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The Reality of Digitizing the Higher Education and Scientific Research Sector in Algeria from the Perspective of Algerian Students Case study of students from the Faculty of Economic Sciences at Setif 1 University

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Abstract

This study aims to understand the reality of digitizing the higher education and scientific research sector in Algeria from the perspective of students. It focuses on digital education, one of the most important and widespread modern technological applications recently. Digital education has emerged as a new mode of learning applied at various levels, aiming to provide high-quality education to a large base of students and beneficiaries, primarily relying on the latest developments in information and communication technology. The study also examines various other services, both administrative and pedagogical, provided through the use of digital platforms in education and electronic university services. It explores the students' interaction with and benefits from these services by distributing a questionnaire to students at Setif1 University, specifically those in the Faculty of Economic, Commercial, and Management Sciences. The aim is to understand the current usage of digital platforms, their advantages, and the obstacles students face when using them. The study concluded that students are somewhat satisfied with the services provided within the framework of distance education. However, they encounter some challenges such as weak internet connectivity and high pressure on service delivery platforms.

Keywords: Digitization, Distance learning, Digital platforms, University students.

Introduction

Digital transformation is an urgent economic necessity, as it achieves numerous socio-economic benefits, especially for developing countries, where telecommunications and information technology now play a significant role in supporting the performance of various economic sectors by contributing to increased efficiency levels, reducing the cost and time required to complete economic and financial transactions, improving labor productivity, and enhancing competitiveness.

A World Bank report indicates that full digitization of the economy can increase per capita GDP by at least 46% over 30 years, translating into long-term monetary gains of no less than $1.6 trillion. The estimates in the report suggest that in the first year, the per capita GDP in the region could reach $300 billion.

Algeria, like other countries, has sought to join the wave of advancements in information technology. In 2013, a plan for digital transformation in Algeria was established, followed by various laws aimed at achieving digital transformation across all sectors. The higher education and scientific research sector is considered one of the important and strategic sectors, serving as the foundation and source of digital transformation.

In a complete digitization of the higher education and scientific research sector and in applying the "zero paper" principle, 60 digital platforms were established during the 2023-2024 academic year (42 platforms according to the digitization roadmap + 4 platforms related to university services to improve student life), in addition to 12 other platforms created to meet the functional requirements of the higher education and scientific research sector.

Based on the aforementioned, the problem of the study can be summarized as follows:

What is the reality of digitizing higher education and scientific research in Algeria from the perspective of Algerian students?

Importance of the study:

The topic of digitization has become very relevant, especially in recent years after the COVID-19 pandemic. Digital transformation has been considered the optimal solution for boosting the economy across all sectors, particularly the government sector. The shift to electronic and smart management has become an inevitability imposed by digital transformation. The higher education and scientific research sector is among the most sensitive sectors that have been significantly impacted by the issue of digitization.

Study objectives:

Through this study, it is aimed to:

- Definition of the concept of digitization in higher education and scientific research;
- Understanding the reality of the digitization of higher education and scientific research in Algeria from the perspective of students at the Faculty of Economic, Commercial, and Management Sciences;
- Presenting a strategy to improve the digitization of higher education and scientific research in Algeria.

Literature review

Beloul Fahima study (2023) entitled **" Digitization of Higher Education Sector in Algeria: Does the 'Zero Paper' Motto in Algerian Universities Deserve Its Claim"**

The study aimed to highlight the state of digitization in higher education and scientific research, as it is one of the key mechanisms for reforming the sector and achieving the quality of scientific research. The study concluded that Algerian universities have become some of the most prominent in the Arab world in their attention to digital spaces, particularly through the initiatives and measures recently introduced by the Minister of Higher Education and Scientific Research with the goal of achieving the "Zero Paper" motto in Algerian universities. Despite this, there are still some obstacles hindering the digital transformation in the higher education sector.

Fenour Nada, and Shaheeb (2023) titled '**Digitalization in Higher Education and Challenges of Distance Learning in Algeria**'"

The study aimed to review the challenges of distance education in Algeria and the main digital tools in higher education by examining the lack of technological infrastructure and weak connectivity, and presenting a range of possible options to overcome these challenges. The study concluded with several key findings: the most prominent digital platforms used for distance education are Moodle, Zoom, and Google Meet. Additionally, the results showed that the main challenges faced by Algerian universities in the experience of distance education include insufficient financial

allocations for the sector and the limited computer and internet skills of students.

J.Rosak-Szyrocka, S.A. Apostu, B. Akkaya **(2023) Higher education and digitalization in perspective of use of internet, integration of digital technology, digital public services: panel study of EU nations**

The study focused on the need to improve higher education management through innovation processes and the digitization of higher education. Managing innovation and integrating digitization into higher education are current issues. By combining and balancing these elements, digitization could be the key to enhancing higher education's ability to innovate and expand the use of advanced learning technologies in its curricula, ultimately leading to improved student performance.

