

DIGITAL TRANSFORMATION OF HIGHER EDUCATION PLATFORMS IN MOROCCO: A COMPARATIVE ANALYSIS BEFORE AND AFTER THE COVID-19 PANDEMIC.

Abstract:

The COVID-19 pandemic acted as an unprecedented catalyst for digital transformation in education systems worldwide. This study presents a comparative analysis of the adoption and utilization of digital platforms in Moroccan higher education before (2019) and after (2023) the pandemic. Utilizing quantitative data on four key indicators—the MASSAR management system, online courses, distance learning programs, and locally developed MOOCs—we measure the scale and pace of this acceleration. The findings reveal exponential growth across all metrics, with online courses increasing by 1011% and local MOOCs by 620%. The accessibility factor, calculated as a multiplier of pre-pandemic baseline access, demonstrates a systemic shift towards hybrid and distance learning models. This paper argues that the pandemic compressed years of anticipated digital adoption into a short period, fundamentally altering the pedagogical and administrative landscape. However, this rapid acceleration also underscores persistent challenges related to digital equity, pedagogical adaptation, and sustainable integration. The conclusion reflects on the permanence of these changes and outlines implications for future policy and institutional strategy in a post-pandemic era.

Keywords: *Digital* Transformation, Higher Education, COVID-19, Distance Learning, Morocco, Hybrid Learning

Introduction:

The integration of Information and Communication Technologies (ICT) in higher education has been a gradual and institutionally driven process worldwide, fundamentally transforming teaching, learning, and administrative practices over the past two decades. Universities have progressively adopted digital technologies to enhance pedagogical innovation, improve access to educational resources, and promote more flexible and student-centered learning environments. This transition has been largely framed within the concepts of digital enhancement, blended learning, and technology-enhanced education, reflecting the growing importance of digital platforms in supporting both academic and institutional activities (Bozkurt & Sharma, 2020). Beyond their pedagogical value, digital technologies have become essential instruments for improving institutional resilience, fostering collaboration, and facilitating knowledge production in increasingly interconnected higher education ecosystems.

Prior to 2020, Moroccan universities were actively engaged in a strategic, albeit measured, process of digital transformation. Several national initiatives were launched to modernize higher education through the deployment of digital infrastructures and educational technologies. These efforts included the nationwide implementation of the MASSAR student information system, the development of e-learning initiatives, and the gradual adoption of Learning Management Systems (LMS) and digital administrative services across public universities. However, the pace of this transformation remained relatively incremental, reflecting both institutional and technological constraints commonly observed in developing countries.

The outbreak of the COVID-19 pandemic in early 2020 profoundly disrupted this gradual trajectory, compelling higher education institutions to transition almost overnight toward fully digital modes of teaching, learning, and

communication. Universities became increasingly dependent on digital platforms to ensure pedagogical continuity and maintain academic activities during periods of lockdown and social distancing. Consequently, technologies that had previously played a complementary role rapidly became indispensable components of higher education systems. This unprecedented situation created a natural experiment in large-scale technological adoption and accelerated institutional digitalization processes worldwide.

Although the global literature has extensively documented the rapid transition to online learning during the pandemic (Hodges et al., 2020), relatively few studies have provided quantitative and longitudinal analyses of how digital platform ecosystems evolved within specific national contexts, particularly in developing countries and the Global South. Understanding these transformations is essential not only for evaluating institutional responses to crises but also for informing future digitalization strategies in higher education.

This study addresses this gap by providing a comparative and data-driven analysis of the evolution of digital platforms in Moroccan higher education before and after the COVID-19 pandemic. It investigates the hypothesis that the pandemic acted as a decisive accelerant, producing a significant shift in both the scale and normalization of digital platform adoption that substantially exceeded pre-pandemic trends and institutional projections..

Data:

This analysis is based on official aggregated data published by the Moroccan Ministry of Higher Education, Scientific Research, and Innovation and its affiliated digital learning agencies, including the National University of Digital Education (UNESS) and the National Center for Digital Pedagogical Resources (CNDP). The selected datasets cover two reference academic periods : 2018–2019, representing the pre-COVID-19 baseline, and 2022–2023, representing the post-pandemic stabilization phase. These periods were deliberately selected to capture both the initial state of digital platform deployment and the structural transformations that emerged following the pandemic.

