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THE ONLINE PRESENCE AND PERFORMANCE OF PUBLIC AND PRIVATE UNIVERSITIES IN ROMANIA

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Abstract

This study evaluates the online presence and communication performance of all 87 accredited higher education institutions in Romania. We use a composite index which looks at their official websites, Search Engine Optimizations (SEO), and social media activity. We also assess their AI readiness, even if this measure is not included in the final score. The results show significant disparities between universities and underline the strategic importance of digital presence of Romanian universities and can be a useful instrument for academic managers looking to improve their institution's performance.

Keywords: online presence, SEO, social media, AI readiness, higher education.

1. Introduction

The increasing reliance on digital platforms highlights the need for effective online strategies to enhance the visibility and performance of universities in Romania. To achieve this, institutions must leverage social media and optimize their websites to attract and engage prospective students effectively. Effective online strategies not only improve visibility but also foster a two-way communication channel with prospective students, essential for adapting to the demand-side market dynamics (Alexa, Alexa and Stoica, 2012). This adaptation is critical for universities to remain competitive and relevant in a rapidly changing educational landscape. Moreover, universities in Romania must continuously evaluate their online strategies to identify gaps and implement best practices that enhance their competitive identity (George, 2015). By doing so, they can better meet the information and communication needs of their target audiences (Alexa, Alexa and Stoica, 2012).

Higher education in Romania has a rich history that dates back to the establishment of the first university in 1581. Over the centuries, the Romanian higher education system has evolved significantly, particularly after the fall of communism in 1989, which led to substantial reforms aimed at aligning the educational framework with European standards. The system comprises a mix of public and private institutions, offering a diverse range of programs and degrees. Despite facing challenges such as funding constraints and the need for modernization, Romanian universities have increasingly focused on enhancing their global presence and academic quality. In recent years, there has been a growing emphasis on developing partnerships with industry stakeholders to ensure that academic curricula meet the demands of the labor market, thereby improving graduate employability and fostering innovation within the educational landscape.

To further enhance their competitive edge, Romanian universities must also prioritize the integration of innovative educational practices that align with the evolving demands of the job market. This includes making use of digital channels for education, research, and outreach, as well as fostering an entrepreneurial mindset among students through innovation and entrepreneurship education (IEE), which has been shown to significantly boost employability by cultivating essential skills such as creativity, adaptability, and resilience (Yang and Khan, 2024). By embedding such curricula within their programs, universities can not only enhance the overall quality of education but also equip graduates with the tools necessary for success in a dynamic economic landscape. Moreover, establishing strong collaborations with industry partners can facilitate experiential learning opportunities, allowing students to apply theoretical knowledge in real-world settings, thereby reinforcing their readiness for the workforce (Ankrah *et al.*, 2023). As higher education institutions embrace these innovative approaches, they will likely see a positive shift in both student engagement and employment outcomes, ultimately contributing to a more robust and responsive educational framework in Romania.

2. Literature review

As Romanian universities navigate this evolving landscape, it is imperative that they not only enhance their online presence but also align their educational offerings with the demands of a knowledge-driven economy. The 2007 higher education reform serves as a pivotal moment, emphasizing the necessity for diversification in academic programs to boost overall performance quality and better prepare graduates for the workforce. Furthermore, the integration of technology into both formal and informal learning environments can serve as a transformative opportunity, enabling students to develop essential skills that are increasingly valued in the job market (Peterlicean, 2014). By embracing these changes, universities can cultivate a more dynamic educational experience that resonates with the aspirations of prospective students and meets the expectations of employers in a competitive global economy.

The importance of online presence in education has become a central theme of contemporary academic discourse, situated at the intersection of digital literacy, media ecology, and the transformation of knowledge societies. Castells' (2010) concept of the network society demonstrates how communication, power, and influence are increasingly shaped by digital networks, and education is one of the most visibly affected domains. The online visibility of educational institutions is no longer peripheral but has become a structural condition for their relevance, competitiveness, and ability to adapt to the expectations of digital-native generations. From official websites and learning management systems to social media platforms, digital libraries, and open-access repositories, online presence simultaneously serves as a symbolic representation of institutional identity and a functional infrastructure for knowledge dissemination.

From a theoretical perspective, the importance of online presence can be understood through the framework of digital literacy and media ecology. Digital literacy is not merely the ability to access and consume information; it requires the critical capacity to evaluate, create, and interact within digital environments (Gilster, 1997; Belshaw, 2011). Institutions that fail to establish a strong online presence risk exacerbating the digital divide, reinforcing inequalities between communities with access to high-quality educational resources and those without (Selwyn, 2022). In contrast, robust online engagement fosters the democratization of education by widening access to learning opportunities regardless of geography or socioeconomic background. Theories of media ecology further emphasize that technologies reshape not only the channels of communication but also the epistemological foundations of knowledge (Postman, 2000). Within this perspective, online presence should not be understood as a neutral medium but as an active agent that reconfigures educational practices, authority, and legitimacy in the digital age.

On a practical level, the necessity of online presence is evident in the growing reliance on e-learning environments, blended learning models, and massive open online courses (MOOCs). The COVID-19 pandemic accelerated these trends, revealing the vulnerability of institutions with weak digital infrastructures and highlighting the resilience of those

with robust digital ecosystems (Hodges *et al.*, 2020). For students, the online identity of an institution often shapes initial perceptions and influences enrollment decisions, functioning as a proxy for quality and credibility (Davis *et al.*, 2019). For faculty and researchers, digital platforms facilitate scholarly collaboration, enhance access to shared data, and increase the visibility of academic output through open-access publishing and institutional repositories (Siemens, 2005).