The primary objective of the research is to study the relationship between higher education and various aspects of digitization in European countries. The study relies on data from 31 European countries for the period from 2013 to 2020, focusing on the components of the Digital Economy and Society Index (DESI) and components of higher education.

The study concluded that the integration of digital technologies and the use of the internet and digital public services significantly impact higher education in European Union countries. Additionally, research has shown that over time, higher education systems in various European countries have evolved in diverse ways in terms of digitization. As a result, the integration of higher education and innovation based on a new digital foundation will support digital public services for research discoveries and creative processes in higher education institutions.

The First Axis: Digitization of the Higher Education and Scientific Research Sector in Algeria.

The higher education and scientific research sector is one of the strategic sectors in the country, which has undergone a qualitative leap in the field of digitization by employing modern information and communication technologies in the various services it provides.

1. The Concept of Digitization of Higher Education and Scientific Research:

The term "digitization," often referred to as "digital transformation," denotes a business strategy supported by "trends related to employing digital technology across all sectors of society." The concept of "digitization" also refers to the use of digital technology in various fields and businesses around the world. The growth of "smart cities" and "smart things" has been linked to the emergence of digitization as a key topic in the development of contemporary countries.

Digitalization can be defined as the process of converting analog data into digital forms. In other words, it involves transforming digital data from images, videos, texts, and audio through applications, programs, and other computer solutions. Once all the data is scanned, it becomes easier to archive, display, and share it. Digitalization helps in finding and accessing information from anywhere in the world.

Digitization in higher education, or the use of information and communication technology (ICT) in higher education, can be defined as: all the technologies used in the field of higher education for the purpose of storing, processing, retrieving, and transmitting information from one place to another. This works to develop and enhance the quality of the educational process through advanced means such as computers and their software, internet technologies like e-books, databases, encyclopedias, journals, educational websites, email, voicemail, written communication, voice communication, scientific conferences, virtual classrooms, e-learning, digital libraries, distance education, and interactive video.

Distance education can be defined as a type of education that uses technology to enable people to learn from any location and at any time. It refers to delivering educational materials through advanced technology, such as the internet, CDs, and DVDs. It is a relatively modern method that relies on the quality of education in its concept.

Distance education involves using technology to deliver information to learners anytime and anywhere. This is done through interactive educational platforms that aim to facilitate learning, save time and effort between the learner and

the teacher, and increase the effectiveness and quality of the learning process.

2. The Contribution of Digitalization to Improving University Services and Enhancing the Quality of Scientific Research:

The Algeria application of the comprehensive digitization strategy has contributed to improving university services, especially education, and enhancing the quality of scientific research. This has been achieved through the following:

- One of the major benefits of digitization is the elimination of physical files by converting them into encrypted digital files that are easy to use. This reduces the burden on service seekers by eliminating the need to search for required documents and visit various offices to obtain them. Digitization involves creating platforms and networks that store and exchange information between different ministries and sectors without requiring individuals to provide justification from the relevant administration. For the 2023-2024 academic year, the digitization of university registration has been fully implemented, covering all stages from orientation to final registration and enrollment in various university services (transport, catering, housing).

- The reliance on digitization has resulted in a reduction of the inconveniences that service users experienced under the paper-based administration, which had proven ineffective in dealing with citizens and providing them with satisfactory services. It ensures the continuous delivery of public services, embodying the principle of administrative continuity.

- The digital space allows for the possibility of correcting errors through reviewing platform content and making adjustments, which helps reduce administrative mistakes made by employees. Even a university professor can correct what they have posted, for example, on their account on distance learning platforms.

- Digitization has significantly contributed to achieving the principles of transparency and equality, and has greatly reduced the spread of corruption. For instance, the processing of promotion files for academic researchers and the submission of various promotion files now occurs through a digital platform (https://progres.mesrs.dz/webgrh). Files are processed within a reasonable timeframe, not exceeding twenty days to announce results, which adds transparency and flexibility to the handling of files.

- Digitalization facilitates the scientific research process for students by allowing them to search for various references and sources without wasting much time and effort compared to traditional methods, which can be very difficult, especially in some university libraries where finding the needed materials is challenging. Digitalization has significantly helped graduate students in preparing their theses by providing a vast amount of information in a short time.

- The use of information and communication technologies in the educational process contributes to enhancing and improving it. These technologies help teachers deliver lectures with new information and conduct lessons remotely. By utilizing information and communication technologies, it becomes easier for the teacher to convey information to the student in a manner that suits them

- Digitization contributes to the advancement of scientific research and the optimal exchange of information. For example, conferences and scientific meetings held through remote communication have enlightened Algerian researchers and allowed them to interact with researchers in their field from other countries without the costs of travel and accommodation for foreign researchers.