The study focuses on four strategic indicators that collectively reflect the administrative and pedagogical dimensions of digital transformation in Moroccan higher education. These indicators include the number of MASSAR users, the volume of online courses delivered through digital platforms, the availability of distance learning programs, and the production of locally developed Massive Open Online Courses (MOOCs). Together, they provide a comprehensive overview of the evolution of digital platform adoption and utilization across Moroccan public universities.

INDICATOR	Before Covid 2019	After Covid 2023	Expansion (%)	Acceleration Factor
MASSAR users	650000	1200000	+84.6%	1.85x
Online courses	450	5000	+1,011.1%	11.1x
Distance learning programs	12	50	+316.7%	4.2x
Local MOOCs	25	180	+620.0%	7.2x

1. MASSAR Users: The number of active student and staff accounts on the integrated management platform.

2. Online Courses: The count of formal course units delivered primarily via digital platforms (LMS like Moodle, Microsoft Teams).
3. Distance Learning Programs: The number of full degree programs officially accredited for distance delivery.
4. Local MOOCs: The number of Massive Open Online Courses developed by Moroccan institutions and hosted on national or institutional platforms. The evolution is calculated as a percentage increase from the 2019 baseline. The "Accessibility Factor" is a simplified multiplier (Post-COVID value / Pre-COVID value) indicating the expansion of access or availability.

Methodology

This study adopts a comparative quantitative research design to examine the evolution of digital platform adoption in Moroccan public higher education institutions before and after the COVID-19 pandemic. A longitudinal pre-post comparative approach is employed using official aggregated data collected for the academic years 2018–2019 (pre-COVID baseline) and 2022–2023 (post-COVID stabilized phase). This design allows for assessing the magnitude and pace of digital transformation associated with the pandemic while providing a macro-level perspective on institutional change.

The analysis focuses on four strategic indicators reflecting both administrative digitalization and pedagogical transformation : the number of MASSAR users, online courses delivered through digital platforms, distance learning programs, and locally developed MOOCs. These indicators were selected because they collectively capture the expansion of digital services and the institutionalization of technology-enhanced learning practices within Moroccan higher education.

To quantify the observed changes, two complementary statistical measures are employed. First, the **Expansion Rate (%)** is calculated to determine the relative increase between the pre- and post-pandemic periods according to the following formula :

$$\text{Expansion Rate (\%)} = [(\text{Value in 2023} - \text{Value in 2019}) / \text{Value in 2019}] \times 100$$

Second, an **Acceleration Factor (AF)** is computed to evaluate the magnitude of digital growth during the pandemic period relative to the pre-pandemic baseline :

