



Digital Transformation in the Algerian University - Between Reality and Aspiration -

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Abstract:

In recent years, most countries worldwide have witnessed a tremendous information revolution, whose impact has emerged across all aspects of individual and institutional life. As strategies, techniques, and means have multiplied, digital transformation within societal organizations has become an inevitable necessity. Among the sectors affected by this digital technology is the university, where the Algerian state has sought to activate digitization in universities by implementing mechanisms that contribute to this sector's advancement, through digital communication, distance learning, and other processes that enhance the university's role and performance.

In this research paper, we will attempt to examine the reality of digital orientation in Algerian universities, using the descriptive-analytical method that aims to identify the studied phenomenon and interpret its surrounding circumstances.

Keywords: Digital Communication; Digital Transformation; Technology; University.

Résumé:

Au cours des dernières années, la plupart des pays du monde ont connu une révolution informationnelle considérable, dont l'impact s'est manifesté dans tous les aspects de la vie des individus et des institutions. Avec la multiplication des stratégies, des techniques et des moyens, la transformation numérique au sein des organisations sociétales est devenue une nécessité inévitable. Parmi les secteurs touchés par cette technologie numérique figure l'université, où l'État algérien s'est efforcé d'activer la numérisation dans les universités en mettant en place des mécanismes qui contribuent à l'avancement de ce secteur, notamment par la communication numérique, l'enseignement à distance et d'autres processus qui améliorent le rôle et la performance de l'université.

Dans cet article de recherche, nous tenterons d'examiner la réalité de l'orientation numérique dans l'université algérienne, en utilisant la méthode descriptive-analytique qui vise à identifier le phénomène étudié et à interpréter les circonstances qui l'entourent.

Mots-clés: Communication Numérique; Transformation Numérique; Technologie; Université.

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I. INTRODUCTION

The Algerian university has witnessed a notable transformation in the last decade across various aspects, especially with the global trend towards institutional digitization. Digital transformation in the higher education sector has become a top priority for the concerned ministry, necessitating the mobilization of numerous resources required for remote teaching, organizing digital conferences, communication platforms, and serving university stakeholders including professors and students. It is observable that many of these mechanisms have removed several obstacles and reduced transportation burdens, such as electronic student registration and their ability to access their grades and averages through dedicated electronic accounts. These technologies have also facilitated faculty members' ability to submit documents and files through platforms designed for specific functions. However, despite these advances, certain problems have accompanied the digitization process of higher education institutions and have prevented the achievement of intended objectives.

Based on the aforementioned, it can be said that state efforts directed towards digitizing the higher education sector now require increased attention from all stakeholders to reach the crystallization of practical objectives serving both the university and its actors. Hence, we can pose the following question: What is the reality of digital transformation in Algerian universities? And what are the obstacles to digitization in higher education institutions and the ways to address them?

To answer this question, we will attempt to address the most important variables associated with university digitization, beginning with presenting the key concepts related to our study topic, which we will address in the following section.

First: Conceptual Definitions

1. The Concept of Digital Communication

The definition of digital communication primarily focuses on the use of digital systems and their innovations, considering them as the sole and fundamental means of communication between parties. This concept is not far removed from computer-mediated communication or computer-assisted communication, all of which emphasize the computer's role in the communication process. Digital communication is a social process where remote communication occurs between parties who exchange roles in transmitting and receiving various communicative messages through digital systems and their means to achieve specific objectives (**Boucheikhchoukha & Sidi Driss, 2022**).

Digital communication can be defined as a process of information exchange between individuals in a digital manner characterized by speed and accuracy, primarily relying on the Internet through which messages are sent or received. Digital communication occurs through various means and applications, taking place between organizational members or the general public. In our study, digital communication encompasses all interactive processes occurring between actors in university institutions, conducted using digital technological techniques to facilitate communication and reduce time and effort.