Equally important is the role of online presence in strengthening engagement and transparency. Social media platforms, for example, enable universities to build reputational capital, interact with their communities, and participate in public debates in real time (Jenkins, Ito and Boyd, 2016). Researchers studying how universities use social networks found most universities adopt a passive, one-way approach to posting, with limited two-way engagement (Capriotti and Zeler, 2023). Learning management systems and virtual classrooms support adaptive and personalized learning pathways, fostering student autonomy and long-term retention beyond the traditional lecture format (Hrastinski, 2019). Moreover, open-access initiatives expand the reach of scientific knowledge, reinforcing academia's commitment to accountability and its role in advancing the public good.

In this context, online presence is no longer a secondary or optional component of education but a constitutive element of institutional identity and practice. Its significance lies in a dual function: it enables inclusivity and accessibility for diverse learners, while simultaneously shaping institutional legitimacy and competitiveness in the global educational arena. Giannakoulopoulos *et al.* (2019) examines the relationship between universities' web presence quality, their SEO performance, and their academic excellence (measured by Shanghai ARWU rankings). Interestingly, the findings show that academic excellence correlates moderately with website quality, but not with SEO performance. The research highlights a potential gap: many universities (even elite ones) have room to improve their SEO practices without compromising content quality. Theories of the network society and media ecology provide the conceptual foundation for understanding these transformations, while applied examples such as MOOCs, blended learning, and institutional use of social media illustrate their practical urgency. Ultimately, cultivating a dynamic and strategic online presence is indispensable for ensuring the long-term sustainability and innovation of education in the digital era.

As universities in Romania seek to enhance their online presence, they must also consider the implications of digital literacy as a key component in preparing students for the demands of the modern workforce. The integration of innovative educational practices, such as project-based learning and digital collaboration tools, not only aligns with the evolving job market but also fosters essential skills like critical thinking and teamwork among students. The role of higher education institutions as research centers emphasizes the necessity of cultivating a culture of innovation and entrepreneurship, which can be facilitated through strategic partnerships with industry stakeholders and the implementation of cutting-edge technologies in the curriculum (Sun and Zhao, 2024). By actively

engaging in these initiatives, universities can better equip their graduates to navigate the complexities of a knowledge-driven economy, ultimately contributing to their long-term sustainability and relevance in a competitive global landscape. This includes the universities' reaction to the explosive adoption of generative AI (GAI) by students all over the world. At the moment, researchers found that universities have generally adopted a proactive but cautious stance toward GAI integration (Jin *et al.*, 2025). This is however not a definitive answer; the AI field is in flux and higher education could change its approach.

As Romanian universities strive to enhance their online presence and educational offerings, they must also address the growing importance of lifelong learning and continuous professional development in a rapidly evolving job market. By embracing such innovative educational models, universities can position themselves as leaders in the field, ultimately contributing to a more agile workforce capable of meeting the challenges of the future (Asniwati, Firman and Wahyuni, 2024, p. 55). As the landscape of higher education continues to evolve, institutions that prioritize these strategies will likely enhance their competitive edge and relevance on both national and international stages.

In addition to fostering lifelong learning, Romanian universities must also embrace the potential of digital platforms to enhance collaboration and knowledge sharing among institutions, both locally and internationally. By participating in global networks and educational partnerships, universities can facilitate cross-border exchanges that enrich academic programs and research initiatives, ultimately broadening their impact and reach. This collaborative approach aligns with the growing emphasis on international competitiveness, as highlighted by recent studies indicating that universities that actively engage in international partnerships often report improved performance metrics and enhanced reputational capital in the global arena (Oral, Singer and Kettani, 1989). Furthermore, the integration of digital tools can streamline these collaborative efforts, enabling institutions to share resources and best practices more effectively, thereby addressing common challenges and elevating the overall quality of higher education in Romania. As such, the strategic development of international collaborations not only enhances institutional visibility but also positions Romanian universities as vital players in the global educational landscape, ultimately contributing to a more interconnected and innovative academic community.

Moreover, as Romanian universities engage in international collaborations, they must also prioritize the adoption of open-access practices to enhance the visibility and accessibility of their research outputs. By embracing open-access publication, institutions can democratize knowledge dissemination, allowing a wider audience to benefit from their academic contributions while simultaneously increasing their global impact and reputation (Barman *et al.*, 2023). This shift not only aligns with the global movement towards transparency and accessibility in research but also fosters a more inclusive academic environment where diverse voices can be heard. Furthermore, the integration of open-source tools and platforms can facilitate collaborative research initiatives, enabling universities to share

data and resources effectively, thus addressing common challenges and enhancing the overall quality of education and research (Shah, Speyer and Yalim, 2023). As they navigate these transformations, Romanian universities have the opportunity to position themselves as leaders in the open-access movement, ultimately contributing to a more innovative and interconnected global academic community.

3. Methodology

The present study evaluates the digital presence and communication performance of accredited universities in Romania by employing a multi-dimensional composite index. The analysis is based on four complementary pillars: the official institutional websites, search engine optimization (SEO), social media activity, and generative engine optimization (AI-GEO). Each of these pillars was examined through a set of standardized variables, selected in accordance with international best practices in digital communication assessment and adapted to the specific context of higher education institutions.

The research design of this study follows a mixed-methods comparative framework, combining quantitative indicators with qualitative expert evaluation. The primary objective was to assess how accredited Romanian universities project their institutional presence in the digital sphere, with a particular focus on accessibility, visibility, communication effectiveness, and preparedness for emerging AI-driven information systems.

The study covers 87 universities, both public and private, accredited at the national level. For each institution, the principal online communication channel was identified and systematically evaluated. In the case of official websites, the analysis focused on accessibility, usability, compliance with legal standards, and the clarity of information provided to different audiences. The SEO component was assessed through a series of technical and content-based indicators measuring visibility, discoverability, and online authority across major search engines. Social media performance was analyzed by examining engagement, consistency, diversity of content, and interaction with audiences. Finally, the AI-GEO index was developed to capture the extent to which universities are prepared for discoverability and credibility in the context of generative artificial intelligence systems, with attention to citation readiness, knowledge graph optimization, and content authority.

