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The Role of Technology in Enhancing Higher Education: A Journey Toward the Smart University

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Abstract:

This research paper highlights the role of technology in enhancing higher education by tracing the evolution of digital tools and technologies in Algerian universities. The higher education sector has undergone significant transformations, most notably through the integration of information and communication technologies into the educational process, the adoption of digital platforms, the expansion of distance learning, and the modernization of teaching methods and scientific research practices. These transformations have contributed to improving the quality of education and facilitating access to knowledge, despite persistent challenges related to digital infrastructure and the level of technological training.

The study also examines the prospects for transitioning toward the smart university in Algeria, as a contemporary model grounded in the use of advanced technologies such as artificial intelligence to improve institutional performance and foster an integrated and intelligent learning environment. This transformation demonstrates promising potential for advancing higher education, provided that the necessary technical and human capacities are ensured and effective digital strategies are adopted to meet the demands of the digital age.

Keywords: Technology; Higher Education; Smart University; Digital Transformation.

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I. INTRODUCTION

Higher education in the modern era is undergoing profound and accelerated transformations driven by successive scientific and technological developments, as its role is no longer confined to the transmission of knowledge, but has become a fundamental pillar in building societies grounded in innovation and the knowledge economy (Zaher, 2001, p. 215). In the context of digital globalization, the higher education sector faces multiple challenges, including the need to improve the quality of training, keep pace with technological developments, respond to the changing demands of the labor market, and foster openness to global educational environments. This compels universities to reconsider their traditional approaches and seek new models that are more flexible and effective (Boukeraa, 2018, pp. 60–71)

In this context, technology emerges as a decisive factor in societal development, given the vast opportunities it offers in accessing and exchanging knowledge, as well as in advancing teaching and learning methods. Algerian universities, in turn, have witnessed a gradual evolution in the integration of information and communication technologies through the adoption of e-learning, digital platforms, and the modernization of teaching methods and scientific research. However, this trajectory continues to face a number of challenges, mainly related to digital infrastructure, insufficient technological training, and the difficulty of transitioning toward the "smart university" model, which is based on the use of advanced technologies such as artificial intelligence and big data to improve university performance (Al-Sayyid, 2026, pp. 353–363) .

Accordingly, this article aims to highlight the role of technology in enhancing higher education in Algeria, analyze the current state of digital transformation in Algerian universities, and explore the prospects for transitioning toward the smart university. The importance of this topic lies in its direct relevance to the development of the higher education system and the achievement of quality training, in addition to its contribution to supporting the digital economy. It also seeks to achieve several objectives, most notably diagnosing the current state of technology use in higher education, identifying the challenges that hinder digital transformation, and proposing ways to advance Algerian universities in this field.

Accordingly, the following research question may be raised: To what extent can technology contribute to the development of higher education in Algeria and enable its transition toward the smart university model in light of current challenges?

To address this question, the descriptive-analytical method was adopted through examining the current state of technology use in Algerian higher education, analyzing the various data associated with it, and investigating the prospects for transformation toward the smart university.

Section One: The Development of Technology in Higher Education in Algeria

The higher education sector in Algeria has witnessed remarkable progress in the field of technology integration, reflecting a growing orientation toward modernizing the educational system and keeping pace with global digital transformations. Examining the development of technology in this field constitutes an essential entry point for understanding the current state of higher education and its role in achieving knowledge-based development (Bouguerra & Barraoudi, 2015, pp. 87–103). In this context, attention will be given to clarifying the concept of

the smart university as a modern model based on the use of advanced digital technologies, alongside highlighting the importance of technologically advanced higher education in fostering innovation and improving the quality of training (Boukhaoua & Abdelrazak, 2004, p. 127) .

Attention will also be directed toward the current state of technology use in Algerian universities by reviewing the gradual developmental path this sector has experienced in integrating digital tools, while identifying the most prominent challenges that continue to hinder the achievement of comprehensive digital transformation, whether in relation to infrastructure, human competencies, or the requirements for transitioning toward the smart university model.