2. The Concept of Digital Transformation

This term refers to companies' ability to adapt and respond to rapid technological changes by modifying their business models, culture, and strategies to maintain their market continuity. It is also defined as the process of converting books, manuscripts,

newspapers, audio materials, and visual materials into digital files that can be handled through computer technology using scanners or other equipment and devices. For institutions, digital transformation centers around transitioning to harness modern technology and its applications optimally to develop their performance and enhance their competitive capability. For individuals, it revolves around accessing basic services and executing tasks through personal computers, smartphones, and smart devices with the push of a button without returning to institutions and contacting their customer service centers when specific requirements need to be met **(Al-Nadawi, 2020)**.

Digital transformation can be defined as the process of transitioning from handling files, documents, and information in a classical manner to adopting a faster and more accurate method using technological communication means that contribute to accelerating administrative processes and information transfer, overcoming time and distance barriers. It has become necessary for most societal institutions, including university institutions, to use this technology, hence the digital transformation in various administrative operations and other interactions among university stakeholders.

3.The Concept of Technology

The concept of technology is among the notions that many researchers and thinkers have discussed, differing in their perspectives due to their varied specializations and the evolution of technology's characteristics itself. However, it is generally agreed that the essence of technology is as old as human inventions themselves. It was initially considered one of the means discovered by humans in their primitive adaptation to nature, later becoming a tool used for service and assistance in meeting growing needs. Its use then developed and became widespread to the extent that it became very important in both public and private life, leading some thinkers to believe that it is responsible for most changes occurring within contemporary society **(Daliou, 2010)**.

In our study, by technology, we mean the collection of modern techniques and means dedicated to communication processes in their digital form within Algerian universities, utilizing software for storing and transferring information between faculty members, students, and university administration, as well as with the concerned ministry. Technology is characterized by continuous updating and development to meet the increasing needs of humans in general and stakeholders in the higher education sector in particular.

4.The Concept of University

It represents the space where free and open discussion occurs between teacher and learner, aiming to evaluate various ideas and concepts. It is also the place where interaction takes place between faculty members from different specializations, as well as students enrolled in these specializations. Others define it as an institution with an important role in preserving, developing, and critiquing knowledge, and in adopting creative energies **(Boulbazine & Layada, 2018)**.

The university also means that space where students acquire important knowledge and skills after secondary education, through choosing a specific specialization that allows them to develop their capabilities and nurture their ideas for entering the workforce, considering that university is the final stage of formal education. The university institution is also considered an opportunity for individuals' self-development

where research freedom and learning self-reliance exist. Additionally, it offers diverse teaching methods while providing numerous spaces that allow for practical learning, such as laboratories, computer rooms, distance learning workshops, and other facilities. After presenting the main concepts related to the study subject, we will attempt in the following section to present the most important national projects in the field of digital education in Algerian universities.

Second: National Efforts in Digital Education in Algerian Universities

The Algerian university is relatively new in adopting e-learning as a modern educational approach, despite its role in enabling university institutions to solve many problems they face, such as the growing demand for university education and cost control issues, among others. Additionally, it helps overcome certain crises that might prevent students from attending in-person education, such as the COVID-19 pandemic. The supervising ministry has launched several national projects within the context of the national distance learning project, including:

1. Video Lecture Network and E-Learning System of the Ministry of Higher Education and Scientific Research

This network connects to all university organizations, including 13 transmitters and 64 receivers. Although this network allows for recording and live broadcasting of lessons, it is primarily used synchronously, requiring the simultaneous presence of professor, facilitator, and student. The network can currently be operated in a "point-to-point" format, and once equipment installation and competency training are completed, the system can accommodate 18 video lectures simultaneously, thanks to a central node and six multi-site units located at the Scientific and Technical Information Research Center.

