

Original Research

Digitalization of higher education in Morocco: challenges of digital accessibility for students: A case study of Ibn Zohr University, Agadir

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Abstract

To give university students more flexibility and accessibility, Morocco has invested in a project to digitize its higher education system by transforming access to administrative and educational services, offering interactive online platforms and electronic portals for program registration and visualization. In addition to improving access and the speed of services offered to students, the modernization of university infrastructure, with improved connectivity that permits widespread, free access to academic resources, tends to highlight structural disparities, particularly for students from underprivileged backgrounds, who face difficulties with accessibility and training. Our study aims to investigate the implementation of digital devices and examine the obstacles to students' digital access to these resources. A rigorous process was used to accomplish this goal, including conceptual analysis, empirical research, and a thorough evaluation of the body of knowledge on the digitalization of higher education. To validate and enhance the suggested conceptual model, both qualitative and quantitative data were gathered from students and administrative officials of the Ibn Zohr University of Agadir (case study). The usefulness of this digital revolution in enabling users, especially students, to access the administrative and instructional resources of academic institutions is thus questioned in this study. This questioning is predicated on the idea that the digital divide between rural and urban areas undermines fair possibilities for digital accessibility; hence, measures regarding equitable access to digital tools are necessary.

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Résumé

Afin d'offrir aux étudiants universitaires plus de flexibilité et d'accessibilité, le Maroc s'est investi dans le projet de numériser son enseignement supérieur par la transformation des modalités d'accès à ces services, pédagogiques et administratives, en fournissant des plateformes en ligne interactives et des portails électroniques pour l'inscription et la visualisation des programmes. La modernisation des infrastructures universitaires, avec une connectivité renforcée, permet un accès étendu et gratuit aux ressources académiques, améliore l'accès et la rapidité des services proposés aux étudiants, mais tend aussi à accentuer certaines inégalités structurelles, en particulier en ce qui concerne les étudiants issus de milieux défavorisés, ce qui les met face aux défis d'accessibilité et de formation. Notre étude vise à explorer la manière dont les dispositifs numériques sont mis en œuvre et à analyser les enjeux d'accessibilité numérique des étudiants à ces ressources. Pour atteindre cet objectif, une méthodologie rigoureuse a été suivie, comprenant une revue approfondie de la littérature existante sur la digitalisation de l'enseignement supérieur, des analyses conceptuelles et des recherches empiriques. Des données qualitatives

et quantitatives ont été collectées auprès des étudiants et des responsables administratifs de l'Université Ibn Zohr d'Agadir (cas d'étude), afin de valider et d'enrichir le modèle conceptuel proposé.

Mots-Clés : Accessibilité numérique, Enseignement supérieur, Fracture numérique, Équité numérique, Agadir, Maroc

1. Introduction

The transition of Moroccan universities towards digital transformation was significantly accelerated by the COVID-19 pandemic. This shift forms part of a broader higher education reform strategy aimed at addressing the challenges of massification, improving educational quality, and enhancing international competitiveness, particularly through the ESRI pact 2030 and the new development model.

As with other industries, the digitalization of higher education entails focusing institutional development on technology use. Dewar defines a smart university as one that is focused on its students, open to the outside world, involved, and connected to its productive environment (Dewar, 2017).

Like many other sectors, the digitalization of higher education places information and communication technologies (ICTS) at the center of institutional development. It seeks to improve users' access to university services while enhancing their digital skills through a constructivist approach that integrates computers and the internet into teaching and learning. Digitalization also promotes greater access to higher education and educational equity (Li, 2020), making it an important area of investigation.

Universities are increasingly striving to meet students' evolving needs by investing in mobile technologies, high-speed internet, digital platforms, and online applications. These technologies redefine the traditional roles of teachers and administrative staff while enabling personalized learning regardless of time or location (Efimov & Lapteva, 2017).

In this context, technology is employed to enhance teaching, research, academic administration, and institutional communication more broadly; digitalization refers to the integration of digital technologies into all aspects of higher education, including teaching, research, multi-disciplinary collaboration, university administration, and communication among students, faculty members, and administrative staff (Zenati, 2023).