Given its experimental nature, the AI-GEO index was not integrated into the overall composite score in the present edition of the study. At this stage, no Romanian university can be considered to have consciously optimized its online presence for generative engines. Nevertheless, the GEO dimension provides important insights into future directions of digital visibility, and it is expected that beginning with the next annual report, the GEO index will be fully incorporated into the overall institutional score.

For each university, the main institutional website and official social media channels were identified and analyzed, alongside technical indicators derived from search engine performance and AI readiness. The study employed a cross-sectional design, with data

collected during a fixed reference period (January–August 2025), allowing for comparability across institutions.

Data collection was based on two complementary approaches. First, automated tools were used to extract measurable indicators such as SEO performance scores, engagement metrics, and technical optimization values. Second, a manual coding procedure was applied to variables that required contextual judgment, including clarity of information, brand identity consistency, and alignment with user needs. This dual approach ensured both replicability of results and interpretive depth where automated tools remain limited.

The design also incorporated a multi-layered scoring system. Each dimension – official websites, SEO, and social media – was evaluated separately through a set of weighted variables, producing standardized sub-scores. These sub-scores were then aggregated to generate an overall index of digital presence. The AI-GEO dimension was assessed in parallel, using a similar scoring framework, but it was not included in the final composite score due to its exploratory status. Instead, it serves as a forward-looking diagnostic tool, highlighting the extent to which universities are prepared for future shifts in digital communication ecosystems.

Each of the four pillars contained multiple indicators:

(1) Official institutional websites

– *Sampling frame of pages***.** Homepage, top-level navigation, Admissions, Study programs, News/Announcements, Contact, Privacy/GDPR & cookies, and at least one index page listing core services. Mobile and desktop views were inspected.
– *Instrumentation.* A 4 tier rubric (0/1/2/3) was applied for each variable: (a) mobile responsiveness and adaptive layout; (b) coherent, contemporary visual design; (c) functional internal search (precision/recall tested with 3 predefined queries); (d) basic accessibility affordances (keyboard navigation, alt text presence, landmarks/ARIA use); (e) GDPR/cookie banner and policy conformity; (f) news/announcements section present and recently updated (within the reference window); (g) main menu legibility and information architecture logic; (h) visible, multi-channel contact data; (i) visible (ATF – above he the fold) links to official social channels; (j) admissions information that is complete, current, and easy to reach in ≤2 clicks.
– *Procedure.* Pages were crawled to capture DOM snapshots; we evaluated the rendered experience and scored the results. Items were scored independently, then reconciled.

(2) Search Engine Optimization (SEO)

– *Crawl & on-page signals.* Automated crawls of the root domain recorded meta titles/descriptions, canonical/robots directives, sitemap availability, indexability, presence, H1 structure, and duplicate-content flags. Laboratory performance audits captured page weight, request count, and Core-Web-Vitals–like metrics (largest contentful paint, cumulative layout shift, first input delay) for mobile and desktop profiles.

– *Link & authority signals.* Public web-graph snapshots were used to summarize inbound linking patterns (volume, diversity of referring domains, follow/nofollow mix) and the presence of organization 'sameAs' links to authoritative profiles.
– *Discoverability proxies.* Branded/unbranded query discoverability was proxied through structured checks (title/description relevance, structured data for organization, program and FAQ, presence in knowledge panels where applicable). No paid visibility (search ads) was considered.
– *Normalization.* All variables were normalized to comparable scales and grouped into sub-scores (SEO, Links, Usability, Performance, Social presence) before aggregation.

(3) Social media (institutional accounts)

– *Platform scope.* Verified, institution-level accounts were included; faculty/department accounts and paid/boosted content were excluded. Analyses relied on public counters only.
– *Collection window.* Posts published within the observation window were scraped with timestamps and interaction counts (reactions, comments, shares, video interactions where visible).
– *Indicators and formulas.*
  – *Followers*: community size at snapshot time.
  – *Average Engagement Rate (AER)*: [mean per-post (reactions+comments+shares) / followers] * 100.
  – *Organic Engagement Rate (OER)*: same numerator normalized by estimated organic reach/impressions where available; otherwise by followers, flagged as an approximation.
  – *Average Posts per Day (APPD)*: total posts / active days.
  – *Post-type mix*: distribution across text/photo/video/link formats.
  – *Diversity & consistency*: entropy-style content diversity index; posting regularity (share of weeks with ≥2 posts).
  – *Brand identity*: presence of consistent naming, logo/avatar, bio, link to the official site.
  – *Comment Sentiment Score (CSS)*: lexicon-assisted sentiment on comment text with manual verification on a stratified 10% sample.
  – *Community dialogue*: share of posts with ≥1 institutional reply within 48h.
– *Quality control.* Bot-like bursts and obvious non-organic anomalies were flagged; indicators were computed with and without flagged posts for sensitivity checks.

(4) Generative Engine Optimization (AI-GEO)

– *Citation readiness.* Page-level availability of explicit citations to verifiable sources (inline references, reference sections, outbound links to authoritative domains) on informational pages (About, Admissions, Programs, FAQ).
– *Answer alignment.* Presence of concise, unambiguous answers to high-intent user

questions (who/what/where/how, deadlines, requirements) with scannable formatting (FAQs, summaries).
- *Knowledge Graph optimization.* Organization/person schema, program/course markup, 'sameAs' links, and consistency of NAP (name–address–phone) across official profiles.
- *Content authority.* Author bylines/credentials, institutional signatures, and policy pages that establish accountability.
- *Technical optimization.* Robots/sitemaps, hreflang where relevant, canonical hygiene, and stable URL structures.
- *Competitive positioning.* Benchmarking of the above elements against the national peer set for similar informational intents.

The AI-GEO dimension was collected and scored in parallel using the same evidence logging protocol but, due to its exploratory status, is reported diagnostically rather than merged into the overall composite this year.