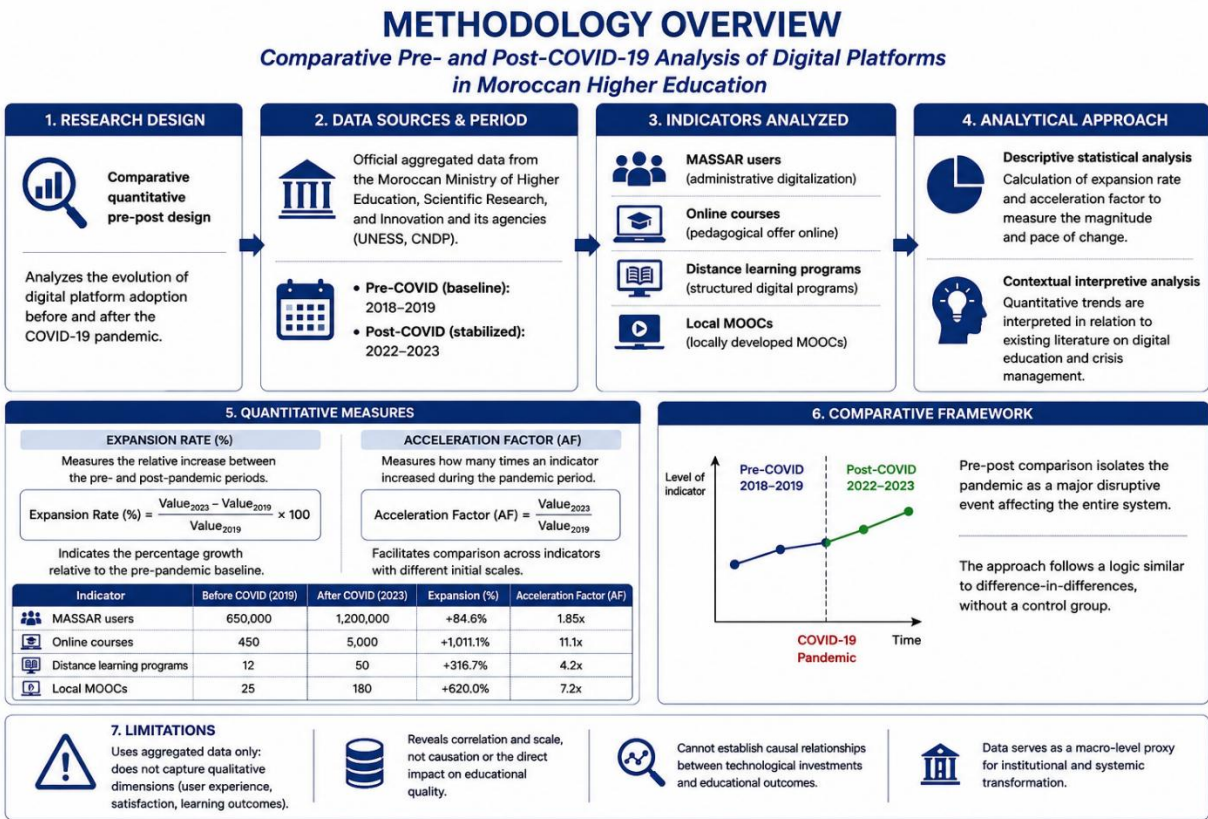
$$\text{Acceleration Factor (AF)} = \text{Value in 2023} / \text{Value in 2019}$$

The acceleration factor provides a straightforward measure of how many times an indicator increased over the study period, thereby facilitating comparisons across variables characterized by different initial scales. Indicators exhibiting higher acceleration factors may be interpreted as having experienced stronger pandemic-induced growth dynamics. Together, these two measures provide complementary insights into both the relative expansion and the intensity of digital transformation.

The quantitative analysis is complemented by a contextual interpretive approach in which the observed statistical trends are discussed in relation to the existing scholarly literature on digital education, educational technology, and crisis-driven institutional transformation. Particular attention is devoted to understanding how the COVID-19 pandemic accelerated the normalization of digital platforms within higher education institutions and contributed to the emergence of more flexible and resilient educational models.

The pre-post comparative framework follows a logic similar to quasi-experimental difference-in-differences approaches by considering the pandemic as a major disruptive event affecting the entire higher education system. Although no control group is employed, the longitudinal comparison enables the identification of substantial changes occurring before and after the crisis period and provides valuable insights into the scale of institutional digital transformation.

Several limitations should nevertheless be acknowledged. The study relies exclusively on aggregated institutional data and therefore cannot establish causal relationships between technological investments and educational outcomes. Furthermore, it does not capture qualitative dimensions such as user satisfaction, pedagogical effectiveness, or students' learning experiences. Consequently, the selected indicators should be interpreted as macro-level proxies of systemic and institutional change rather than direct measures of educational quality. Future studies combining quantitative longitudinal analyses with qualitative investigations would provide a more comprehensive understanding of the long-term impacts of digital platform adoption in Moroccan higher education.