2. The FPD-CARO Project

This initiative by "Abderrahmane Mira University" introduces new educational pedagogical practices based on autonomy, social learning, cognitive contradiction, self-learning, and knowledge construction within educational activities. To achieve this goal, a work program was established in mid-November 2006, clearly defining the responsibilities of all concerned parties: the National Virtual Education Committee, the Scientific and Technical Information Research Center, and the Continuing Education University. Within this framework, committees and pedagogical experts with diverse training were appointed, especially in partnerships with leading universities in digital education, with the University of Sciences and Technology "Houari Boumediene" being the best example.

3. The Algerian Research Network (ARN)

This network specifically supports the distance learning system. However, observers of its characteristics find it unable to meet Internet needs, as Algeria's infrastructure is insufficient for managing educational services, given the inadequate Algerian telecommunications funds for line rental, which has compelled Algeria to consider other solutions.

4. The COSELEARN Distance Learning Project

This program represents cooperation between the Ministry of Higher Education and Scientific Research and the Swiss institution "AQLILEARNING," including nine countries from the Sahel and Maghreb regions, implemented in two phases:

4.1 First Phase: Ending in late 2007, this phase focused on training in distance learning principles and concluded at the end of 2008, enabling the training of 24 experts and engineers in several Algerian university institutions.

4.2 Second Phase: Beginning in 2009, it included training e-learning specialists and aimed to establish permanent teams for pedagogical and technical support, contributing to meeting the challenge of student overcrowding, especially by providing a unified technological environment for partner countries, offering students access to electronic services.

5. The Complementary Project to "Tempus" 2008-2013

This project was prepared within the logic of higher education sustainability, intended to allow participating institutions to equip themselves with structures supporting distance learning. The project included the concept of academic mobility (movement of professors and students). Within this context, the IDE@ Master's program was established, delivered remotely, including 20 professors for "Master Utice," with 13 professors graduating as experts in distance learning capable of designing and conducting remote training. Additionally, it included administrative and technical staff (Zeraoula, 2022).

It can be said that the state's efforts to achieve digital orientation in Algerian universities began years ago through the establishment of several projects involving the activation of digitization in teaching and electronic communication between university stakeholders. These projects aimed at using technology in education and targeting a large number of learners, in addition to training courses in distance learning for professors and equipping classrooms with technical means used in lectures. Several platforms were created, some dedicated to courses and others allocated for submitting faculty files for various administrative operations and services, such as housing files, internships, and promotions.

Furthermore, digital transformation has removed many obstacles for students by opening portals for electronic registration, accessing various announcements of interest to them, and obtaining references and books available on university websites and scientific research centers. Moreover, most university libraries have benefited from numerous digitization techniques that have contributed to enhancing library services for students and reducing administrative burdens.

The digital transformation, which has become a focus of the higher education sector, has led to the necessity for both students and professors to undergo training in the digital field to achieve maximum benefit from the digitization process. Considering the rapid developments witnessed by most countries worldwide in the digital field, it has become necessary for Algerian universities to keep pace with these developments in the digitization space, which we will present in the next section.

Third: The Inevitability of Digital Transformation in Higher Education

In an era characterized by technological innovation and continuous advancement, digital transformation has become an imperative in higher education. This transformation represents a qualitative shift in educational delivery methods and institutional management, bearing significant importance and specific objectives within this context. The following elucidates the reasons for this inevitability:

1. Ensuring Universal Access

Digital transformation facilitates learning opportunities for all students, regardless of their geographical location or personal circumstances, thereby promoting educational equity and inclusivity.

2. Enhanced Learning Experience

Digital transformation enables the implementation of innovative technologies such as game-based learning and virtual reality, rendering the learning experience more interactive and engaging.

3. Improved Educational Quality

Digital transformation contributes to enhancing the quality of educational resources and their delivery methods. Educators can utilize modern technologies to improve teaching methodologies and provide diverse, updated educational content.

4. Increased Flexibility and Efficiency

Digital transformation offers greater flexibility for both students and educators in organizing their time and educational resources, while simultaneously increasing the overall efficiency of the educational process.

5. Enhanced Interaction and Communication

Digital transformation facilitates improved interaction between students and educators, promoting effective and constructive communication among all participants.