Using Ibn Zohr University in Agadir as a case study, this research examines the impact of digital transformation on students' access to administrative and pedagogical resources. The rapid evolution of university practices, driven by technological innovation, highlights the importance of investigating the effectiveness of this transformation. Accordingly, the study addresses the following research question: How much has the digital transformation of Moroccan universities improved students' access to administrative and educational resources?

This article also examines the major challenges facing the Moroccan higher education system in its digital transformation, including the modernization of technological infrastructure, the training of human resources, and the promotion of equitable access to digital resources. The study is based on the hypothesis that the rural -urban digital divide limits students' equitable access to administrative and educational resources. Consequently, reducing this divide and

ensuring equal access to digital technologies are essential for achieving inclusive and effective digital transformation in Moroccan higher education. Therefore, policies aimed at ensuring equitable access to digital tools for universities are essential.

2. Conceptual structure

Our research supports the perspective advanced by Warschauer's (2003), who argues that digital accessibility extends beyond the mere provision of technological tools or Internet connectivity; instead, it must be understood in relation to individuals' capabilities, social practices, and the contexts in which technology is used. This perspective is complemented by Amartya Sen's (Sen, *Inequality Reexamined*, 1995). Sen argues that justice should be assessed in terms of people's actual capabilities, not merely through the equal distribution of resources. From this perspective, digital accessibility constitutes a key mechanism for promoting social justice because it influences effective access to education, civic participation, and individual autonomy.

(Sen, 1999) (Sen, 1985) Likewise, (Nussbaum, 2011) emphasizes that development should be evaluated according to what individuals are genuinely able to do and to be. Consequently, digital accessibility should be understood not simply as access to technological infrastructure but as the opportunity to use digital technologies in meaningful, independent, and empowering ways. (Sen, 1999).

Drawing on Sen's and Nussbaum's work, the present study highlights the importance of achieving genuine equality of opportunity for participation. This requires taking into account the socioeconomic and political factors that shape individuals' ability to exercise their rights and benefit from digital technologies. (Nussbaum, 2011).

Digital accessibility therefore involves much more than access to devices or internet connections. It encompasses the ability to mobilize technical, informational, and social competencies to participate effectively in the digital environment. When digital platforms are appropriately adapted and students receive personalized support, digital accessibility becomes a powerful driver of educational empowerment and inclusion for university students.

The (OCDE, 2020) similarly emphasizes that digital accessibility should be integrated into educational policies to promote lifelong learning, reduce territorial inequalities, and mitigate the unequal effects of digital transformation. Strategies for promoting digital accessibility vary according to theoretical perspectives and policy environments. Three major approaches can be identified:

- The technology-centred approach focuses primarily on providing infrastructure, equipment, internet connectivity, and online services. This approach remains dominant in many developing countries, where access to digital infrastructure continues to pose a major challenge (Foudou, 2025). However, it has been criticized for reducing digital inclusion to a purely technical issue and overlooking the social dimensions of technology use (Diminescu, 2012).
- The capability approach inspired by (Sen, 1999) and (Nussbaum, 2012) conceptualizes digital accessibility as a source of agency—the capacity of individuals to make informed choices and pursue goals they value—and this perspective emphasizes empowerment, the development of digital competencies, and the importance of recognizing individuals' diverse aspirations and circumstances.

- Finally, the critical or sociotechnical approach, defended by Warschauer's (2003) analyses digital accessibility through the lens of structural inequalities such as gender, socioeconomic status, disability, and geographical location. According to this perspective, providing technical access alone does not guarantee meaningful digital participation, as the digital inequalities observed reflect broader social and economic disparities.

In conclusion, digital accessibility cannot be understood solely as the provision of technological infrastructure or Internet access. Rather, it requires an ethical, social, and political understanding of how individuals interact with digital technologies. Only by adopting this broader perspective can educational institutions ensure that digital transformation promotes inclusion rather than reproducing or exacerbating existing inequalities.

3. Methods

To examine the appropriation, uses, and representation of digital devices at Ibn Zohr University of Agadir, Morocco, this study adopted a mixed-methods approach, combining the strengths of qualitative and quantitative research techniques (Creswell & Clark, 2007). A mixed-methods design enables researchers to explore complex social phenomena by integrating different sources of evidence and perspectives. In this study, it was used to investigate students' digital accessibility to educational and administrative resources while considering the institutional, cultural, and political dimensions that influence the design and implementation of digital accessibility technologies. According to (Denzin, 2012), Mixed-methods research relies on methodological triangulation, which combines multiple sources of data to enhance the validity and credibility of findings.