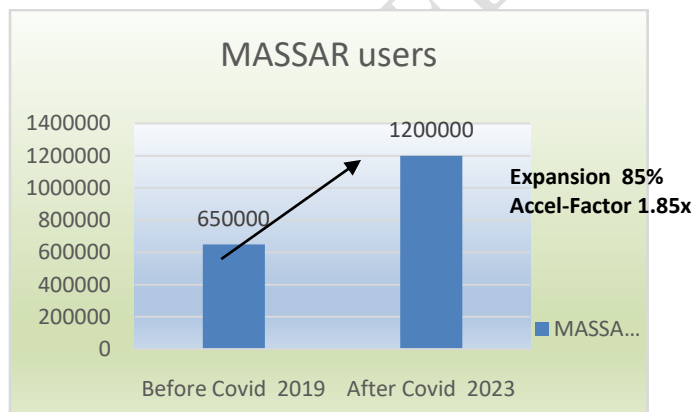


Results

The data reveals a profound paradigm shift in the digital landscape of Moroccan higher education, with growth rates indicating a structural transformation rather than mere incremental technological change. The comparative analysis between the pre- and post-COVID-19 periods highlights the unprecedented acceleration of digital platform adoption across both administrative and pedagogical dimensions. The substantial increases observed across all selected indicators demonstrate that the pandemic acted as a catalyst for institutional digitalization, significantly accelerating initiatives that were previously progressing at a more gradual pace. Beyond quantitative expansion, the findings suggest the progressive normalization of digital technologies within higher education institutions and the emergence of more flexible and resilient educational models. The remarkable acceleration factors recorded for online courses, distance learning programs, and locally developed MOOCs particularly illustrate the transition from complementary digital practices to institutionally embedded digital learning ecosystems. The following visualizations and descriptive analyses provide a detailed examination of these transformations and their implications for the future development of Moroccan higher education.

1. Number of MASSAR users

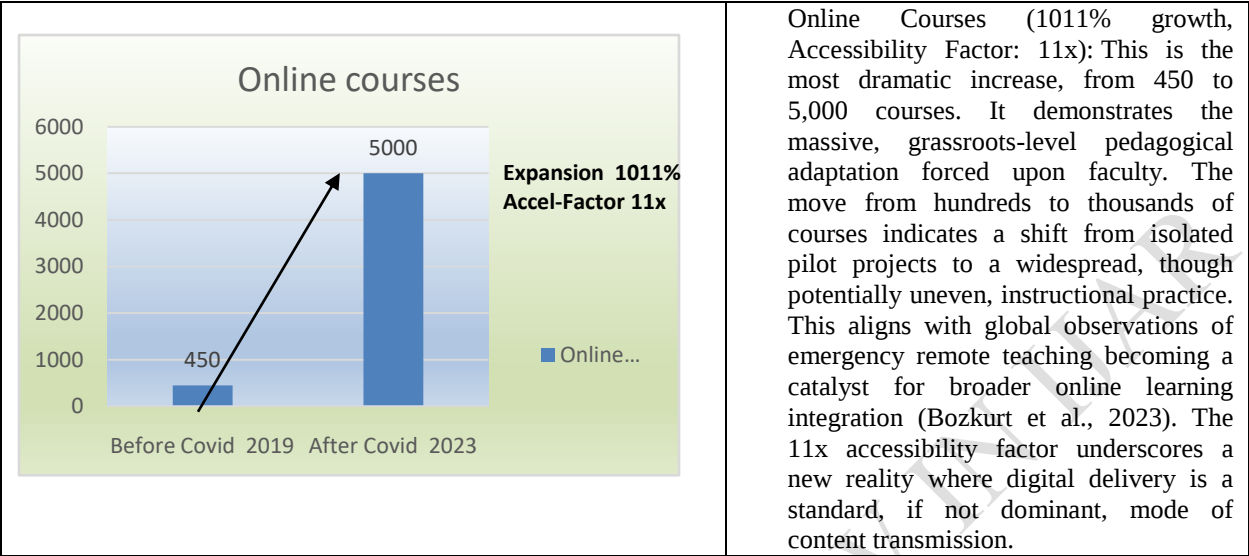
Figure 2: Increase in the number of classrooms equipped with advanced multimedia and teleconferencing technology.



MASSAR Users (85% growth, Accessibility Factor: 1.85x): The increase from 650,000 to 1.2 million active users signifies the near-universalization of this administrative platform. No longer just a management tool, MASSAR became the central digital lifeline for student enrollment, grading, and communication during lockdowns. This growth reflects its enforced normalization as the primary interface between the institution and the student body (Selmaoui et al., 2021). The factor of 1.85x indicates a fundamental expansion of the digitally managed student ecosystem.