6. Development of Self-Directed Learning

This transformation enables students to access educational resources readily and organize their learning process effectively.

7. Technological Advancement Alignment

Digital transformation assists in updating educational curricula and technologies to align with contemporary technological developments and labor market requirements.

8. Educational Scope Expansion

Digital transformation contributes to expanding higher education's reach to include students from diverse cultures and countries, thereby promoting cultural exchange and international collaboration.

9. Innovation and Creativity Stimulation

Digital transformation encourages students and educators to develop and innovate new learning and teaching methods, fostering innovation and creativity in the educational process.

10. Theory-Practice Balance Achievement

Digital transformation enables better balance between theoretical and practical education through the utilization of virtual and interactive practical learning technologies.

11. Personalized Learning Experiences

Digital transformation facilitates personalized learning experiences tailored to each student's needs and individual level, enhancing their opportunities for success and achievement of educational objectives.

Digital transformation contributes to expanding access to education, encourages innovation and creativity, develops self-learning skills, enhances interaction and communication, helps achieve balance between theoretical and practical education, promotes environmental sustainability, and provides personalized learning experiences.

Furthermore, digital transformation in education has created competition among universities, institutes, educators, and educational technology platforms worldwide. Universities focus on attracting human talent, providing a healthy educational environment, and offering advanced technology to both educators and students to deliver high-quality distance education (**Ladjal, 2024**).

In light of the intense competition among university institutions across various countries worldwide, it has become imperative for Algerian universities to invest in all their capabilities to secure a respectable position among global universities. This includes enabling students, wherever they are located, to receive education using digital communication technologies to achieve comprehensive learning. The relevant ministry has provided opportunities for faculty training in distance teaching methodologies and conducting and evaluating examinations through digital platforms. Additionally, digital transformation has contributed to the diversification of scientific material and facilitated its accessibility and utilization, such as digital libraries and the electronic portal for scientific research. New methods have been introduced to measure citation rates in research and studies, as well as approaches to combat academic plagiarism.

Pedagogical responsibilities have necessitated the activation of digitalization to save time and effort, such as in deliberation processes, organizing student averages, selecting specializations, annual registration procedures, and accessing university student services. Digital transformation has compelled students to learn computer skills and engage in self-development. Through continuous practice, students find themselves proficient in using information technologies and acquiring communication skills. Digital transformation presents an opportunity to keep pace with technological advancement and enables university stakeholders to exchange information and cultures with universities in other countries, presenting opportunities for local, regional, and international cooperation.

All these factors have led the Algerian state to spotlight higher education and scientific research due to their outputs benefiting both the state and society. Crises prompt nations to consider effective solutions to overcome obstacles and their consequences, as demonstrated during the COVID-19 pandemic. This health crisis further pushed the government to activate greater digitalization in university environments to enable students to receive their lessons while simultaneously maintaining their health.

Considering the driving factors for digital transformation in the university environment, which necessitated the digitalization of the higher education sector, the Algerian state has made efforts to activate digitalization in university institutions through a series of laws, mechanisms, and programs, which will be addressed in the following section.

Fourth: State Efforts in Digital University Development

The emergence of digitalization in higher education and scientific research in Algeria was a product of technological transformations aimed at digital transformation through the application of information and communication technology, and the implementation of electronic administration in Algerian universities. This development can be traced back to the European Commission's "Avicenne" project, which aimed to

support the virtual university initiative and elevate Mediterranean universities through creating network links that lead to the development of technology-based education systems.

Following the Algerian government's orientation towards implementing electronic administration across its sectors, various ministries, including the Ministry of Higher Education and Scientific Research, were required to create a digital environment. This was particularly important as digital transformation had become an effective and necessary mechanism for advancing and modernizing higher education in light of trends toward e-learning concepts, virtual universities, and new pathways implemented by developed nations, which Algeria worked to realize within its universities.