The Second Axis: Field Study

This section addresses the field aspect of the study, which was conducted on a group of students from the University of Setif 1, specifically students from the Faculty of Economic, Commercial, and Management Sciences, Class of 2023/2024. This involved distributing a questionnaire related to the study variables, as well as analyzing the results

obtained.

3.1. Study Population and Sample

To understand the reality of the digitization of higher education and scientific research from the perspective of Algerian university students, a group of students from Ferhat Abbas Sétif 1 University was selected. Due to the sample size, it was limited to students from the Faculty of Economic, Commercial, and Management Sciences for the academic year 2023/2024.

An electronic form was distributed across various college-related pages on social media, in addition to being distributed in paper form. A total of 240 forms were collected, of which 13 were excluded from the analysis due to incomplete basic information. Therefore, the number of forms eligible for study and analysis is 227.

3.2. Study Variables

The questionnaire distributed to students consists of two main sections, in addition to questions related to personal variables such as (gender, educational level, and major).

The first axis included questions about the scientific, pedagogical, and administrative aspects, covering four dimensions, each with 5-6 questions. These dimensions measure: library services, distance education, announcement of exam results, and administrative services provided to students by the college administration.

The second axis included the obstacles and impediments facing the digitization of various higher education and scientific research services.

The five-point Likert scale was selected to measure the questionnaire statements. The overall trend of the study sample responses was estimated by calculating both the arithmetic mean and the standard deviation for the questionnaire items using SPSS version 20. The following table illustrates this.

Table (01): The General Trend of the Five-Point Likert Scale

The Arithmetic Mean of the Corresponding Levels	**The General Trend of the Sample**
]**1 - 1.79**]	**Very Low (Completely Disagree)**
]**1.80 - 2.59**]	**Low (Disagree)**
]**2.60 - 3.39**]	**Moderate (Neutral)**
]**3.40 - 4.19**]	**High (Agree)**
]**4.20 - 5**]	**Very High (Strongly Agree)**

- **Distribution of sample members according to personal variables**

Since the sample was distributed randomly among students of the Faculty of Economic, Commercial, and Managerial Sciences, it came out as follows:

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Table 02: Distribution of the study population by (gender, educational level, and specialization)

	Gender		Educational level					Major				
	Male	Female	First	Second	Third	Master 1	Master 2	Preparatory year	Economy	Commerce	Management	Finance and Accounting
Repetition	82	145	7	23	79	77	41	6	16	35	51	119
Percentage	36.1	63.9	3.1	10.1	34.8	33.9	18.1	2.6	7	15.4	22.5	52.4
Total	227											

Source: Prepared by the two researchers based on the outputs of SPSS software.

It is evident from the table above that 63.9% of the sample are female, which reflects the response rate of female students compared to male students in the college. Master's students (Master 1 and Master 2) from various disciplines come first with a combined percentage of 41%, followed by undergraduate students at 34.8%, then second-year students at 10%, and finally first-year students at 3%.

As for the fields of study, Finance and Accounting came first with a percentage of 52.4%, followed by Management Sciences, then Commercial Sciences, then Economic Sciences, and finally the Common Core with a percentage of 2.6%.

- **Students' responses to the first axis (scientific, pedagogical, and administrative aspects)**

Through this axis, the students' responses to the four dimensions of the first axis will be analyzed, which are: library services, distance education, exam result announcements, and administrative services.

2.1. The First Dimension: Library Services

This dimension measures the students' perspectives on the digital transformation in the services provided by the various college libraries, including the organization of books, access to various references, borrowing, and other library services. The results are as follows:

Table 03: Results of Students' Responses to the First Dimension (Library Services)

Number	Question	Degree of Agreement					Arithmetic Mean	Standard Deviation
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
1	The use of digitization in the library makes it easy to obtain information at any time.	12	12	14	108	81	4.03	1.053
		5.3	5.3	6.2	47.6	35.7		

2	The use of digitization in the library is a support for the college in terms of information storage.	**7**	**4**	**17**	**105**	**94**	**4.21**	**0.892**
		3.1	**1.8**	**7.5**	**46.3**	**41.4**		
3	The electronic management in the library works on providing data and information accurately.	**10**	**29**	**33**	**87**	**68**	**3.77**	**1.142**
		4.4	**12.8**	**14.5**	**38.3**	**30**		
4	The use of digitization in the library contributes to the arrangement of books, which reduces effort during research.	**12**	**14**	**20**	**71**	**110**	**4.11**	**1.135**
		5.3	**6.2**	**8.8**	**31.3**	**48.5**		
5	The electronic services offered by the college library are satisfactory.	**21**	**34**	**51**	**85**	**36**	**3.36**	**1.186**
		9.3	**15**	**22.5**	**37.4**	**15.9**		
The overall arithmetic mean and standard deviation of the first dimension							**3.9**	**0.806**
The overall trend of the first dimension (library services)							**High**	

Source: Developed by the researchers using SPSS software.