Cross-cutting procedures and safeguards
- *Researcher expertise.* Data collection and coding were conducted by researchers with prior experience in digital communication analysis, web auditing, and social media metrics. Their expertise ensured the consistent application of coding rules, contextual interpretation of borderline cases, and the ability to identify anomalies that automated tools may overlook. Expert judgment was therefore a central component in validating the accuracy of results.
- *Database availability for reproducibility.* All collected data have been stored in structured databases, including URLs, timestamps, and extracted indicators. While screenshots and raw crawl files are maintained internally, anonymized datasets and aggregated scores are available for verification and replication purposes upon request. This ensures transparency and allows future researchers to reproduce or extend the analysis.
- *Ethics & compliance.* Only public data were accessed; no personal data were processed; analyses adhered to GDPR principles and focused exclusively on institutional communication.
- *Exclusions.* Paid campaigns (search or social), analytics pixels, email marketing, and subunit websites were not analyzed; design 'taste' was not evaluated beyond usability/accessibility criteria.

This collection protocol yields harmonized, comparable inputs for each pillar, balancing automated measurement with expert judgment where human interpretation is necessary.

4. Results

Overall 1 – Green zone (231.73 – 172.59 out of 300)

Universities in the green zone are at the top of the national ranking in terms of the quality and functionality of their digital ecosystem. The official websites are well optimized for mobile, with modern design, clear structure and constantly updated content. Navigation is fluid, pages load quickly, and international versions are complete and functional, which facilitates attracting foreign students and international collaborations. SEO optimization is above average, with well-indexed pages and a content architecture that favors organic visibility. In the social media area, these universities have an active and coherent presence, using platforms as strategic communication and branding tools, with interactive campaigns adapted to the target audience. The combination of a high-performance website, high visibility in searches and constant communication in social media makes them competitive and capable of maintaining a real advantage in the national educational environment.

Overall 2 – Yellow zone (171.49 – 147.34 out of 300)

Universities in the yellow zone occupy an intermediate position, with strengths in some areas and visible gaps in others. At the website level, many have a good structure and clearly present essential information, but the design can be outdated or lacks adjustments that would improve the user experience, especially on mobile. In terms of SEO, the performances are uneven – some universities have well-optimized content and correct indexing, others lose ground due to the lack of a clear online visibility strategy. In social media, activity varies significantly: there are institutions with regular posts and targeted campaigns, but also others that have a sporadic presence and are not connected to the rest of the digital communication. The growth potential of these universities is high, and coordinated interventions on all three dimensions can quickly bring them into the green zone, especially if coherence between digital platforms, continuous optimization for search engines and a well-defined social media strategy are ensured.

Overall 3 – Red zone (146.06 – 38.00 out of 300)

Universities in the red zone are at the bottom of the ranking in terms of the quality of their digital presence, with significant problems in all three areas analyzed. Official websites often have an outdated design, lack essential optimizations for mobile devices, and navigation is difficult and unintuitive. Content is rarely updated, and international versions are either missing or non-functional, considerably reducing their attractiveness for students from abroad. From an SEO point of view, these institutions have low visibility in search engines, caused by the lack of technical optimization and content adapted to modern indexing criteria. Social media presence is reduced or almost non-existent, which means the loss of an essential channel of communication and promotion. To become competitive, these universities need significant investments in rebuilding online platforms, from website infrastructure to implementing effective SEO strategies and truly integrating social networks into the communication mix.