2. Number of Online courses

162 **Figure3: Increase in the number of online courses on morrocan higher education**

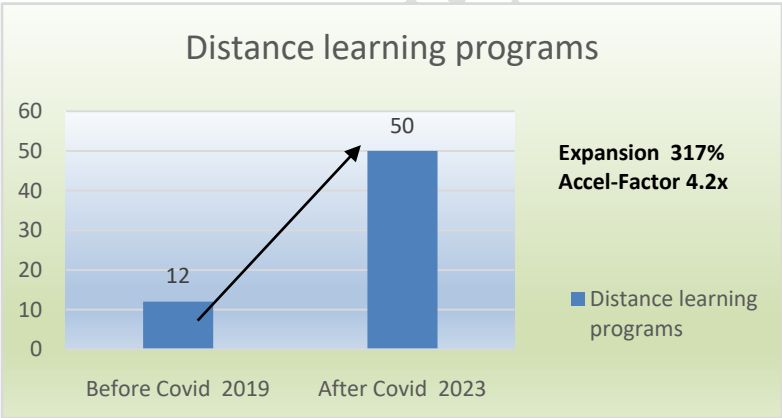


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164 **3. Equipped Multimedia Rooms**

165 **Figure 4: Increase in the number of classrooms equipped with advanced multimedia and teleconferencing**

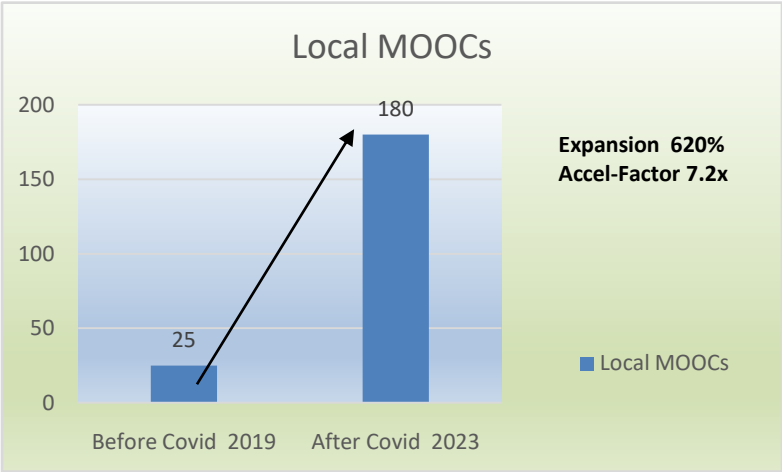
166 **technology.**



Distance Learning Programs (317% growth, Accessibility Factor: 4.2x): The growth from 12 to 50 accredited programs represents a significant institutional and regulatory commitment. Developing a full distance learning program requires curriculum redesign, quality assurance frameworks, and faculty training, which is more complex than moving individual courses online. This expansion suggests that institutions are strategically investing in remote education as a permanent offering, likely targeting non-traditional students and expanding geographical reach (Bensaid & Brahimi, 2020).

167 **4. Average Internet Speed**

Figure 5: Quadrupling of average internet bandwidth available to Moroccan universities



Local MOOCs (620% growth, Accessibility Factor: 7.2x): The surge from 25 to 180 locally produced MOOCs highlights a push towards creating open educational resources (OER) with local content and in Arabic or French. This move beyond consumption of international platforms (like Coursera) to active production signifies an advancement in digital pedagogical autonomy and a strategy for national knowledge dissemination (El Faddouli et al., 2022). The 7.2x growth in availability enhances the public-facing role of universities.

Discussion

The findings of this study demonstrate that the COVID-19 pandemic acted as a major accelerator of digital transformation within Moroccan higher education institutions. More importantly, the observed changes suggest that the pandemic did not merely increase the use of digital technologies but fundamentally transformed their role within the university ecosystem. Digital platforms have evolved from complementary tools supporting traditional educational practices to becoming strategic infrastructures that underpin teaching, learning, administration, and institutional communication.