- Following (Bowen, 2009) methodological framework, the study began with a comprehensive review of the institutional context, public policies, and legal frameworks governing digital accessibility and the protection of personal data within institutions affiliated with Ibn Zohr University. The documentary corpus included institutional regulations, digital transformation strategies, the General Reference of the amelioration (RGAA, 2021), (WCAG, 2018)), GDPR compliance guidelines, and other official documents related to the University's digital transformation. In addition, a qualitative audit of the university's institutional websites was conducted using the automated evaluation tool Access Web. The audit focused on technical accessibility, cognitive accessibility, data security, and transparency.
- Data collection was carried out over five months, from 4 December 2024 to April 2025, in two complementary phases. The first phase consisted of a qualitative study based on semi-structured interviews with nine participants representing six academic institutions affiliated with Ibn Zohr University. Purposive sampling was designed to ensure the diversity of profiles and the relevance of institutional or lived positions. The participants included deans, vice-deans, directors, heads of human resources departments, and members of the university presidency, including the director of the digitalization department, the head of student affairs and university life, the head of administrative affairs, and the head of budget and finance. The interviews, lasting an average of 45 to 60 minutes, were conducted in person and fully transcribed. Consistent with the interpretative tradition of qualitative research (Blanchet & Gotman, 2007) (Paillé & Mucchielli, 2021), these interviews aimed to explore the institutional logics, perceptions, and practices that shape the implementation of digital accessibility within the university.

The second phase consisted of a quantitative survey administered through Google Forms. A total of 192 students from both open-access and regulated-access groups were surveyed to evaluate their experiences of digital accessibility and its impact on access to educational and administrative services at Ibn Zohr University.

The difficulty of covering the large area that Ibn Zohr University encompasses and the lack of funding to deploy the necessary means to carry out the study are the main reasons for the sample size of 192 students compared to the total number of 147,806 students enrolled at the university. As a result, the mixed technique was used to add qualitative data to the study and provide a better explanation for the findings.

The strategy used for selecting students in open-access schools, as opposed to regulated schools, is based on word-of-mouth contact with teachers and educational managers to encourage their students to respond to the questionnaire, since the culture of participating in field surveys remains limited in Morocco in general and among students in particular.

Following (Granjon, 2022), the questionnaire and interview guide were organized around three analytical dimensions: access to digital resources, the ability to use these resources effectively and autonomously, and the critical appropriation of digital technologies within the university environment. To deepen the understanding of the research context, the study also included observations of the digital environments most frequently used in academic life, including international platforms and online support services. These observations examined how students interacted with digital technologies in real situations, allowing the researchers to assess both the functional accessibility of digital systems and the practical conditions of their use. This approach helped identify discrepancies between institutional standards and users' actual experiences.

- Finally, the analysis combined qualitative, quantitative, and comparative approaches using evaluation grids based on the principles of universal Design, WCAG 2.1. and RGAA standards; particular attention was given to users' appropriation of digital tools in relation to training opportunities, digital mediation, and the maintenance of technological systems. By integrating documentary analysis, interviews, surveys, and digital observations, the study achieved methodological triangulation, thereby strengthening the validity, reliability, and ecological validity of the research findings.

Observations targeted key digital environments and media essential for accessing knowledge and university life: learning platforms (such as Moodle and ENT accounts), support tools (videoconferencing), and student-dedicated spaces (portals of the various institutions comprising Ibn Zohr University).

Qualitative information from the literature review and interviews was analyzed using an inductive thematic content analysis, as described by (Braun & Clarke, 2008). This methodical approach comprised immersive reading, line-by-line coding in NVivo (Bobbineau, 2016), and a refined, validated classification to ensure reliability (Paillé & Mucchielli, 2021). The main themes identified concerned the design and regulation of digital accessibility systems. By addressing prescriptive requirements and field realities, supported by quantitative data, this method enables a comprehensive understanding of the dynamics of digital accessibility. By bridging perspectives and institutional contexts, methodological triangulation of documentary analysis, qualitative and quantitative field studies, observation, and thematic analysis strengthens the approach's resilience.