The table above shows the extent to which the sample agrees with the items related to the first dimension associated with digitizing library services. The results in the table indicate that over 80% of the sample (between agree and strongly agree) **believe that the use of digitization in the library facilitates obtaining information at any time**, while 10% of students expressed their disagreement with this item. In contrast, over 85% of the sample supported the idea that **the use of digitization in the library aids the college in storing information**. Only 5% of the students disagreed that digitizing library services benefits the college, while 7% of them were neutral on this point.

Regarding the third point, **electronic management in the library works to provide data and information accurately**. More than 60% of the sample expressed their agreement that digitizing library services has contributed to delivering them with better quality and greater accuracy, while about 17% of the students did not agree with this point, and the remaining 14% were neutral on this matter.

While the results related to the fourth item in this dimension indicate that **digitization in the library helps in organizing books, thus reducing the effort during searches**, more than 78% of the sample agreed that digitizing library services contributes to reducing the effort required to search for various references and books, whereas 7% of the

students expressed their disagreement with this idea.

As for item five, which measures **the satisfaction of the sample individuals with the electronic services provided by the college library**, the results were as follows: more than 43% of the sample expressed their satisfaction with these services (agree and strongly agree), while more than 24% expressed their dissatisfaction with these services, and 22.5% were neutral on this matter.

The arithmetic mean for the items related to the library services dimension was 3.9, which is higher than the hypothetical mean (3) and falls within the fourth level on the five-point Likert scale (Table 1), **indicating a high degree**. The standard deviation was 0.806, signifying a high level of homogeneity in the responses.

Based on the results of this dimension, it is clear that the students of the Faculty of Economic, Commercial, and Management Sciences for the 2023/2024 batch are highly satisfied with the digital library services provided by the three faculty libraries. This indicates that the digitization of these services itself acts as a significant incentive for the students. This is further confirmed by the general trend of the first dimension's sections, which were high and reflect a positive image of the digital transformation in library services as part of a diverse service system offered to various stakeholders at the university, primarily the students.

2.2. The Second Dimension: Distance Learning

This dimension refers to the perspective of the sample individuals regarding the shift towards distance education adopted by Algerian universities, in parallel with in-person education. The results were as follows:

Table 04: Students' Responses Results on the Second Dimension (Distance Learning)

Number	Question	Degree of Agreement					Arithmetic Mean	Standard Deviation
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
6	Ease of access to the college's website and then to the Moodle platform for downloading study materials.	22	44	22	91	48	3.44	1.283
		9.7	19.4	9.7	40.1	21.1		
7	Sufficient information has been provided to explain the use of the website for downloading academic material.	21	52	49	81	24	3.15	1.167
		9.3	22.9	21.6	35.7	10.6		
8	I have the necessary means to access the college's online distance learning platform (computer, smartphone, internet...).	10	13	23	99	82	4.01	1.045
		4.4	5.7	10.1	43.6	36.1		

9	The internet speed is suitable, enabling me to access the platform and download and follow the lessons.	30	53	35	58	57	3.21	1.372
		13.2	23.3	15.4	25.6	22.5		
10	Communication with professors is done remotely through the college's electronic platforms.	39	71	46	48	23	2.76	1.251
		17.2	31.3	20.3	21.1	10.1		
11	The college's online platform services, including Moodle, are satisfactory.	29	46	46	84	22	3.11	1.211
		12.8	20.3	20.3	37	9.7		
The overall arithmetic mean and standard deviation of the second dimension.							**3.28**	**0.851**
The overall trend of the second dimension (distance learning)							**Average**	

Source: Prepared by the researchers, using SPSS outputs.

The table above illustrates the extent to which the sample members agree with the items related to the second dimension, which pertains to distance education. Over 60% of the sample members expressed their agreement with **the ease of accessing the college's website and then the Moodle platform to download study materials**. Meanwhile, about 29% of the sample reported difficulties in accessing the Moodle platform and downloading study materials. Additionally, over 9% of the students expressed neutrality on this point.

As for the results of the second item, **sufficient information was provided to explain the use of the website for downloading scientific material.** More than 46% of the sample agreed that enough information and explanations were provided on how to use the website and the Moodle platform for downloading lessons and lectures, while over 30% disagreed with this item, and 21% of the students were neutral on this point.

As for the third point, **having sufficient means to access the college's online distance learning platform (computer, smartphone, internet...),** approximately 80% of the sample reported having adequate means to use the college's digital platforms, such as smartphones and computers. In contrast, no more than 10% acknowledged not having these means.