The Ministry issued directives emphasizing the necessity of using digital means in university management, through simple measures such as replacing fax with email, and converting bulletins and periodicals to digital format to reduce printing costs, making them accessible through the digital portal of the Research and Development Center (CERIST).

In 2008, Algeria established a strategy called "E-Algeria Strategy 2013," which noted that developed countries design proactive policies to develop the digital economy through strong support for the information and communication technology sector. The E-Algeria strategy was aligned with the vision aimed at:

- Emergence of an Algerian science and knowledge society
- Enhancement of national economic, corporate, and administrative performance
- Improvement of education, research, and innovation capabilities
- Establishment of industrial clusters in ICT
- Increasing country attractiveness
- Improving citizens' lives through promoting ICT use and dissemination

The strategy identified five indicators to measure progress and evaluate digital status:

1. Digital Root Index
2. Digital Access Index
3. E-Readiness Index
4. ICT Diffusion Index
5. Government Readiness Index

To keep pace with modern technologies, university presidents issued decisions to establish local steering committees for digitalizing their institutions and supporting education, research, and training through digital platforms. These platforms enabled the creation of independent communication spaces and provided information accessibility anytime, anywhere, with high speed and precision.

In the same context, the preliminary draft of the 2020 Higher Education Orientation Law defined the proposed legal framework allowing higher education institutions to develop their digital applications across administrative and pedagogical functions, considering them as effective elements in university student education and training (Jebli & Mansour, 2022).

The digital platform facilitated:

- Independent communication spaces
- Ubiquitous information access
- High-speed and precise information delivery

- Comprehensive digital transformation of administrative and academic functions

This framework represents a significant step in Algeria's ongoing efforts to digitalize its higher education system and align with global educational technological advancements.

It can be stated that the state's efforts in the digital domain within universities hold significant dimension, given the advantages and positive aspects that digitalization brings to educational processes and pedagogical activities. The supervising ministry has sought to universalize digitalization across all national universities and involve all university stakeholders to ensure that Algerian university institutions maintain educational quality and promote scientific research while securing a prestigious position among international universities and improving their rankings.

Learning from successful global models in university digitalization has led to notable progress for Algerian universities, evident in:

- Distance teaching implementation
- Online thesis discussions
- Pedagogical activities conducted through students' electronic accounts
- Organization of hybrid conferences and seminars

This hybrid approach represents a positive initiative that has facilitated researcher participation in scientific events, enriching them with discussions and ideas. It has also stimulated training and development in digital technology usage, which has enhanced effective communication between students and educators.

The state annually allocates a budget for higher education and scientific research to ensure this sector's operation, with a portion dedicated to strengthening the digital domain in universities. This includes:

- Providing necessary equipment and technologies
- Covering digitalization requirements
- Supporting digital infrastructure development

International cooperation between universities has been among the factors encouraging digital transformation in Algerian universities. The government has:

- Signed various agreements in scientific research exchange
- Issued numerous laws and directives to university presidents nationwide
- Promoted digitalization activation within their institutions
- Ensured its implementation across education, research, and pedagogical activities

The Algerian state's efforts in university digitalization have not been limited to distance learning or interactive platforms but have extended to creating and developing the concept of smart universities, which will be presented in the following section.

This comprehensive approach demonstrates Algeria's commitment to:

- Modernizing its higher education system
- Enhancing educational quality
- Promoting scientific research
- Strengthening international academic positioning
- Developing smart university infrastructure
- Fostering digital innovation in education

The continuous evolution of these efforts indicates a strategic vision for transforming Algerian universities into modern, digitally-enabled institutions capable of meeting contemporary educational challenges and future requirements.