4. Results

4.1. What made Ibn Zohr University our choice?

As a case study about our research topic, Ibn Zohr University is unique among Moroccan universities in that it encompasses five of the twelve regions that comprise the kingdom's territory, or roughly 53% of the country's total land area. The map shows that it is situated in eight university towns. With 147.806 students, or 14% of all students enrolled in Moroccan public universities, Ibn Zohr University has the highest percentage.



Figure 1. Ibn Zohr University on the Moroccan Map. (Source: www.uiz.ma 2022 / elaborated by: (ERRACHIDI, 2023/2024))

Ibn Zohr University's territory, shown in red, is divided into two sections: 10% of the total area is urban, and the remaining 90% consists of rural and periurban areas. There are 88,683 students from rural and periurban areas, compared to 59,122 students from metropolitan areas. This emphasizes how crucial digital accessibility is for Ibn Zohr University students.

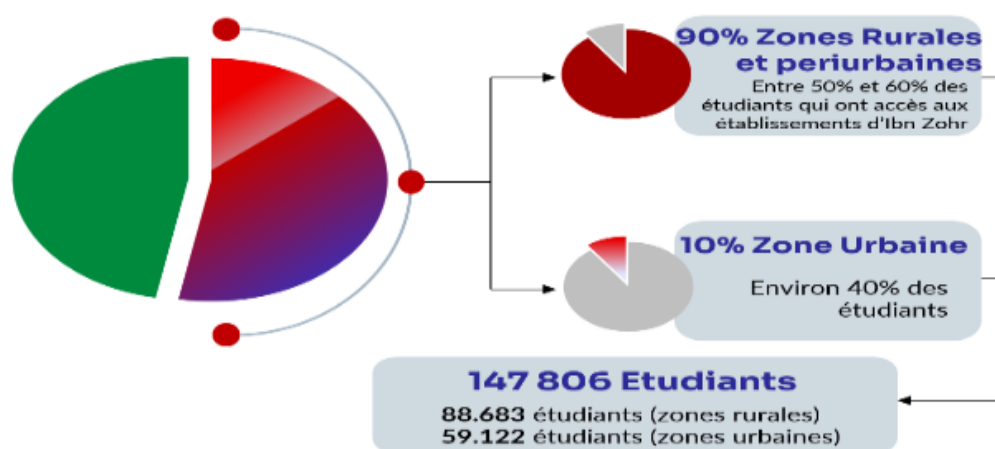


Figure 2. Student's geographic dispersion. (Source: www.uiz.ma / conceptualized and elaborated by the author)

4.2. Characteristics of the sample

The group is dispersed over the three years of the degree, with a noticeable concentration in the middle of the cycle. Of the study sample, the first-year accounts for 27.4%, the second year for 41.5% (the most represented group), and the third year for 31.1%. With 20.6% under 20, 57.1% between 21 and 25, and 22.3% over 25, the population is comparatively mature; the latter percentage may indicate continuing education or taking non-traditional routes.

Additionally, we have a significant female majority among the students participating in the study, with 37.6% men and 62.4% women.

Table 1. Characteristics of the sample. (Source: Adapted from: Quantitative study / conceptualized and elaborated by the author.)

Level of education	1st year of bachelor's degree	2nd year of bachelor's degree	3rd year of bachelor's degree
	27.4%	41.5%	31.1%
Age	Under-20	Between 21 and 25 years old	Over 25 years
	20.6%	57.1%	22.3%
Gender	Male		Female
	37.6%		62.4%
Parental home	University city		Outside the university city
	27.1%		72.9%

The vast majority of students are geographically mobile, meaning that at least three out of every four students will likely have additional coursework related to independent living, lengthy travel, or a university career.

The term "digital accessibility" refers to a set of strategies, guidelines, and procedures used by the university and its institutions to ensure that every student, particularly the most vulnerable, has equitable, independent, and long-lasting access to digital, administrative, and educational resources. (Granjon, 2022) claims that it includes three essential dimensions:

1. Hardware access (connection and equipment),
2. Digital abilities,
3. The ability to use these digital materials independently and critically, which depends on their simplicity.