The results of item four, related to internet speed, indicate that a satisfactory percentage of over 48% (between Agree and Strongly Agree) believe that **the internet speed is adequate for accessing the Moodle platform**, downloading, and following lessons. On the other hand, more than 36% of students expressed disagreement with this item, while the remaining students were neutral on this point.

While the results of the fifth item related to communication show that more than 48% of the sample disagree with this item, indicating that they do not believe there is **communication with the professors through these digital platforms**, with Moodle being one of the main ones, 31% of the students agreed with this item, and 20.3% remained neutral on this point.

The sixth point is that **the services of the college's electronic platform and the Moodle platform are satisfactory**. This measures students' satisfaction with distance learning through the use of digital platforms. About 38% of them expressed their satisfaction with the level of these services, while more than 33% expressed their dissatisfaction, and the

remaining students were neutral on this matter.

The mean for the items related to the second dimension of distance education was 3.28, which is higher than the hypothetical mean (3) and falls into the third range on the five-point Likert scale (Table 1) at a moderate level, with a standard deviation of 0.806 indicating a high degree of homogeneity in responses.

Based on the results of this dimension, it is evident that the students of the Faculty of Economic, Commercial, and Management Sciences for the 2023/2024 cohort are moderately satisfied with the distance education service provided by the college and its professors. This indicates that the digitization of higher education, through the integration of in-person and distance learning systems—which was necessitated by environmental changes such as the COVID-19 pandemic and is also essential to keep up with developments in higher education and research—does not significantly motivate students. There are shortcomings that need to be addressed and overcome to improve the educational process in the context of digitization.

2.3. The Third Dimension: Announcing Exam Results

This dimension measures students' perspectives on announcing exam results digitally through the Progress platform, replacing the traditional (paper-based) method.

Table 05: Results of Students' Responses on the Third Dimension (Announcement of Exam Results)

Number	Question	Degree of Agreement					Arithmetic Mean	Standard Deviation
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
12	The Progress platform contributed to significantly reducing the time required to announce exam results.	24	40	19	81	63	3.52	1.341
		10.6	17.6	8.4	35.7	27.8		
13	Using the Progress platform is the appropriate way to announce the results.	15	31	32	85	64	3.67	1.209
		6.6	13.7	14.1	37.4	28.2		
14	Accessing the PROGRES platform to view results is easy.	30	53	24	71	49	3.25	1.373
		13.2	23.3	10.6	31.3	21.6		
The overall arithmetic mean and standard deviation of the third dimension.							**3.48**	**1.091**
The general trend of the third dimension (announcement of exam results).							**High**	

Source: Prepared by the researchers, using SPSS outputs.

The table above shows the agreement of the sample individuals on the items related to the third dimension associated with announcing exam results via the Progress platform. The results for the first item indicate that over 53% (between agree and strongly agree) of the sample individuals agreed that **the Progress platform contributed to saving time in announcing and viewing exam results** by the students. Meanwhile, about 28% of the students expressed their disagreement with this item, while the remaining 8% were neutral about this idea.

As for the results of the second item, which is the use of **the Progress platform as the appropriate means for announcing results**, over 65% of the sample expressed their agreement that the Progress platform is a suitable and good means for announcing various exam results. Meanwhile, about 20% of the students rejected this idea, and the remaining 24% of the total sample expressed their neutrality towards this means of publishing exam results.

The results of the third item concerning the ease of access to the Progress platform showed that **accessing the platform to view the results is easy,** with 53% of the sample expressing agreement. In comparison, 26.5% disagreed with this item, while approximately 10% were neutral.

The arithmetic mean of the items in the third dimension related to the digital publication of exam results through the Progress platform was 3.48, which is higher than the hypothetical mean (3). It belongs to the fourth domain with a high degree and has a standard deviation of 1.091, indicating a high degree of homogeneity in the responses.

It is clear from the results of this dimension that the students of the Faculty of Economic Sciences, Commercial Sciences, and Management Sciences for the 2023/2024 batch are highly satisfied with the electronic publication of exam results via the Progress platform. This indicates that digitizing these services is highly motivating for the students. This is further confirmed by the overall trend of the third dimension's paragraphs, which were high, reflecting the positive image of the digital transformation in publishing various exam results through the use of a unified platform, the Progress platform.