First: The Concept of Technology in Higher Education

Educational technology is considered one of the modern concepts associated with the evolution of human societies and their transition from the traditional model to the digital one. It is defined as the set of educational means that rely on the use of technological materials, equipment, and software within the educational process, in connection with modern communication systems. However, this concept did not emerge suddenly; rather, its roots extend to distant historical stages. Some scholars argue that it dates back to primitive human beings who used simple tools and techniques for learning and adapting to their environment. With the development of civilizations, this concept underwent gradual transformations until it assumed its contemporary form, which is based on integrating digital technology into the various components of the educational process (Faqihi, 2023, pp. 195–210)..

1. Definition of Educational Technology

UNESCO has defined educational technology as a systematic approach aimed at designing, implementing, and evaluating the educational process according to specific objectives, through the mobilization of all available resources in order to achieve more effective education (UNESCO, n.d.), This definition reflects the comprehensive dimension of educational technology, as it is no longer limited to the mere use of technical tools, but has come to encompass pedagogical planning, the management of the educational process, and the evaluation of its outcomes. The integration of technology into education also contributes to the development of teaching and learning methods by shifting from traditional lecture-based approaches to interactive methods grounded in participation and motivation, thereby improving the quality of academic achievement.

However, the achievement of these objectives remains contingent upon the provision of an integrated technological environment within educational institutions, including digital infrastructure, modern equipment, and qualified human resources. It is equally dependent on the availability of adequate funding to reduce the digital divide among educational institutions, whether within the public sector itself or between the public and private sectors (Bouchallaq, 2002, p. 307). In this context, the quality of education and academic research is considered a direct outcome of the interaction between, on the one hand, the competence of instructors and, on the other, advanced educational curricula. This complementarity contributes to creating a stimulating learning environment based on interaction and innovation, thereby enhancing the development of the educational system and elevating the standard of scientific research in universities.

From a doctrinal perspective, technology in higher education is also defined as an integrated system of modern tools and techniques used to improve the educational process and develop methods of knowledge transmission within the university. A number of Arab scholars have addressed this concept, with some considering it a modern framework that combines technical and pedagogical means in order to achieve greater effectiveness in education and

enhance interaction between teacher and student . Others have emphasized its role as a fundamental instrument for the transition from traditional education to innovation-driven digital education (Tuaima & Al-Bandari, 2004, p. 510).

In French legal scholarship, educational technology has been viewed as part of the transformations affecting the educational system under the digital revolution. Some scholars argue that it constitutes a means of reorganizing the educational process on modern foundations based on interaction, flexibility, and the use of digital media. This perspective further emphasizes that educational technology is no longer merely an auxiliary tool, but has become a fundamental component in building an advanced educational system capable of responding to the demands of the digital age (Al-Assili, 2000, p. 124)..

Gentry defined educational technology as "the systematic application of strategies and techniques derived from concepts in the behavioral sciences, the physical sciences, and other fields of knowledge for the purpose of solving educational problems" (Gentry, 1991, p. 33), This definition highlights the scientific and organizational character of the field and underscores its role in improving the effectiveness of the educational process through the mobilization of interdisciplinary knowledge.

The Association for Educational Communications and Technology (AECT) also defined it as "the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning." This definition reflects the comprehensive scope of educational technology, as it is not confined to technical means alone, but extends to encompass all stages of the educational process from planning and implementation to evaluation thereby ensuring effective and sustainable learning.

2. The Importance of Technologically Advanced Higher Education

Advanced higher education constitutes one of the fundamental pillars for building modern societies, given its central role in knowledge production and in developing human competencies capable of keeping pace with economic and technological transformations. University education is no longer confined to the transmission of conventional knowledge; rather, it has become a space for creativity and innovation, contributing to the preparation of generations capable of critical thinking and solving complex problems, which in turn positively impacts the comprehensive development of nations.