4.3. Hardware access (connection and equipment)

Our qualitative study's findings indicate that Ibn Zohr University has built a robust infrastructure to deliver top-notch digital services to its users. All the universities, having already been connected to the Internet, have been equipped with computers, data storage servers, and other electronic devices.

Additionally, a crucial stage in the university's digital transformation is the integration of online learning platforms and establishing digital access accounts for every student. These

platforms enable more adaptable and customized approaches, improve communication between educators, administrators, and students, and make educational and administrative materials more accessible. They completely align with the New Development Model and the ESRI 2030 PACT's recommendations for reforming Morocco's educational system.

A secondary storage server has been placed in addition to the primary server to guarantee the security and protection of digital and private data. This ensures service continuity if the primary server fails.

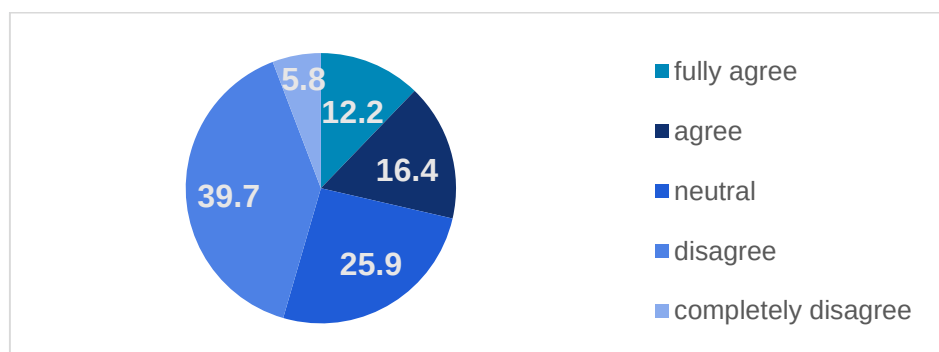


Figure 3. Students' responses on digital infrastructures. (Source: Quantitative study / conceptualized and elaborated by the author)

A strong data infrastructure must include storage servers because they offer centralized space for managing and storing data while improving safe access to it. The University's data infrastructure is made more capable by modern storage servers that incorporate cutting-edge technologies, including encryption, scalability choices, and automatic data backup and recovery.

However, the quantitative study's findings suggest that student satisfaction with the significance of these infrastructures is still lacking, as the graph illustrates, with 28.6% of students agreeing and 45.5% disagreeing.

4.4. Digital abilities

As a starting point for streamlining student accessibility at Ibn Zohr University, the management of digital infrastructures necessitates specialist human resources to guarantee its correct operation and high-quality performance. To carry out this function, Ibn Zohr University has hired skilled experts, such as media technicians, information engineers, and specialist administrators. The presidency of the university and its connected academic institutes share these resources according to assigned financial items, needs, and available capacities.

The operational efficiency of information technology personnel is largely governed by public employment frameworks and their institutional proximity to the university presidency. Specifically, these conditions dictate resource availability, inter-institutional allocation, and the quality of performance in assigned duties.

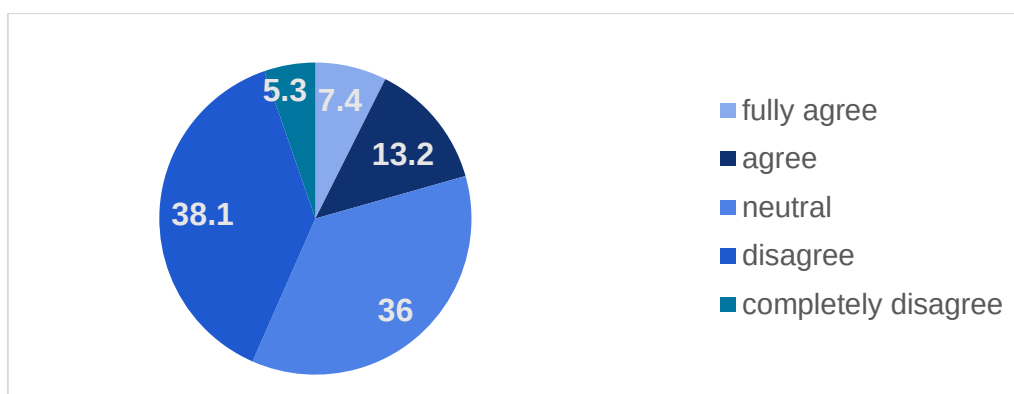


Figure 4. Students' responses to human resources skills. (Source: Quantitative study / conceptualized and elaborated by the author)

The establishments and presidency of Ibn Zohr University employ a total of 23 computer engineers, 35 specialized administrators, and 66 technicians specializing in media and digital fields in general, according to responses from administrative officials interviewed during the exploratory phase of the qualitative study. However, 43.4% of students disagreed with the statement that its human resources lack digital capabilities, while 20.6% agreed.