2.4 The Fourth Dimension (Administrative Services)

This dimension measures the students' perspective on the electronic administrative services provided to them by the college and university administration in general, from initial registration to obtaining the graduation certificate. The results were as follows:

Table 06: Results of students' answers on the fourth dimension (administrative services)

Number	Question	Degree of Agreement					Arithmetic Mean	Standard Deviation
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
15	The digitization of annual re-registration facilitated a lot for students.	22	42	31	82	50	3.42	1.82
		9.7	18.5	13.7	36.1	22		
16	The electronic registration in university services (transfer, food, housing...) has facilitated matters for students	29	39	20	75	64	3.47	1.390
		12.8	17.2	8.8	33	28.2		

17	Electronic registration for university services has reduced the transportation costs for student registration.	**19**	**11**	**30**	**94**	**73**	**3.84**	**1.174**
		8.4	**4.8**	**13.2**	**41.4**	**32.2**		
18	The digitalization of university services has led to an improvement in their quality.	**32**	**39**	**43**	**72**	**41**	**3.22**	**1.316**
		14.1	**17.2**	**18.9**	**31.7**	**18.1**		
19	The university services digital platform is user-friendly and easily accessible.	**23**	**49**	**47**	**69**	**39**	**3.23**	**1.252**
		10.1	**21.6**	**20.7**	**30.4**	**17.2**		
20	The electronic registration process for various university services is easy and simple.	**20**	**31**	**49**	**82**	**45**	**3.44**	**1.205**
		8.8	**13.7**	**21.6**	**36.1**	**19.8**		
The overall mean and standard deviation of the fourth dimension							**3.44**	**1.011**
The general trend of the fourth dimension (administrative services)							**High**	

Source: Prepared by the researchers, using SPSS outputs.

The table above shows the level of agreement among the sample members regarding the fourth dimension related to various administrative services provided by the college to students. The results for the first item, "**Digitization of annual re-registration has made things easier for students**," indicated that over 58% of the sample agreed with this item, while 28% of them disagreed that electronic re-registration made things easier for students. The remaining respondents expressed neutrality.

Regarding the results of the second item, **electronic registration in university services (transport, dining, accommodation, etc.) has made things easier for students**, supporting the results of the first item. Over 61% of the sample indicated that electronic and remote registration for various university services, including transport, dining, accommodation, and grants, has saved them a lot of effort and time. 30% of the sample rejected this item, and the remainder expressed neutrality.

The third item, **electronic registration for university services, reduced transportation costs for student enrollment**. It received approval from about 76% of the sample, who indicated that remote registration for various university services has contributed to lowering transportation costs to the university and the expenses of in-person procedures. Meanwhile, approximately 13% of the sample did not agree with this item, and the remaining 13% expressed neutrality on this point.

The results of item four indicate that **the digitization of university services has led to an improvement in their quality**, with approximately 50% of the sample agreeing that the digitization of various university services has contributed to their quality enhancement. Meanwhile, over 31% expressed disagreement with this statement, and the

remaining respondents were neutral.

As for the fifth item, **the digital platform for university services is simple and accessible,** it received approval from more than 47% of the sample (between agreeing and strongly agreeing). Meanwhile, about 32% of the students believe that the digital platform for university services is not simple and there are difficulties in dealing with it. On the other hand, 20.7% of the sample expressed neutrality regarding the simplicity of this platform.

The results of the sixth and final item in the fourth dimension show that **the electronic registration method in various university services is easy and simple**, supporting the results of the previous item. Over 56% of the sample agreed that electronic registration in various university services is easy and simple, while about 21% of the sample disagreed with this item, and the remaining respondents expressed neutrality.

The arithmetic mean for the items related to administrative services was 3.44, which is higher than the hypothetical mean (3) and falls into the fourth range on the five-point Likert scale (Table 1) at a high level, with a standard deviation of 1.011, indicating a high degree of homogeneity in the responses.

The findings indicate that students from the Class of 2023/2024 in the Faculty of Economics, Business, and Management express a high level of satisfaction with the digital administrative services offered by both their faculty and the university. This suggests that the digitalization of these services has been a significant motivator for students. The consistently positive responses throughout the fourth dimension further support this, painting a favorable picture of the digital transformation within the university's administrative services.

- **Students' responses to the second axis (obstacles and impediments)**

This axis refers to the obstacles that students perceive as hindering the digital transformation in the higher education and scientific research system, and negatively affecting the quality of services provided to them. The results were:

Table 07: Results of student responses on the second axis (obstacles and impediments

Number	Question	Degree of Agreement					Arithmetic Mean	Standard Deviation
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
21	The college does not have designated spaces for students that are equipped with internet.	6	5	15	86	115	4.32	0.895
		2.6	2.2	6.6	37.9	50.7		
22	Weak internet connection	4	12	19	73	119	4.28	0.950
		1.8	5.3	8.4	32.2	52.4		
23	Lack of students' possession of technological tools (computers, smartphones, smart boards...)	6	30	62	59	70	3.69	1.122
		2.6	13.2	27.3	26	30.8		
24	The specificity of	1	12	72	83	59		