Many developed countries have recognized the importance of advancing higher education and have therefore modernized their curricula and linked them to modern technology and labor market demands. In the United States, universities such as the Massachusetts Institute of Technology and Stanford University are considered leading models in integrating scientific research with technological applications, thereby contributing to the support of an innovation-driven economy. Finland has also achieved remarkable progress by adopting a flexible educational system focused on quality and interaction, while encouraging self-directed learning and the use of digital technologies in the educational process.

In the Asian context, the experiences of South Korea and Singapore highlight the importance of investing in higher education as a means of achieving rapid economic development. These countries modernized their universities and linked them to industry, thereby contributing to the graduation of highly qualified competencies capable of competing globally. They also strengthened digital education and scientific research, enabling them to emerge as global hubs in technology and innovation.

Accordingly, the development of higher education is no longer an option but an imperative necessity imposed by the demands of the digital age, as it contributes to strengthening national competitiveness, achieving sustainable development, and building a

knowledge-based economy, while requiring adaptation to national specificities in order to ensure maximum effectiveness.

Second: The Current State of Technology in Higher Education in Algeria

The higher education sector in Algeria is characterized by a diversified institutional structure reflecting the State's efforts to develop and expand the university system. The university network includes nine (9) university centers, each composed of affiliated institutes and departments, in accordance with Article 3 of Executive Decree No. 05-299, which defines the missions of the university center and the rules governing its organization and operation. This structure also includes specialized institutions, notably eleven (11) higher schools for teachers, in addition to thirty-seven (37) national higher schools, each of which includes specialized academic departments, in accordance with Articles 3 and 4 of Executive Decree No. 16-176 establishing the model statute of the higher school. This institutional diversity reflects a clear orientation toward strengthening specialization and improving the quality of training in line with the requirements of national development .

1. The Gradual Development of Technology in Algerian Universities

Technology has emerged as one of the fundamental factors in developing and improving the quality of the educational process, as information and communication technologies play a pivotal role in modernizing teaching and learning methods by reducing the time and effort required and increasing the effectiveness of knowledge transmission. Numerous studies have demonstrated that the appropriate integration of these technologies into the various components of the educational process contributes to improving its outcomes and benefits society through the preparation of competencies capable of keeping pace with scientific and technological developments.

Technology also contributes to the provision of a high-quality educational environment through the establishment of specialized information banks that enable students and researchers to access knowledge rapidly and invest it in scientific research, thereby enhancing knowledge production and contributing to the development of practical solutions to various societal problems. In this context, digitalization enables universities to achieve their fundamental objectives as stipulated in Algerian legislation, particularly Executive Decree No. 03-279 of 23 August 2003 (Executive Decree No. 03–279, 2003), which defines the missions of the university and the rules governing its organization and operation, especially Articles 5 and 6, which emphasize the university's role in training, research, and service to society.

The quality of training is among the principal objectives that educational technology seeks to achieve, as training constitutes one of the core domains within the national framework for quality assurance in higher education. This prompted the Ministry of Higher Education and Scientific Research to adopt policies aimed at improving the quality of education through the integration of technology, as reflected in Decision No. 167 of 31 May 2010 establishing a National Committee for the implementation of the quality assurance system in higher education.

Technology has also contributed to the development of university administration through the shift toward electronic management. The adoption of information systems and digital applications has improved communication among the various actors involved in the educational process and enhanced the efficiency of administrative management. This was further confirmed by the Ministry of Higher Education's initiative through Decision No. 50 of 21 January 2018 concerning the establishment of a committee responsible for providing technical support for the digitalization of the administration of the higher education and scientific research sector (Ministerial Decision No. 50, 2018, p. 12). Thus, digitalization constitutes a fundamental pillar

in modernizing the Algerian university and elevating its performance to more advanced and efficient levels.