4.5. The capacity for autonomous and critical use:

In addition to controlling the steps of access to the doctoral body via a website designed for this purpose, the university has offered platforms for remote registration of new students in open and regulated institutions. However, thanks to a unique process set up for this reason, the university made it easier to apply for recruitment competitions by developing a G-Concours platform to handle and organize them remotely.

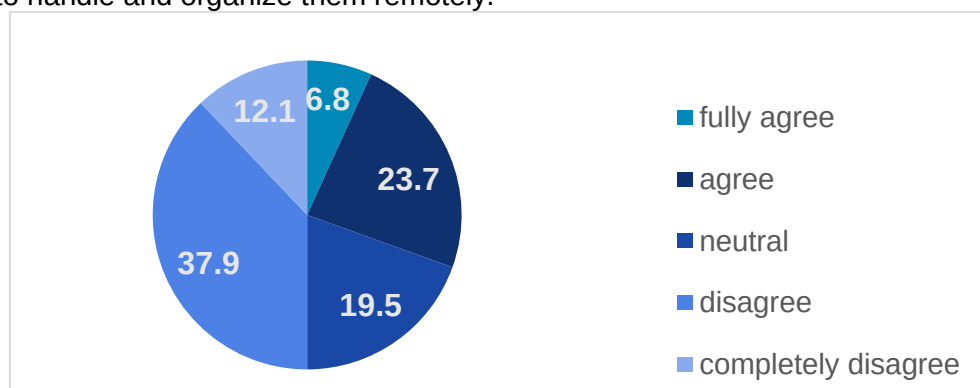


Figure 5. Students' responses on the functioning of electronic platforms. (Source: Quantitative study / conceptualized and elaborated by the author)

In terms of education, the university has made it possible for all its users to have remote access to several national and international electronic resources by setting up an account on the IMIST platform or using the ScholarVox platform. It also created MOOC platforms for online learning that are connected to students' social media accounts and electronic accounts. However, the students' replies indicate that these platforms are inefficient, with 30.5% agreeing and 50% disapproving.

5. Discussion

The findings indicate that the institutional digital platforms at Ibn Zohr University remain insufficiently accessible, particularly for students who live far from university campuses and rely on these platforms to access administrative and educational services. One of the major barriers identified is the absence of systematic training in digital accessibility for university staff, including both teachers and administrative personnel. These inequalities reflect a structural digital divide that is reinforced by disparities in institutional resources, technical expertise, and organisational capacity (BERCHEQ, 2022). These results are consistent with (Warschauer, 2003), concept of the second digital divide, which argues that digital inclusion depends not only on physical access to technology but also on users' ability to use digital tools effectively. Although accessibility standards have been formally integrated into the institutional framework of Ibn Zohr University, their implementation remains inconsistent because of recurring technical failures, limited institutional support, and inadequate maintenance.

The capacity approach of Sen and Nussbaum allows for a deeper analysis beyond this purely material view of digital access to examine what students can actually do and become. According to Sen, a person's ability to perform functions (succeed in studies, access information) depends on their personal, social, and environmental conversion factors. The geographical isolation and inaccessibility of platforms act as structural barriers that limit students' freedom of choice and action.

In the face of these deficiencies, the system shifts the burden of adaptation onto the students themselves. Instead of offering institutional level playing field, students are required to demonstrate excessive adaptability. This undermines autonomy and transforms the tool of emancipation into an additional burden.

Students described what can be characterised as a "do-it-yourself accessibility" approach, in which accommodations are informal, temporary, and largely dependent on their own adaptive capacities. The lack of appropriate equipment and technical assistance means that digital technologies function simultaneously as instruments of inclusion and sources of exclusion. These experiences illustrate the tension between the promise of digital inclusion and the persistence of structural inequalities. They also reflect what Mouchon (2020) describes as "compensatory tinkering", whereby individual coping strategies compensate for institutional shortcomings in ensuring universal accessibility.