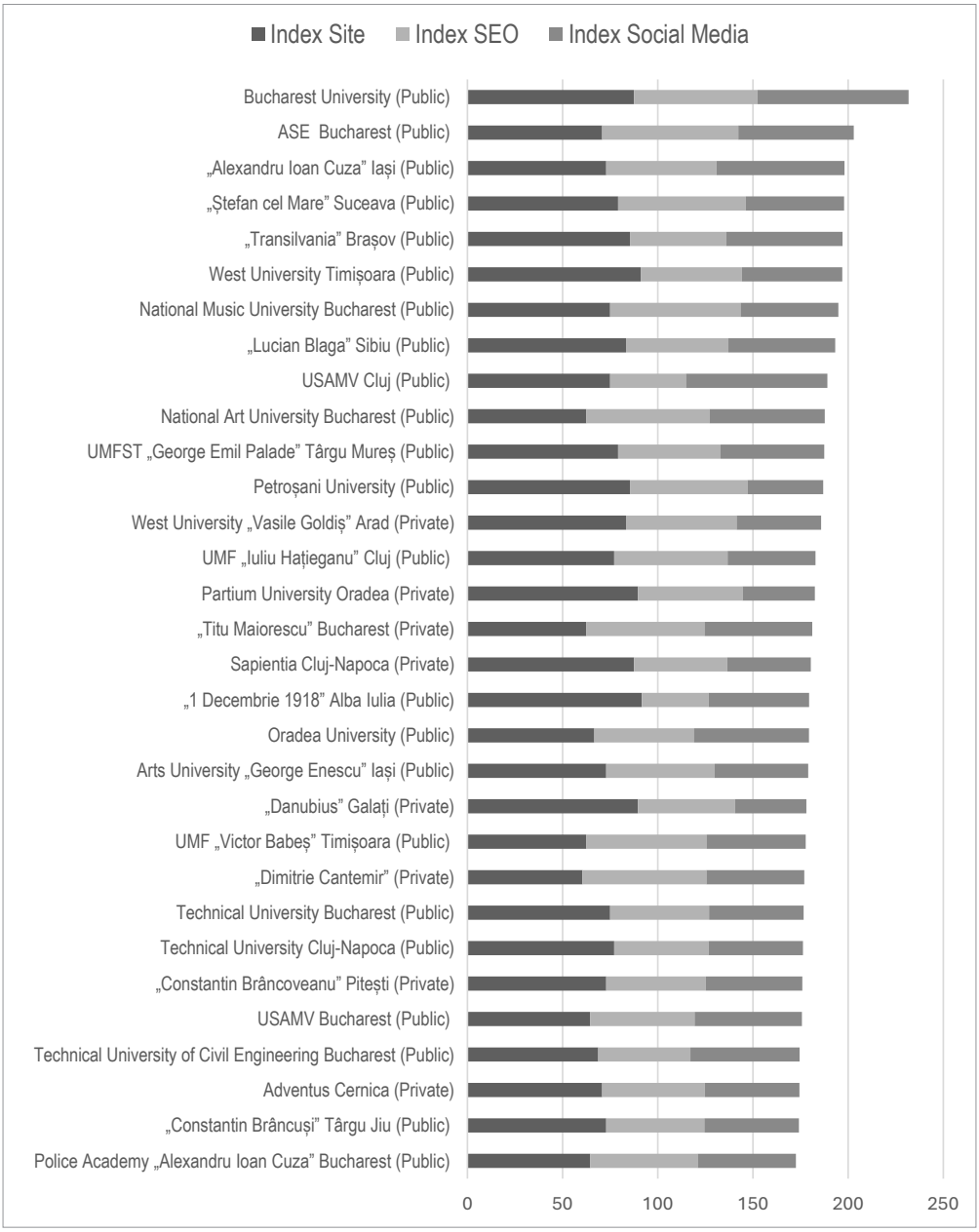

Figure 1: Universities in the green zone – overall score

Source: universitati-digitale.ro

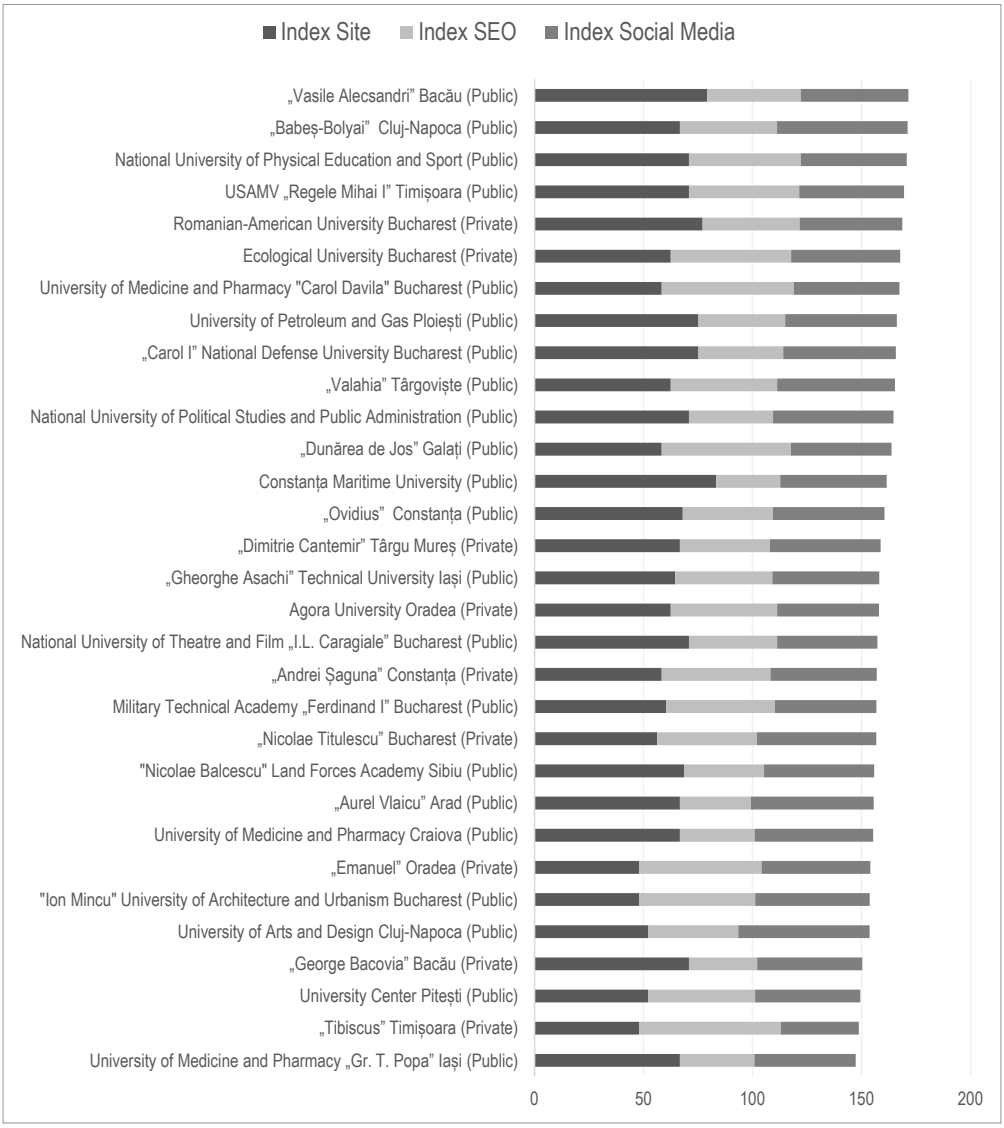

Figure 2: Universities in the yellow zone – overall score

Source: universitati-digitale.ro

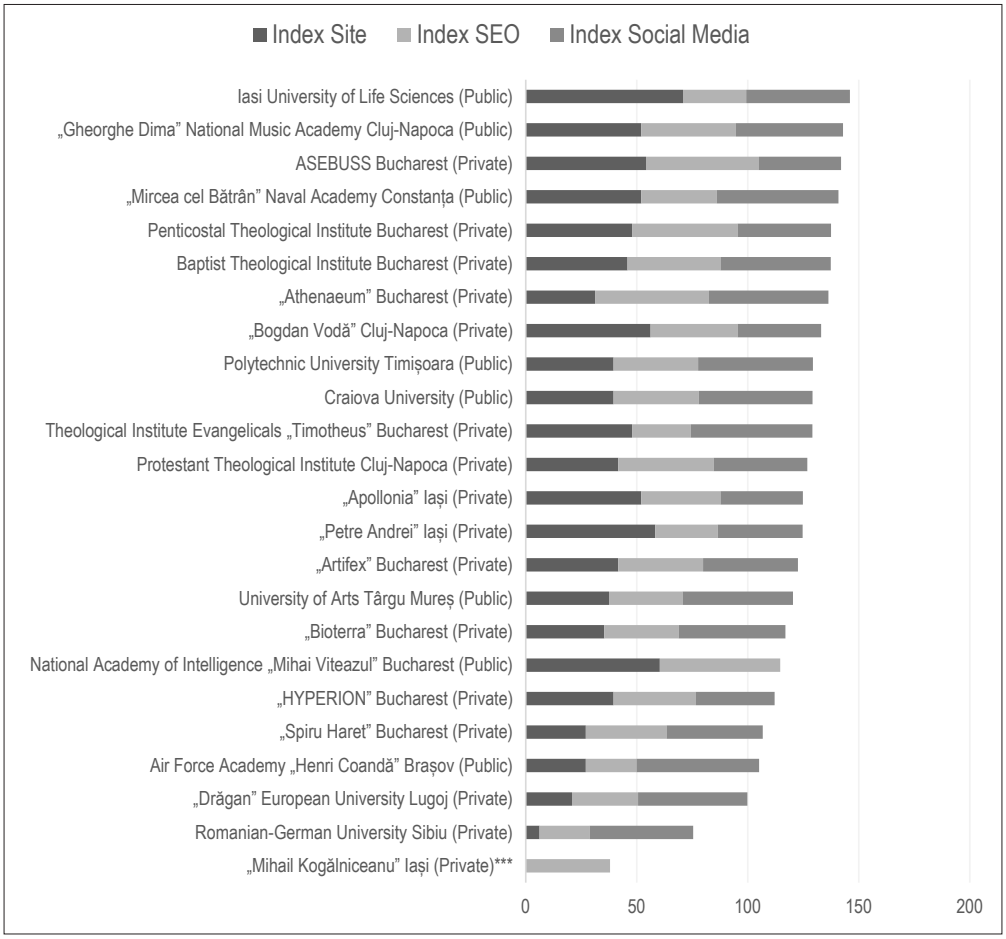

Figure 3: Universities in the red zone – overall score

Source: universitati-digitale.ro

4.1. Official websites

The analysis revealed three distinct performance clusters. The green cluster (weighted average score ≈ 0.79) includes universities with modern, well-structured websites that align closely with international standards. The yellow cluster (≈ 0.64) demonstrates adequate implementation of core functionalities but displays notable gaps in accessibility, branding, and international optimization. The red cluster (≈ 0.40) is characterized by significant shortcomings in critical areas such as design, mobile functionality, and technical infrastructure. Mobile responsiveness is a nearly universal strength, achieved by 100% of institutions in the green cluster and by 96.6% in the yellow cluster. Logical menu structures are also consistently present, exceeding 76% across all clusters, which suggests generally intuitive navigation. Admission information is easily accessible, with high levels of clarity reported

in the green (96.6%), yellow (87.9%), and even the red cluster (80.8%). Accessibility for individuals with disabilities remains insufficient across all clusters, reaching only 58.6% in the green and as low as 7.7% in the red cluster. Visible links to social media platforms are found in fewer than 45% of websites, reflecting weak integration of broader digital presence. Compliance with GDPR requirements is also problematic, as cookie banners were correctly implemented in only 57.5% of green and 11.5% of red cluster institutions, raising concerns about legal adherence.