Fifth: Requirements and Challenges of the Smart University in Algeria

The transition towards a smart university is a difficult and complex process that requires several conditions and skills to form a single, indivisible unit from the constituent elements, which is always viewed as a whole. These requirements can be summarized as follows:

- An intelligent physical infrastructure that includes all university facilities, with smart and modern buildings.
- An intelligent technical infrastructure containing networks, educational and administrative application platforms that facilitate the educational process.
- An information and data infrastructure to facilitate the transfer and analysis of data.
- A communication network that enables and facilitates the communication between the individuals concerned within the university campus.
- Competent and qualified human resources capable of adapting to emerging changes, and having the technical and technological capabilities that enable them to adapt to the smart and technological environment of the university.
- Smart learning environments where platforms and software facilitate the educational process for both students and teachers.
- Smart strategies that enable the university to adapt to the changes and challenges that arise in the internal and external environment.
- Sustainable development through attention to energy sources and their preservation, and the fight against pollution.

Algerian universities are striving to keep pace with the rapid technical developments of this era, which are leading us to a digital and smart transformation in all areas of life. The university must be one of the first to keep up with this development, as it is the primary source of scientific and technical research and innovations. However, due to a set of challenges or obstacles, the Algerian university has been slightly delayed. The most important obstacles can be mentioned as follows:

- Lack of a good technical infrastructure that enables the university to undergo this transformation.
- Lack of an information infrastructure that facilitates the exchange of information and experiences in an automated and easy manner.
- Risks of technological and informational security, as hacking is easy and can disrupt the system of large environments.
- Weakness of electronic transactions in management.
- Weak technical and technological awareness among students, faculty, and administrators.
- Dominance of paper transactions in university administrations.
- Lack of conviction of some faculty and administration members in the importance of digital transformation.
- High cost of software, technical networks, and maintenance and protection programs, making acquisition difficult.

- Lack of student awareness of digital transformation (**Abdelaali & Sirat, 2024**).

As the primary source of diverse expertise and skills in various fields, universities are now required to keep pace with the scientific and technological advancements that developed countries have already achieved. The state must, therefore, allocate all possible resources to ensure that Algerian universities move beyond the bounds of distance education and seriously consider preparing the necessary infrastructure. This includes equipping universities with the latest technologies and tools, such as high-speed internet connectivity, as well as securing a qualified and efficient workforce to carry out the comprehensive technical preparation of the university. This is essential to maximize the benefits and utility for all stakeholders and subsequently provide the job market with highly competent and well-trained human resources. The existence of a technical, technological, and operational climate can motivate both faculty and students to deliver optimal performance within their respective specializations.

However, achieving the creation of a smart university necessitates concerted efforts and seriousness in investing the available capabilities to realize the desired objective. This depends on providing university institutions with budgets that align with the requirements of this digital transformation. Despite the state's efforts in this regard, the Algerian university continues to suffer from some deficiencies that hinder the smooth functioning of educational and administrative processes, such as fluctuations in internet speed, continuous interruptions, and a lack of necessary resources and expertise. These factors have prevented the university from achieving its aspiration to develop a smart university that meets global standards and criteria.

In addition to the above, the Algerian university is moving towards attempting to activate artificial intelligence within educational processes and in the handling of studies and research, with the aim of achieving better quality in the field of higher education. This will be addressed in the following section.

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Sixth: Artificial Intelligence Applications to Achieve Quality in Algerian Higher Education

Artificial Intelligence (AI) applications represent an advanced and intelligent technological technique that has managed to assert itself forcefully in the field of university education. These applications have facilitated activities and tasks within the university campus, transforming the learning process from its traditional concept to the term of interactive digital learning.

AI applications have enabled administrators and faculty to be relieved of time-consuming and effortful tasks related to students, such as lesson preparation, exam paper correction, grading, and student record management. Additionally, these applications have allowed students to access educational lessons on various global digital platforms, enhancing their skills, competencies, knowledge, and application, thereby improving the quality of their university education.

These intelligent applications provide the university educational system, and the Algerian educational system in particular, with immense opportunities for development and the realization of set goals and aspirations. They also help build an excellent mental image and a high-quality educational level without excessive financial costs or physical effort, by providing appropriate strategic methods anytime and anywhere the user desires.