The study further shows that the effectiveness of assistive technologies is constrained by software bugs, inappropriate ergonomics, and insufficient implementation of web content accessibility (WCAG, 2018). The principal structural barriers include limited access to specialised software, unstable internet connectivity, and shortages of appropriate digital equipment. These conditions contribute to cognitive exclusion by making it more difficult for students to interact effectively with digital learning environments. Consequently, accessibility depends not merely on the technical availability of digital tools but on their ability to respond to the diverse needs of users (Warschauer, 2003).

The accessibility evaluation, conducted using the CIRCET Morocco framework (CIRCET, 2018), and the French General accessibility improvement framework (RGAA, 2021), both aligned with WCAG 2.1 level AA, revealed substantial disparities among the websites of Ibn

Zohr University's academic institutions. Compliance differs by approximately 40% between institutions with regulated access and those with open access. Regulated-access institutions generally demonstrate clearer information architecture, better navigation, and greater compliance with accessibility standards, whereas open-access institutions exhibit significant shortcomings in website structure, usability, and the accessibility of educational and administrative resources.

These findings suggest that regulated-access institutions benefit from continuous improvement supported by public policies that prioritise elite higher education through greater material, technical, and human resources (Pellegrin, Alazali, & Meyer, 2020). In contrast, open-access institutions continue to experience chronic underinvestment. This disparity raises important questions regarding the equity of Moroccan higher education policies, the potential elitism of regulated-access institutions, and the managerial challenges that hinder the digital transformation of the university system as a whole. The findings also demonstrate that technological standards alone cannot guarantee digital accessibility without strong institutional governance and sustained organisational commitment.

The results identify three strategic priorities for improving digital accessibility: strengthening ethical governance, adapting accessibility policies to local institutional contexts, and providing continuous training and support for all stakeholders. Only through these measures can digital accessibility contribute meaningfully to social justice and equal educational opportunities.

Finally, the principles of transparency, equity and accountability (AYAD & ELHACHLOUFI, 2023) should guide the governance of digital technologies within higher education. Establishing monitoring mechanisms and involving students in the design, evaluation, and continuous improvement of digital platforms are essential, particularly because algorithmic systems may reproduce existing inequalities when trained on incomplete or biased datasets. Institutions must also remain accountable for the collection, processing, and protection of sensitive personal data. In this context, a comprehensive digital accessibility strategy should integrate artificial intelligence (AI) alongside existing digital technologies, while ensuring that AI systems are developed and deployed according to ethical and inclusive principles (Jobin, Ienca, & Vayena, 2019); (UNESCO, 2022) Digital accessibility should therefore be understood not only as a technical requirement but also as a matter of cognitive inclusion and social justice that enables universities to respond effectively to the diversity of students' educational needs.

5. Conclusion

As demonstrated by this field study at Ibn Zohr University, the digital transformation of educational and administrative services is crucial for enhancing students' digital accessibility. Nevertheless, the success of this transformation remains heavily influenced by social, political, and infrastructural factors. Although students can access digital resources via computers, tablets, or smartphones, many still encounter significant financial barriers. Even with a personal device, the high cost of internet access remains a major hurdle-exacerbated by inadequate scholarships and a persistent digital divide that restricts equitable access to digital tools. This situation disproportionately affects students from rural areas, many of whom face severe economic hardship. Moreover, institutional regulations still require physical presence on campus to access specific academic resources, particularly library services. This requirement undermines the flexibility and inclusiveness of digital services, especially for commuter students or

those residing far from the university. Consequently, by placing students at the center of technological innovation and bridging the digital divide in rural and peri-urban areas, Moroccan universities can drive equal educational opportunities and cognitive justice. Ultimately, these findings underscore the necessity of formulating public and institutional policies grounded in inclusive digital governance—integrating both technological and social dimensions to ensure equitable access to higher education.

Author contributions

- **Mustapha ASSOUANE:** Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing

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Use of generative AI

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Conflicts of interest

The authors declare that they have no conflicting interests.

Data Availability Statement

The data is available from the corresponding author upon reasonable request.

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