The Moodle platform is considered one of the most prominent web-based e-learning systems, as it is a free application that provides an integrated educational environment supporting various dimensions of the educational process. This platform offers multiple tools for course design, student monitoring, and academic guidance, in addition to the integration of diverse learning resources such as web pages and multimedia files (Sghiri et al., 2021, p. 952). It also provides tools for creating, grading, and publishing electronic examinations, as well as communication and interaction tools between students and instructors, such as chats and discussion forums, thereby contributing to the efficient and effective achievement of educational objectives within an integrated digital environment.

On the other hand, Zoom is among the most prominent modern communication applications that have emerged in the field of distance education. It is an American company headquartered in San Jose, operating in the field of communications technology. This platform provides multiple services, including video conferencing and online chat through a cloud-based peer-to-peer communication system. It is also widely used in distance education and in organizing virtual conferences and academic events, as it enables screen sharing, file display, and presentation delivery, in addition to accessibility across various smart devices (Tatbirat, 2022, pp. 44–67). These features have contributed to ensuring the continuity of the educational process and facilitating communication among the different actors within the university environment.

As for Google Forms, it is one of the effective technological tools supporting e-learning, as it enables the easy and rapid creation of electronic tests, questionnaires, and surveys. This application is distinguished by its capacity to collect and analyze data instantly, particularly when integrated with Google Drive, where responses are automatically stored in Google Sheets spreadsheets, allowing users to sort and extract results in an organized manner. It also contributes to providing accurate and immediate feedback, thereby enhancing the effectiveness of the educational process and improving the quality of assessment and follow-up within the digital environment.

2. Challenges Facing Higher Education in Developing the Smart University in Algeria

The higher education sector in Algeria, like that of many developing countries, faces a range of challenges related to the use of information and communication technologies, whether in university education or in education more broadly. Among the most prominent of these challenges is the high cost of technological tools, such as computers, relative to individuals' income levels, in addition to the limited spread and relative monopolization of communication services, which hinders the widespread adoption of modern technologies. Furthermore, the digitalization of higher education in Algeria remains far from the level achieved by developed countries, and even by some countries with comparable resources, despite certain initiatives such as distance learning and the digitalization of university websites, which often remain either outdated or insufficiently utilized (Zarqoun & Toufik, 2025, p. 327).

Teaching methods in many universities also continue to rely on traditional approaches, whether in lectures or tutorial sessions, which negatively affects students' academic achievement. However, the COVID-19 pandemic marked a significant turning point (Driadi & Bousbaa, 2023, pp. 212–225), as it compelled the Ministry of Higher Education to accelerate the pace of digital transformation through the establishment of electronic educational platforms containing lessons and lectures for the benefit of both students and instructors. Digital platforms such as the "Iqra" platform, affiliated in the National Office of University Publications, were also launched to provide access to various scientific references. This experience highlighted the

importance of information and communication technologies in improving students' comprehension, facilitating the educational process, reducing costs, and opening new prospects for communication and scientific exchange at the international level.

Despite these efforts, several obstacles continue to limit the effectiveness of digital transformation in Algerian universities, including insufficient equipment, such as the limited number of computer laboratories, the inadequate availability of specialized educational software, and the absence of internet access in some classrooms, in addition to the general weakness of digital infrastructure. This transformation also faces human challenges, including some instructors' limited mastery of modern technologies or their weak engagement with them, in addition to administrative constraints that do not encourage innovation, as well as legal issues related to the protection of intellectual property rights in software and digital content.

The technical challenges associated with digital transformation in higher education are reflected in the difficulties resulting from the rapid pace of technological development, whether in terms of hardware, software, or emerging technologies, which makes it difficult for the various actors involved in the educational process to adapt quickly. The integration of technology into education is among the most significant of these challenges, particularly given disparities in the preparedness of educational environments and the limited awareness among some stakeholders of its importance and positive implications. Therefore, the success of this transformation requires the concerted efforts of all stakeholders through strengthening awareness of the importance of digitalization and providing the necessary training to ensure the effective use of modern technologies (Zarqoun & Toufik, 2025, p. 327).