Substantial disparities emerge in several areas. Modern visual design is achieved by 72.4% of green institutions but only 15.4% of those in the red cluster. Functional international versions are available in 82.8% of green and 28.8% of red institutions. Internal search engines yielding relevant results are present in 67.2% of green institutions compared to only 19.2% in the red cluster. Similarly, regularly updated news sections appear in 79.3% of green institutions but in only 42.3% of red cluster websites. Universities in the green cluster possess a solid foundation yet must advance accessibility, social media integration, and GDPR compliance to consolidate their position. Institutions in the yellow cluster exhibit strong potential for rapid improvement if they address deficiencies in branding, internationalization, and accessibility. In contrast, the red cluster requires substantial intervention, particularly in design, mobile functionality, and legal standards, in order to reach even a baseline level of competitiveness (universitati-digitale.ro, n.d.)

4.2. Search Engine Optimization

The analysis highlights three performance clusters with significant differences in search engine optimization (SEO), link management, technical performance, and social media presence. The green cluster (average total ≈ 61.45) comprises universities with high SEO scores (71.35), well-managed links, and an above-average social presence (49.15). These institutions demonstrate solid technical and content structures, positioning them close to international best practices. The yellow cluster (≈ 50.94) shows balanced implementation of SEO elements, with consistent link (54.35) and usability (52.11) scores, but weaker technical performance and modest social presence. The red cluster (≈ 36.27) faces significant shortcomings in SEO (39.79), link management (40.55), and social media (19.65), placing it well below current visibility and optimization requirements.

All clusters show relatively functional link structures, with internal and external link scores consistently above 40. Usability scores above 50 are observed even in the red cluster, indicating some effort toward accessible interfaces. Moreover, the presence of balanced internal and external links suggests a minimally functional SEO foundation across the board.