	certain modules (technical and scientific modules)	**4**	**5.3**	**31.7**	**36.6**	**26**		
25	Lack of interactivity (interactive communication) between students and teachers on digital platforms.	**4**	**12**	**28**	**93**	**90**	**4.11**	**0.938**
		1.8	**5.3**	**12.3**	**41**	**39**		
26	Lack of understanding of remotely delivered lessons and lectures.	**11**	**24**	**48**	**76**	**68**	**3.73**	**1.142**
		4.8	**10.6**	**21.1**	**35.5**	**30**		
27	The difficulty of registering on electronic service platforms due to their continuous downtime.	**9**	**17**	**18**	**82**	**101**		
		4	**7.5**	**7.9**	**36.2**	**44.5**		
28	The difficulty of viewing the exam results due to the great pressure during the announcement of the results.	**3**	**18**	**18**	**52**	**136**	**4.32**	**1.008**
		1.3	**7.9**	**7.9**	**22.9**	**59.9**		
29	The remote learning platform is not free and requires a high internet speed, which makes it difficult to access.	**11**	**40**	**43**	**70**	**63**	**3.59**	**1.203**
		4.8	**17.6**	**18.9**	**30.8**	**27.8**		
The overall mean and standard deviation of the second axis.							**4**	**0.639**
The overall trend of the axis of obstacles and hindrances.							**High**	

Source: Prepared by the researchers, using SPSS outputs.

The table above presents the sample population's agreement on the items of the second axis, which pertains to the obstacles and hindrances to the success of digital transformation. The results of the first item, concerning **the lack of college spaces equipped with internet access**, reveal that over 88% of respondents agreed that there are no designated spaces for students with internet access to use for logging into the university and college's various digital platforms.

Regarding the second point concerning **the weak internet connection and slow internet speed**, more than 84% of students agreed that the internet speed at the university level is weak and does not keep pace with global developments in this field.

The results of the third item revealed **that students lacked access to technological devices (computers, smartphones, tablets, etc.).** A substantial 56% of respondents indicated that they did not own such devices. While these findings might not accurately reflect the actual situation, 15% admitted to possessing these types of devices.

More than 62% of the sample agreed that the nature of certain scientific and technical modules hinders the implementation of distance learning, as shown in the results of the fourth item regarding **the specificity of certain modules (technical and scientific modules)**, while 31% remained neutral.

While 80% of the sample (between agree and strongly agree) agreed with the fifth item about **the lack of interactivity (interactive communication) between the student and the teacher on digital platforms**, and therefore consider this element to be one of the biggest obstacles to the success of the digital transformation in the educational process which requires mutual and effective communication between the two parties, about 7% of the sample saw the opposite of what was presented, and the rest showed neutrality at a rate of 12%.

While 65.5% of the surveyed students acknowledged difficulties in comprehending online lessons and lectures delivered through the Moodle platform, over 15% reported no comprehension issues regarding the remote learning materials. These findings corroborate the results of item six, which indicated a general **lack of understanding of remotely taught lessons and lectures.**

More than 80% of the sample considered the frequent downtime of digital platforms to be one of the biggest obstacles to digital transformation and the success of digitalization in the college. This supported the results of the seventh item: **the difficulty of registering for electronic services due to their constant downtime**. Approximately 10% of the sample did not agree with this item, and the rest were neutral.

The results of the eighth item, '**difficulty in accessing exam results due to the heavy load during the results announcement period**,' indicated that 82% of the sample agreed that it was difficult to access the Progress platform during the publication of exam results. This is attributed to the heavy load experienced by the platform, and is thus one of the most prominent obstacles to the success of digitizing higher education and scientific research services.

58% of the sample considered that the weak internet flow makes it difficult to access these digital platforms and is an obstacle to the success of the digital transformation. This is what was mentioned in the results of the ninth and last item: **The remote learning platform is not free and requires a high internet flow, which made it difficult to access**, while 21% did not agree with this statement, while the rest expressed their neutrality about this point.

The mean score for the items in the second axis, related to the obstacles of digitizing higher education and scientific research, was 4. This is higher than the hypothesized mean (3) and falls within the fourth category of the five-point Likert scale (Table 1), indicating a high degree. The standard deviation of 0.639 suggests a high degree of homogeneity in the responses.

Therefore, it is clear from the results of this axis that students of the Faculty of Economic, Commercial and Management Sciences for the academic year 2023/2024 consider that the process of digitizing higher education and scientific research, with its various services, whether in the scientific, pedagogical or administrative aspects, faces various and multiple obstacles that may negatively affect the success of the digital transformation process, most notably the weak internet speed and the pressure experienced by these platforms, which makes it difficult to access and benefit from their services, in addition to a very important element, which is the lack of interactive communication between the various parties, and at the top of that is the communication between the student and the professor.

The Results

E-governance significantly contributes to overall administrative development by leveraging modern technological solutions and systems. These advancements streamline administrative operations, enhance human resource efficiency, and cultivate a new generation of professionals adept at handling cutting-edge technologies. Consequently, the quality of services delivered to various stakeholders improves. The move towards digitizing higher education and scientific research in Algeria is a step in the right direction, aiming to elevate the quality of services provided, enhance the learning process, and raise the overall standards of higher education and various services.