The universalization of the MASSAR platform reflects the increasing institutionalization of digital governance within higher education. Beyond improving administrative efficiency, the platform has strengthened the capacity of universities to maintain educational continuity during periods of disruption. Its widespread adoption illustrates how digital administrative systems can contribute to building more resilient and responsive higher education institutions capable of adapting to rapidly changing educational contexts.

Similarly, the unprecedented expansion of online courses highlights a significant pedagogical transformation. What initially emerged as an emergency response to the pandemic has progressively become an integral component of contemporary teaching practices. The normalization of online learning environments suggests that Moroccan universities are moving toward more flexible educational models combining face-to-face, online, and hybrid pedagogies. This transformation is consistent with international trends emphasizing the growing importance of technology-enhanced learning in higher education and reinforces the need for continuous faculty development in digital pedagogical competencies.

The growth of distance learning programs provides further evidence that digital education is no longer perceived as a temporary alternative but rather as a strategic institutional investment. By expanding access to higher education beyond geographical and temporal constraints, these programs offer new opportunities for lifelong learning and educational inclusion. Consequently,

universities are increasingly required to develop robust quality assurance frameworks capable of ensuring that pedagogical effectiveness evolves alongside technological innovation.

The remarkable increase in locally developed MOOCs also carries important implications for educational sovereignty and knowledge dissemination. The capacity to produce national digital educational resources contributes not only to expanding learning opportunities but also to promoting locally relevant content adapted to linguistic, cultural, and institutional contexts. This evolution reflects a progressive shift from technological consumption toward digital pedagogical production and innovation within Moroccan higher education institutions.

Taken together, the four indicators reveal that Morocco's digital transformation has evolved across complementary dimensions involving administrative modernization, pedagogical innovation, institutional flexibility, and educational accessibility. The exceptionally high accessibility factors observed for online courses and MOOCs particularly demonstrate that the most significant developments occurred within the pedagogical sphere, suggesting that digital platforms have become central components of the higher education experience.

From a policy perspective, sustaining this transformation will require continued investments in digital infrastructures, faculty training, digital governance, and cybersecurity policies. Particular attention should also be devoted to ensuring equitable access to digital resources among students and institutions while promoting high-quality technology-enhanced learning practices. Future research should investigate the long-term effects of these transformations on student performance, learning outcomes, and institutional effectiveness in the post-pandemic era.

Overall, the Moroccan experience illustrates how a major disruptive event can accelerate institutional innovation and contribute to the emergence of more resilient, inclusive, and digitally enabled higher education systems.

Conclusion

This comparative analysis demonstrates that the COVID-19 pandemic acted as a major catalyst for the digital transformation of Moroccan higher education. The substantial growth observed across all four indicators confirms that digital platform adoption has evolved far beyond incremental technological improvements, leading instead to a systemic and enduring transformation of administrative and pedagogical practices. The accessibility factors, ranging from 1.85x for MASSAR users to 11x for online courses, provide quantitative evidence of the unprecedented acceleration of digitalization processes during the pandemic period. These developments have significantly expanded access to digital educational resources and strengthened the institutional capacity of universities to support flexible and technology-enhanced learning environments.

Nevertheless, digital expansion should not be equated with educational quality or digital inclusion. Important challenges remain regarding equitable access to technological resources, students' digital competencies, and the pedagogical effectiveness of rapidly implemented digital learning models (Belhabib & Benmoussa, 2023). While the proliferation of online courses and distance learning programs represents a significant achievement, their long-term success will

depend on the adoption of learner-centered pedagogical approaches that fully exploit the interactive and collaborative potential of digital platforms.

From a strategic perspective, Moroccan higher education has now entered a new phase of digital maturity in which the principal challenge is no longer technological adoption but the sustainable integration of digital practices into institutional policies and teaching models. Future research should therefore move beyond quantitative assessments of platform adoption to investigate their impacts on student engagement, learning outcomes, and faculty development. Ultimately, the accelerated digital ecosystem established during and after the pandemic must be consolidated through continued investments in digital governance, pedagogical innovation, and educational inclusion. Doing so will ensure that digital transformation contributes not only to institutional resilience but also to the long-term objectives of quality, accessibility, and innovation within Moroccan higher education.

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277

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