Social media integration remains underdeveloped, with an average score of only 30.7 across the sample, pointing to weak alignment between SEO and broader digital strategies. Technical performance is also a critical weakness, with a mean score of 39.09, reflecting issues such as page speed, mobile optimization, and metadata implementation. Furthermore, the performance gap between the green and red clusters exceeds 30 points in the SEO

score, underscoring the absence of common standards. Clear disparities are evident across multiple dimensions. The SEO score reaches 71.35 in the green cluster compared to only 39.79 in the red cluster. Similarly, the social score stands at 49.15 for green institutions but just 19.65 for red institutions. Technical performance shows a comparable gap (49.75 in green vs. 34.45 in red), while usability remains relatively stable in the green (57.20) and yellow (52.11) clusters but drops to 34.18 in the red cluster. Green cluster institutions must consolidate their advantages by investing in advanced technical performance, internationalized content, and deeper integration with social media channels. Yellow cluster universities show rapid growth potential if they strengthen technical performance and social presence, building on their already solid SEO base. The red cluster requires substantial intervention, particularly in technical optimization, both on-page and off-page SEO, as well as in social media integration, in order to achieve a minimal level of competitiveness (universitati-digitale.ro, n.d.).

4.3. Social Media

An examination of the three clusters and their associated variables reveals several strategic conclusions about how universities manage their online communication. Large audiences do not necessarily translate into high engagement, suggesting that community size does not guarantee active participation. Increasing the follower base appears to be a secondary objective compared to maintaining interaction with existing audiences. Both the Average Engagement Rate (AER) and the Organic Engagement Rate (OER) display modest averages, with substantial variance across institutions. Higher scores are typically observed among universities that consistently publish diverse and audience-adapted content. Most institutions maintain a medium-to-low posting frequency, yet higher daily activity does not necessarily yield proportional engagement, indicating that volume alone cannot compensate for a lack of relevance. Visual content, particularly photographs and videos, dominates, while overall diversity remains limited in many cases. Institutions that experiment with alternative formats such as live events, stories, and interactive materials tend to achieve superior engagement outcomes. Performance in terms of visual consistency and brand identity is moderate. Some universities maintain coherent visual styles, whereas others frequently change their color schemes and visual tone, potentially undermining long-term brand recognition.

Comment sentiment is generally neutral to positive, though significant variation occurs during crises or when sensitive topics emerge. The distinction is clear between institutions that respond promptly and constructively and those that avoid active engagement. Direct interaction with audiences through comment responses is often underutilized. A positive correlation is observed between engagement metrics and dialogic activity, with active conversations leading to visibly higher AER and OER. Engagement quality shows a decline over time, with higher levels in Q1 followed by progressive decreases toward Q3. Strategies focused solely on posting volume without content

diversity do not result in meaningful engagement growth. Institutions with consistent visual branding and a unified tone achieve more stable long-term performance. At the same time, there is substantial potential to increase engagement through content diversification, as university communities remain relatively stable overall, and sentiment is largely positive. Nevertheless, a lack of active dialogic engagement diminishes trust capital. Content strategies are often reactive and temporary, lacking long-term continuity, while the limited use of interactive video formats represents a missed opportunity for differentiation (universitati-digitale.ro, n.d.).

4.4. AI readiness

The overall performance of the universities analyzed is modest, with an average total score of approximately 52 out of 100. This indicates that most institutions are only partially prepared for visibility and recognition in the context of AI-driven information environments. The distribution of results is uneven: while a few universities reach scores above 80, many remain in the 40–50 range, highlighting significant disparities in preparedness. The strongest results are recorded in the areas of content authority, with an average of around 62, and technical optimization, with an average of 71. Universities benefit from solid institutional credibility and affiliation, and their websites are relatively well-structured, technically sound, and accessible. By contrast, the weakest performance is observed in citation readiness, averaging only 35, and answer alignment, with a mean of 39. While university content often includes valuable information, it is not sufficiently supported by explicit citations and rarely framed in the form of direct responses to frequently asked questions. This limits the extent to which such content can be retrieved, cited, and displayed by AI systems. Knowledge graph optimization scores are also only partial, with a mean of 52. Although some degree of data structuring exists, it remains insufficient to enable clear recognition of entities and relationships by algorithms. Terminology is sometimes inconsistent, and structured data lacks standardization, constraining semantic integration.

Competitive positioning also remains limited, with an average score of 51. The content offered by universities does not succeed in creating strong differentiation from other institutions. The emphasis tends to fall on generic information such as admissions, rankings, or program descriptions, while unique elements capable of providing distinctive visibility in the higher education landscape are missing. Taken together, the findings suggest that Romanian universities enjoy online visibility and recognized institutional authority, yet they lack the modern standards necessary for their information to be easily citable, clearly structured, and competitively positioned in relation to how AI systems and search engines currently integrate and display content (universitati-digitale.ro, n.d.).

5. Discussion and conclusions

The findings of this study underscore a multidimensional picture of the digital presence of Romanian universities, characterized by a blend of structural strengths and systemic weaknesses. Across the four pillars analyzed – official websites, search engine optimization, social media performance, and readiness for generative artificial intelligence – Romanian higher education institutions exhibit uneven progress that reflects both the opportunities and constraints of their digital transformation. At the level of official websites, the evidence demonstrates that a significant share of universities has achieved compliance with contemporary web standards, particularly in terms of mobile responsiveness and basic usability. However, even within the green cluster, accessibility for individuals with disabilities, legal compliance through GDPR-conform cookie banners, and robust integration of social media channels remain incomplete. The persistence of these gaps highlights the limited extent to which digital inclusivity and legal alignment are systematically pursued. The yellow cluster institutions, which stand on the threshold of strong performance, offer evidence of latent potential that could be unlocked through targeted interventions in design modernization, accessibility, and internationalization. Conversely, the red cluster remains a cause for concern, with outdated technical infrastructures and fragmented communication practices that risk marginalizing these universities in the digital sphere.