Educational challenges, for their part, revolve primarily around the need to adopt a modern intellectual and pedagogical vision within higher education institutions, one based on the planned and deliberate integration of technology into the educational process. This requires preparing the relevant actors psychologically and intellectually to accept this transformation, in addition to developing curricula and teaching methods in line with the demands of the digital age. Educational programs must also be adapted to societal needs and development requirements in order to ensure the quality and effectiveness of training (Yousfi, 2016, pp. 173–184).

As for legislative challenges, these are linked to the capacity of the legal framework to keep pace with digital transformation through the enactment of clear legislation regulating the use of technology in higher education. This includes guaranteeing freedom of thought and intellectual production, protecting intellectual property, adopting modern mechanisms such as electronic signatures, and establishing laws governing partnerships between the university and its economic and social environment. It also requires updating incentive and promotion systems in ways that encourage innovation and the use of modern technologies.

Human resources, on the other hand, represent a decisive factor in the success of digital transformation, as this requires the availability of qualified competencies in the field of educational technology, together with the development of continuous training programs to keep pace with technological advancements. Instructors must also be encouraged to move from traditional methods toward interactive and creativity-based e-learning through intensive training in the use of various digital tools and applications.

At the level of material resources, the provision of adequate funding constitutes one of the most significant challenges facing the implementation of e-learning, as it requires substantial investments to equip digital infrastructure, provide technological tools, and train human resources. Ensuring the continuity of funding in the context of economic fluctuations represents an additional challenge, particularly in light of the rising costs of recruiting and qualifying competencies, which calls for the adoption of sustainable financial policies capable of supporting digital transformation in higher education (Yousfi, 2016, pp. 173–184).

Section Two: Prospects for the Transition Toward the Smart University in Algeria

The concept of the smart university has emerged as one of the modern models seeking to achieve a qualitative transformation in higher education through the preparation of highly competent educational outcomes capable of interacting with an advanced technological environment. This model is based on the provision of an integrated educational environment that includes digital infrastructure, as well as administrative, pedagogical, and organizational facilities, thereby contributing to the development of educational systems, the enhancement of scientific research quality, and the creation of more effective learning opportunities in line with global developments in education and technology.

First: Adopted Strategies

The adoption of effective digital transformation strategies in higher education has become an urgent necessity imposed by the rapid transformations taking place worldwide in the fields of technology and knowledge. The development of the university system is no longer possible without adopting modern approaches based on the use of digital tools and the strengthening of scientific partnerships. In this context, universities seek to adopt a set of integrated strategies aimed at improving the educational environment and enhancing institutional performance through investment in digital infrastructure and the modernization of teaching methods, in addition to openness to national and international institutions in ways that promote the exchange of expertise and the transfer of knowledge (Bouzqou & Al-Arabi, 2025, pp. 445–455).

Accordingly, attention will be directed toward the most significant strategies adopted to support digital transformation in higher education, as a fundamental step toward building a smart university capable of responding to the demands of the contemporary era.

1. Developing the Digital Environment

The development of the digital environment constitutes one of the fundamental pillars for the success of digital transformation in the higher education sector. This requires the provision of an integrated technological infrastructure, including high-speed internet networks, modern computing equipment, and effective e-learning platforms. Such development contributes to the creation of an interactive learning environment that enables students to access academic resources with ease, while also allowing instructors to adopt modern teaching methods based on digital media, such as distance learning and blended learning, thereby enhancing the quality and efficiency of the educational process.

The development of the digital environment is not limited to the technical dimension alone; it also extends to the qualification of human resources through training instructors and students in the efficient use of digital tools, in addition to the digitalization of educational and administrative content within university institutions. It also contributes to improving university governance through the adoption of electronic systems in registration, pedagogical follow-up, and academic pathway management, thereby facilitating administrative procedures and enhancing transparency and efficiency within the university, in support of achieving the objectives of higher education in the digital age.

