10.3390/computers10050057

Shehatta, I., Al-Rubaish, A.M., Mahmood, K. (2020). Ranking Web of Universities: Is Webometrics a Reliable Academic Ranking? *Pakistan Journal of Information Management and Libraries*, *22*, 103–135, Retrieved from https://pjiml.pu.edu.pk/jo/index.php/pjiml/article/view/50

Simões, C., & Soares, A.M. (2010). Applying to higher education: information sources and choice factors. *Studies in Higher Education*, *35*(4), 371–389, https://doi.org/10.1080/03075070903096490

Stepura, T., & Kuzmak, O. (2023). Capability of Higher Education in Overcoming Digital Inequality in the Conditions of the Crisis in Ukraine. *Economics*, *11*(s1), 21–36, https://doi.org/10.2478/eoik-2023-0028

Ulutaş, A. (2019). University Website Performance Evaluation Using Fuzzy SWARA and WASPAS-F. K. Vatansever & Y. Akgül (Eds.), *Multi-Criteria Decision-Making Models for Website Evaluation* (pp. 151–165). Hershey, PA: IGI Global Scientific Publishing. Retrieved from https://doi.org/10.4018/978-1-5225-8238-0.ch008

World Wide Web Consortium (2025). *Web Content Accessibility Guidelines (WCAG) 2.1.* Retrieved from https://www.w3.org/TR/WCAG21/