Search engine optimization results mirror this polarized landscape. Universities with higher SEO scores demonstrate that Romania does possess institutions capable of approaching international best practices, particularly through coherent link management and relatively solid usability structures. Yet technical optimization remains a bottleneck across the system, with performance indicators pointing to issues of page speed, metadata completeness, and mobile compatibility. The overall weakness in aligning SEO with social media strategies suggests that many universities still conceptualize visibility in fragmented terms, failing to capitalize on the synergistic effects of integrated digital communication. The significant performance gaps between clusters – often exceeding 30 points – reinforce the argument that Romanian higher education operates without a shared baseline of digital standards. The analysis of social media engagement provides further nuance. Large follower bases were not systematically correlated with higher engagement, demonstrating that volume cannot substitute for relevance or sustained interaction. Institutions that embraced content diversity, experimented with interactive formats, and cultivated dialogic communication with their communities achieved higher engagement rates. Nevertheless, the overall averages remain modest, with most universities displaying sporadic posting schedules, limited content innovation, and reactive strategies that lack continuity. The observed decline in engagement quality from Q1 to Q3 suggests a structural inability to sustain communication momentum over time. Moreover, the insufficient use of dialogic practices – such as timely and constructive replies to comments – indicates a missed opportunity to consolidate trust and strengthen institutional legitimacy in the eyes of digital-native audiences. The exploratory

dimension of generative engine optimization reveals perhaps the most significant structural deficit. While universities benefit from recognized institutional authority and relatively solid technical foundations, their content is rarely optimized for citation readiness or answer alignment. The scarcity of explicit references, standardized structured data, and scannable formats limits their potential visibility in AI-driven search and conversational systems. This is not merely a technical gap but a strategic one, as the failure to adapt to generative AI ecosystems risks excluding universities from the emerging infrastructures of knowledge retrieval. Competitive positioning scores further emphasize this vulnerability, showing that institutional content largely reproduces generic descriptors of programs and rankings, without establishing distinctive elements that would differentiate them in a globalized and highly competitive educational market.

Taken together, the results suggest that while Romanian universities have made visible progress in developing a digital presence, this progress is neither evenly distributed nor strategically consolidated. The green cluster demonstrates that excellence is achievable within the national context, yet the systemic weaknesses observed in the yellow and especially red clusters underscore the absence of a coordinated national strategy for digital communication in higher education. This lack of coherence not only perpetuates disparities between institutions but also constrains the sector's collective capacity to project Romanian academia onto the global stage. In theoretical terms, the findings validate perspectives from media ecology and network society theories, which highlight the centrality of digital infrastructures in shaping institutional authority and legitimacy. The Romanian case shows that online presence is no longer peripheral but constitutive of how universities are perceived, engaged with, and integrated into knowledge ecosystems. In practical terms, the results call for a dual response: first, the establishment of baseline standards for web accessibility, technical optimization, and legal compliance, and second, the development of strategic frameworks that encourage universities to adopt dialogic communication, diversify content strategies, and prepare for the integration of AI-driven information systems.

Ultimately, the digital presence of Romanian universities remains at a crossroads. Without substantial and coordinated interventions, the gap between high-performing and underperforming institutions is likely to widen, reproducing inequalities of visibility and legitimacy. However, the existence of a critical mass of institutions already aligned with international practices demonstrates that systemic improvement is attainable. By treating digital presence not as an ancillary function but as a core dimension of institutional identity, Romanian universities can reposition themselves to meet the demands of a global, AI-mediated knowledge society, ensuring both competitiveness and inclusivity in the years ahead.

6. Research limits and recommendations for future research

This research is only one snapshot of the current situation and the data collected is overwhelmingly quantitative. Integrating qualitative measures in future analysis could paint a more comprehensive picture of the importance universities give to digital channels. Supplementary indicators could be used for evaluating universities' brand visibility; as an example, Petersen (2025) analyzes the frequency and network of university mentions in 2 million online news articles. Such an addition would also show the effects higher education institutions of online efforts.

The results of this study point to several directions that should be further explored through systematic research in order to deepen the understanding of how universities in Romania and beyond can strengthen their digital presence. While the present analysis offers a comprehensive assessment across official websites, SEO, social media, and readiness for generative AI, it also reveals multiple blind spots that future studies could address to enrich both theoretical insight and practical application.

First, there is a need for longitudinal research designs that track the evolution of institutional performance across time. The current cross-sectional perspective offers a valuable snapshot but cannot fully capture dynamic trajectories, seasonal variations, or the long-term impact of specific interventions. A longitudinal dataset could reveal whether improvements in one area – such as search engine optimization or mobile design – translate into measurable increases in student applications, international collaborations, or reputational indicators over several academic cycles.

Second, future studies should extend the analytical framework by integrating outcome-oriented variables. While the present study focused on technical optimization, engagement metrics, and structural readiness, it did not systematically link these indicators to downstream outcomes such as student recruitment, retention, or alumni engagement. Establishing causal connections between digital presence and institutional performance would provide administrators with stronger evidence for prioritizing digital strategies as core components of university governance.

Third, comparative international research would be invaluable. Benchmarking Romanian universities exclusively against themselves highlights domestic disparities but leaves open the question of how these institutions perform relative to their regional and global peers. By applying the same methodology across multiple higher education systems in Eastern Europe or within the European Union, researchers could better contextualize Romania's position and identify transferable practices or policy interventions.

Fourth, the generative AI dimension demands targeted exploration. As this study has shown, Romanian universities are not yet prepared for AI-driven knowledge environments, particularly in terms of citation readiness, structured data, and answer alignment. Future research should examine not only institutional adaptation strategies but also how AI systems currently process, retrieve, and represent academic information. Ethnographic or experimental studies could reveal how prospective students interact with generative

engines in making educational choices, thereby clarifying the extent to which AI is reshaping the information ecosystem of higher education.

Taken together, these recommendations point to a research agenda that is both ambitious and necessary. The Romanian higher education system, like many others, is navigating a critical juncture in which digital presence is not merely a tool of communication but a determinant of institutional survival and competitiveness. By expanding the methodological scope, embracing longitudinal and comparative designs, and engaging with the transformative role of AI, future research can provide deeper insights that inform not only academic debate but also policy-making and institutional strategy.

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