2. Partnership with National and International Institutions

Partnership with national and international institutions constitutes one of the fundamental pillars supporting digital transformation in the higher education sector, as it contributes to the exchange of expertise and knowledge and to strengthening the technical and pedagogical capacities of university institutions. At the national level, universities work in cooperation with various governmental sectors, such as ministries of communication, technology, and emerging

enterprises, in order to develop digital infrastructure and provide appropriate technological solutions, thereby ensuring the improvement of educational quality and university services (Behache, 2024, pp. 670–687).

At the international level, partnerships with foreign universities and international organizations contribute to the transfer of successful experiences and the adoption of best practices in the field of e-learning. These partnerships include academic exchange programs, joint research projects, cooperation in the development of digital curricula, and the benefit derived from global educational platforms and modern technologies. Such relationships also enable universities to integrate into international scientific networks, thereby strengthening their academic presence and enhancing their level of competitiveness.

These partnerships also contribute to supporting the continuous training of instructors and students through the organization of training courses and joint workshops aimed at developing digital skills and promoting a culture of innovation. International institutions also play an important role in financing digital transformation projects and providing technical and consultative support, which helps accelerate the pace of transition toward the smart university. Thus, national and international cooperation constitutes a genuine lever for modernizing higher education and achieving integration between local and global knowledge.

Second: Successful International Models Applicable to the Algerian Context

Many countries around the world, whether developed or developing, have experienced pioneering initiatives in the implementation of e-learning systems, relying on the use of modern tools and technologies to simplify scientific concepts and enhance the educational process (Bouzqou & Al-Arabi, 2025, p. 681) These experiences gradually evolved into the adoption of integrated distance learning systems based on digital platforms and interactive media, thereby enabling greater flexibility in learning and expanding access to knowledge.

Second: Successful International Models Applicable to the Algerian Context

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1. At the Level of Arab Countries (Khatiri et al., 2021, pp. 82–98)

At the level of Arab countries, several successful experiences have emerged in the field of e-learning, among them the experience of Palestine International University, headquartered in Gaza and officially established on 17 July 2005. This university developed a modern e-learning system based on what is known as the “Live Webinar,” a system that enables direct communication between instructor and student via the Internet through interactive virtual classrooms. This system relies on a set of tools, including visual and written lectures, as well as presentation slides, allowing instructors to deliver lessons in a manner similar to conventional teaching, while enabling explanation and direct interaction through the use of an electronic whiteboard.

This system also allows students to engage actively during lectures through participation in discussions, asking questions, expressing opinions, and listening to and seeing the instructor directly, thereby enhancing the quality of learning and reducing the distance between the different actors involved in the educational process. Slide presentation constitutes one of the

most prominent modes of this system, as educational content is delivered in an organized visual format that students can browse and interact with, while also allowing them to ask questions to the instructor or peers within the same virtual learning environment. This experience therefore represents a successful Arab model in the field of e-learning from which broader lessons may be drawn and generalized.

Egyptian universities also witnessed an early development in the adoption of e-learning, having begun since the mid-1980s to integrate educational and technological media into the educational process in an effort to keep pace with global developments in this field. This orientation was reinforced through the introduction of modern means such as educational satellite channels, videoconferencing, and the Internet, which contributed to broadening access to learning and improving methods of knowledge delivery. Cairo University also established an Open Education Center affiliated with the university presidency, dedicated to designing and implementing educational programs based on the use of technological tools and modern educational materials.

The Egyptian vision for developing e-learning was grounded in the concept of quality, as university institutions sought to link digital education applications to the quality standards approved by competent bodies, thereby strengthening the relationship between educational quality and the use of technology. This orientation emerged in a context marked by increasing competition between higher education institutions and the private sector in the fields of education, training, and human resource development, in addition to challenges related to limited material and human resources and the pressure of expanding access to growing numbers of students, which prompted the search for more flexible and efficient educational alternatives (Khatiri et al., 2021, p. 89).