There are many ways in which AI applications have been utilized by international universities, including Algerian institutions, in their educational systems, among which are the following:

1. Lesson and Course Plan Preparation:

Faculty use tools like ChatGPT to create educational courses that improve student outcomes and align with their requirements. They also utilize tools like "Education Copilote" to create lesson content and prepare plans.

2. Task Management and Automation:

Through AI applications using machine learning algorithms, faculty can automate manual processes, reducing their workload and saving time and effort. These activities include grading homework, classifying exams, and preparing reports, among others.

3. Virtual and Personalized Private Lessons:

University faculty and students benefit from AI applications to provide personalized tutoring, identifying students' strengths and weaknesses to provide targeted academic support.

4. Automated Classification:

Tools using machine learning algorithms automatically classify the tasks and assessments carried by teachers, facilitating the review of student grades before their announcement.

5. Identifying Knowledge Gaps:

Analyzing student data to create personalized assessments for each student, highlighting their weaknesses and areas needing improvement.

6. Exam Preparation:

AI applications assist in preparing exams, analyzing student data, and using this to develop assessments that help them improve their skills.

7. Creating Intelligent Content:

Using AI applications to generate intelligent content for digital textbooks and study guides, ensuring a customized digital learning environment with various features and personalization options.

8. Detecting Cheating in Exams:

Educational institutions utilize AI applications, such as facial recognition or voice analysis, to verify student identities and detect suspicious behaviors during exams.

9. Providing Secure Learning Systems:

University institutions use artificial intelligence techniques to create decentralized networks to prevent unauthorized access to stored data, thus limiting the access of hackers to critical data such as student grades.

Algerian higher education institutions, in the face of the huge technological momentum, have found themselves between ambition and challenge to keep pace with the digital age, and to search for alternatives to get out of the current situation they are experiencing of low educational level, lack of adequate facilities for academic research, and the need to improve their teaching performance and raise the quality of education. They must adopt artificial intelligence applications. In recent years, Algeria has sought to develop these smart technologies, especially in the higher education sector, leading to the establishment of advanced schools of artificial intelligence and the provision of universities with specialized laboratories and centers in this field. This reflects the interest of Algerian university institutions in such digital technological strategies (Jegrif, 2024).

The application of artificial intelligence in the field of scientific research still faces several obstacles due to the novelty of its use. Concerns may arise about the reliability of artificial intelligence due to the fact that it may be prone to producing biased interpretations or inconsistent analyses, as artificial intelligence algorithms often work based on pre-determined statistical patterns and rules that may not capture the subtle differences and specific aspects of the qualitative data context, leading to inconsistent interpretations that have the ability to affect the reliability of the study results (Akaak & Aouine, 2024).

Activating artificial intelligence technology in the Algerian university represents an important step in improving the quality of the educational process and the performance of the university system in general. This technology encourages the digital orientation of students and creates motivation to enhance their skills and develop their capabilities. Artificial intelligence also helps to alleviate the burdens on teachers, as their roles shift

to analyzing information and defining objectives with greater accuracy and efficiency in light of the speed of search, organization, and arrangement of information provided by artificial intelligence. This technology deserves attention through encouraging training and learning around it, and discovering the optimal ways to use it without absolute reliance on this technology, so that the individual's mind does not become stagnant due to ready-made information without insight and without the effort of searching. The rational use of these digital technologies should be encouraged, and students should be urged to research, try to understand, and practice analysis. These technologies can be relied upon to diversify information and fill the student's knowledge base, while also making efforts to arrange and reformulate that information in another way, so that the learner acquires the ability to formulate, analyze, and generate ideas.

Despite the attempts of the higher education sector to develop modern university institutions through the resources allocated by the state to advance and develop the roles assigned to it, there are some obstacles and constraints that impede the success and generalization of digitalization in the Algerian university, which we will try to present in the following section.