The results of the field study were as follows:

- The results regarding library services indicate that students of the Faculty of Economic, Commercial and Management Sciences support the use of electronic administration and the digitalization of library services, considering the latter to be a support for the faculty and contributing to improving the quality of services

- The results regarding remote learning studies indicate that students from the Faculty of Economics, Business, and Management have a moderate level of satisfaction with the use of the Moodle platform for distance learning. While Moodle effectively facilitates the dissemination of course materials and remote interactions between students and professors, it lacks the necessary features for real-time, interactive communication between the two parties.

- The results related to the announcement of exam results indicate that students of the Faculty of Economics, Commerce, and Management Sciences strongly support the administration's use of electronic means to announce results and digitize these results, which contributes to saving time and cost, despite some shortcomings, especially the difficulty of accessing the Progress platform during the period of result publication due to the heavy load on the platform.

- Findings related to electronic administrative services indicate that students of the Faculty of Economics, Business, and Management Sciences support the digitalization of various administrative and university services. This is expected to enhance service quality and make it easier for students to access these services remotely, eliminating the need for on-campus visits and associated costs.

- The results concerning the obstacles indicate that students of the Faculty of Economics, Business, and Management Sciences perceive, to a great extent, that the most prominent challenges to the success of digitizing higher education and scientific research are primarily related to material capabilities, such as high-speed internet and the availability of dedicated spaces and resources. Additionally, the lack of interaction between the two main parties in the educational process, the student and the professor, within the framework of distance learning, is another significant obstacle.

Based on the understanding and analysis of the current reality of higher education and scientific research in Algeria**, a strategy to develop the higher education and research sector in Algeria** can be proposed:

To foster significant growth and improvement in Algeria's higher education and scientific research sectors, a comprehensive and integrated strategy is required. This strategy should be tailored to the demands of the digital age and should encompass the following key elements:

Firstly: Developing the digital infrastructure within the sector

The digital transformation in the higher education and scientific research sector in Algeria requires the provision of a suitable smart infrastructure to support the digital transformation, and this is through the provision of:

- Study rooms equipped with computers connected to the internet, modern technological devices, smart boards, and linked to the website for online lecture delivery to create a study room with a suitable and stimulating learning environment.

- Fingerprint-based student attendance tracking systems.

- providing comprehensive coverage with super-fast internet networks available to everyone, students and professors.

- Develop smart applications that enable constant communication between administration and students, administration and teachers, and teachers and students, allowing information to be accessed anytime, anywhere.

- Full digitization of all university transactions between administration, students, professors, and staff, relying on information technology and modern technical devices.

Secondly: Developing legislations, systems, and laws related to digital transformation.

This will be achieved by appointing a special committee tasked with planning and forecasting the future of higher education and scientific research in Algeria in the age of digitalization, and developing a comprehensive legal framework for universities. This committee will consist of experts from both within and outside the country across various fields. Their mission is to conduct a study of the current situation and the needs of the job market, develop future plans for sector development, and carry out regular evaluations of the activities of higher education and scientific research institutions, while promoting best practices. This will be accomplished through the following:

- Identifying the graduate specifications that suit the job market, especially in the age of digitalization and artificial intelligence.
- Identifying the essential requirements and academic qualifications that a graduate must acquire to be qualified in the new job market.
- Determining the type of core courses necessary to achieve the required graduate specifications and standardizing them across all universities.
- Identifying the practical qualifications that a graduate should possess to find a place in the job market.
- Implementing incentive awards for university graduates who excel at the national level and supporting beneficial graduation projects.

By providing the necessary digital infrastructure and restructuring the teaching and working system in universities, Algeria will achieve a qualitative leap in all areas of life because the university and scientific research is the artery of development in various fields.

Thirdly: the training and development of human resources

A qualified human resource is considered the cornerstone of the success of any project. Therefore, to ensure the success of the higher education digitalization project in Algeria, the responsible ministry should:

- Organizing training courses to develop self-skills in using various digital platforms for different stakeholders in collaboration with the Ministry of Higher Education and Scientific Research, starting with employees, users, professors, and extending to students and any other party benefiting from the services of the Ministry of Higher Education and Scientific Research.
- Allocating a suitable budget to train and qualify all employees in all universities and institutions on the use of computers and then digital platforms to improve the digital services provided to various beneficiaries.
- Providing training courses at the beginning of the academic year for new students on how to use the Moodle digital platform.
- Organizing seminars, workshops, and scientific awareness forums with the participation of various colleges, institutes, and universities to highlight the importance of digital transformation in higher education and scientific research and to demonstrate the positive impacts of this transformation.

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