To reinforce this trajectory, the National Center for E-Learning was established in 2005 with funding from the Higher Education Information Systems and Technology Development Project, and was later integrated in 2009 into the E-Services and Knowledge Center affiliated with the Supreme Council of Universities. This center aimed to enhance the quality of higher education in Egypt through the integration of e-learning as one of the core modes of university education, thereby enabling universities to compete at both the regional and international levels. It also provides technical and consultative support to universities, particularly in the areas of instructional design, electronic course development, staff training, and digital content marketing, making it an advanced Arab model in the field of digital transformation in higher education.

The Kingdom of Saudi Arabia has also witnessed remarkable progress in the field of e-learning, as the Ministry of Higher Education established the National Center for E-Learning and Distance Education with the aim of supporting universities in adopting this modern mode of education. This center contributed to strengthening the use of technology in the educational process and to providing the organizational and technical framework necessary for the development of digital education within university institutions.

In this context, a number of Saudi universities, such as King Saud University, King Fahd University of Petroleum and Minerals, and King Faisal University, adopted the teaching of certain courses via the Internet, thereby enabling students to benefit from a flexible and advanced learning environment. Other universities, such as King Abdulaziz University and Umm Al-Qura University, also established specialized centers for distance education, providing electronic lectures and digital educational materials while supporting students' self-directed learning. This development extended further to include educational projects delivered through satellite broadcasting, particularly for female students, with the aim of expanding access to education across different regions of the Kingdom.

These efforts were further reinforced through the adoption of a national information technology plan, which recommended the integration of e-learning and distance education into the higher education system, as well as the establishment of national centers to provide technical support and to develop and improve the quality of digital educational content. This strategy also aimed to promote a culture of e-learning, expand the absorptive capacity of universities, support scientific research in this field, establish quality standards for the design and production of digital courses, provide consultation to relevant stakeholders, and encourage distinguished initiatives and projects (Ministry of Education, 2009, pp. 8–10).

The experience of the Sultanate of Oman is likewise considered one of the leading Arab experiences in integrating technology into education, as the Ministry of Education adopted a comprehensive plan aimed at developing the educational system in line with national development requirements. Within this framework, the Basic Education System was adopted, consisting of two stages: the first comprising ten years of basic education divided into two cycles (from Grade 1 to Grade 4, and from Grade 5 to Grade 10), followed by a two-year secondary education stage. This organizational structure represented a fundamental step toward modernizing education and creating a suitable environment for the integration of technology across its various stages.

The Ministry also sought to introduce computers into school learning resource centers as a central tool for developing the educational process, with particular emphasis on making the basic education stage the foundational base for technology adoption. This initiative aimed to equip students with computer literacy skills and provide educational software based on multimedia, thereby contributing to the development of students' cognitive capacities, strengthening research and exploration skills, and encouraging self-directed learning and independent access to knowledge from multiple sources (Ministry of Education, 2012, pp. 45–49).

The Algerian experience in the field of e-learning is likewise considered one of the initiatives that received early attention from the State (Khatiri et al., 2021, p. 90), as this mode of education was included among the priorities of the higher education sector through the launch of the National University E-Learning Project, within the framework of the 2007 Priority and Planning Report prepared in September 2006. This orientation reflected the public authorities' determination to keep pace with global digital transformations and to modernize the higher education system in line with the demands of the contemporary era.

However, the implementation of this project in practice encountered several difficulties, most notably the absence of rigorous strategic planning and the lack of a unified information policy across universities, which led to fragmented efforts and the adoption by each university of different educational platforms. Although the Ministry of Higher Education and Scientific Research acquired the "e-Charlemagne" platform, this project did not achieve the expected results due to weak infrastructure, a shortage of qualified human resources, and the absence of a supportive legislative framework (Abdelhamid Mehri University Constantine 2, 2026).