Seventh: Obstacles to Digital Transformation in the Algerian University

Digital education has a set of obstacles that hinder its application in many educational institutions. Among these obstacles are:

1. Obstacles related to infrastructure:

The use of infrastructure in the field of education in the current era, characterized by the technological age, has become a necessity that has imposed on the higher education sector the expansion of the concept of traditional infrastructure to the concept of digital infrastructure, which includes both physical aspects (buildings, libraries, classrooms...) and human aspects (administrators, administrators, teachers, learners...). Among the difficulties related to the infrastructure, we find:

- Weak internet network at the university level, leading to limited scope for research and communication.
- Lack of electronic devices and digital programs necessary to use Internet resources.
- Lack of technical support to detect problems facing devices and their various programs.

2. Obstacles related to training programs:

These are primarily related to the pedagogical obstacles faced by faculty members when presenting the scientific material, such as the shortage of time allocated to distance education sessions, and the lack of a relationship between the prescribed course material and the learner, which makes it necessary to update it in order to keep pace with the developments in the educational field and modern technologies.

3. Obstacles related to experience:

These obstacles are represented in:

- Difficulty in designing and implementing educational activities on distance learning platforms.
- Difficulty in dealing with the basic services on which the educational applications of the network are based, such as the search service, e-mail, file transfer chat...
- Lack of skills in the field of designing and presenting electronic courses.

4. Obstacles related to students:

These lie in:

- Difficulty in combating academic cheating in the digital evaluation process.
- Lack of faculty in determining patterns of feedback.
- Difficulty in dealing electronically with student participation (**Melili; Jowadi, 2022**).

It can be said that despite the state's efforts to achieve quality education through digital transformation, many difficulties stand as obstacles to the realization of the Ministry's desired objectives. These difficulties include problems with the Internet network, which is often slow to the point of disrupting the distance education process, as well as a lack of resources in some universities, where faculty members resort to their own personal financial means, in addition to delays in repairing and maintaining equipment related to digitization. Furthermore, there is a problem of experience among some faculty members in managing educational processes and conducting remote exams, while students also suffer from a weakness in training in this field, especially since its uses are relatively new to them. Additionally, the lack of availability of computers and digital learning devices for many students acts as a barrier to the effectiveness of digitization in the university, in addition to the technical problems that occur in the education platforms, preventing many of the actors in the process from accessing them and the inability to control the causes.

In the following, we will attempt to propose some recommendations and suggestions related to the field of digital transformation in the Algerian university.

I. Recommendations and Suggestions:

The process of digital transformation in the field of higher education and scientific research is a fundamental axis that deserves support and attention. Here are some suggestions related to this matter:

- The need to organize training courses for faculty and others for students in all universities on the uses of digital education.
- Support university institutions with all the means, techniques, and advanced devices required for digitization.
- Ensure support for university institutions with a high-speed internet network that is consistent with the requirements of digital educational and pedagogical activities.
- Encourage students to develop their capabilities by accustoming them to the use of digitization means in educational processes.
- Urge students not to be entirely reliant or dependent on digitization and the readily available information it provides, as this will impede their thinking and limit their ability to generate ideas.
- Train maintenance workers in the field of digitization to quickly repair malfunctions.

II. Conclusion:

From what has been presented, it can be said that digital transformation in the Algerian university space has become one of the main areas of concern for the state and the supervisory ministry, as evidenced by the many measures that have affected the educational process in recent years. The beginning was the use of distance learning as a form of education and acquisition, in addition to the establishment of many digital platforms, some of which were dedicated to faculty and university users, and others to

students in order to facilitate access to their educational and pedagogical needs. The university facilities have also been strengthened with digital devices such as employee entry and exit registration technologies, surveillance cameras, and biometric cards, as well as the activation of digitization in university services. The supervisory ministry aspires to activate artificial intelligence technology in various educational and administrative processes. However, despite this, there remain some shortcomings and difficulties that hinder optimal digital transformation in the Algerian university, obstacles that require finding solutions to overcome them and thus keep pace with the development occurring in the universities of developed countries.

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