2. At the International Level

The experience of the United States is regarded as one of the most prominent global models in the field of digital transformation in education, as this transformation has been closely associated with a comprehensive development encompassing various spheres of life, reflecting the level of progress achieved by these societies. American authorities have attached considerable importance to information technology as a fundamental pillar in the development of education, to the extent that it has become a priority for decision-makers within carefully designed strategies aimed at disseminating digital culture and promoting its use across various sectors, foremost among them education.

In this context, the United States witnessed accelerated steps toward integrating technology into education beginning in the 1990s. By 1995, all American states had completed comprehensive plans for implementing computer use in the educational process. The states subsequently entered into a race to adopt distance education and integrate it into educational institutions, with particular emphasis on qualifying and training teachers in the use of modern technologies, enabling them to support their colleagues and guide students through this transformation. Parallel efforts were also made to provide an integrated infrastructure, including computer equipment, communication networks linking schools to one another, and the development of effective educational software that became an integral part of school curricula.

Thus, the integration of technology into education in the United States ceased to be merely an option or a temporary project; rather, it became a core component of the educational system, reflecting a strategic orientation toward building an integrated digital education capable of responding to the demands of the contemporary era and enhancing the quality of learning.

The experience of Japan is likewise considered one of the leading global experiences in the field of e-learning, as it began early to integrate technology into its educational system within the framework of a comprehensive strategic vision. This experience was launched in 1994 through an educational television network project based on the broadcasting of educational materials via video tapes delivered to schools on demand using a cable system. This initiative represented an initial step toward consolidating the concept of distance education and broadening learning opportunities beyond the traditional framework (Khatiri et al., 2021, p. 87).

In 1995, the "One Hundred Schools Project" was launched with the aim of connecting schools to the Internet in order to experiment with and develop educational activities and pedagogical software, thereby enhancing the quality of the educational process and keeping pace with technological progress. In the same context, the Educational Policy Committee prepared a report addressed to the Ministry of Education recommending the establishment of a regional information system to support lifelong learning across Japanese prefectures, in addition to the creation of specialized centers for the production of educational software and a national information center.

This experience also placed strong emphasis on the human factor through the development of plans to train teachers and faculty members in the use of modern technologies, supported by substantial government budget allocations during the period 1994–1997. This support included the establishment of educational software centers across various prefectures, the promotion of scientific research in the field of educational technologies, and the support of various initiatives related to distance education. This experience reflects the integration of strategic planning with investment in human and technological resources, which has made Japan an advanced model in the field of digital education.

Conclusion:

In conclusion, it becomes evident that digital transformation in higher education is no longer a secondary option, but rather an imperative necessity imposed by the demands of the digital age and the challenges of knowledge globalization. The analysis of the current state of higher education in Algeria has shown that considerable efforts have been made to integrate information and communication technologies, whether through the adoption of digital platforms or the development of certain modern pedagogical practices. Nevertheless, these efforts remain below the level required to achieve a comprehensive and integrated digital transformation.

It is equally evident that the transition toward the smart university model remains contingent upon a set of fundamental conditions, most notably the development of digital infrastructure, the strengthening of human resource capacities through continuous training, the provision of a supportive legislative and regulatory environment, and the need to unify the strategic vision across higher education institutions. Successful international and Arab experiences have demonstrated that investment in technology, when coupled with rigorous planning and effective partnerships, constitutes a decisive factor in improving the quality of education and enhancing the competitiveness of universities.

Accordingly, the realization of a smart Algerian university integrated into the digital economy requires the adoption of a comprehensive approach based on the integration of technical, pedagogical, and organizational dimensions, while drawing on comparative experiences and adapting them to national specificities. Such an approach would contribute to improving the quality of training and scientific research and would strengthen the role of the university as a central actor in achieving sustainable development and building a knowledge society.

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