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The Impact of E-Transformation on the Efficiency of University Administrations 'According to the Opinions of Some Employees in the Higher Education and Scientific Research Sector - Algeria '

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Abstract:

The study aims to examine the impact of electronic transformation on the efficiency of university administrations in Algeria, based on the perceptions of a sample of 280 administrators from different institutions. A questionnaire was designed and analyzed using the Statistical Package for the Social Sciences (SPSS). The results indicate that electronic transformation has a positive but limited effect on administrative efficiency, with a Pearson correlation coefficient of R = 0.318, accounting for approximately 10.1% of the variance in performance. However, most statistical tests (T-test and ANOVA) showed no significant differences across demographic variables, such as gender and academic qualification (P> 0.05). These findings suggest that while electronic transformation contributes to improving performance, its impact remains modest and is influenced by other contextual and structural factors. The study highlights the importance of strengthening digital infrastructure, developing human resources, and adopting supportive policies to maximize the benefits of electronic transformation in higher education.

Keywords: *electronic transformation, efficiency, performance, universities, Algeria.*

JEL Classification: *M1, L25.*

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1. *Introduction*

The technological developments and changes that the world experienced at the end of the twentieth century had a major impact on all fields and levels, as the emergence of what is known as the information and communications revolution, through the expansion of the use of electronic networks and software, led to a transition from using traditional methods in achieving Business to modern electronic methods, this is what resulted in the emergence of electronic management, which represents one of the most important modern trends in the administrative field.

In this context, electronic management is considered one of the most important modern methods in contemporary management, which has enabled organizations of various types and types of economic activities to benefit from its applications, as a result of the increasing use of computers and the information revolution that it has brought about in all fields, due to the advantages and high capabilities it provides in storing data and Exchanging information through global and local information networks, contrary to what was prevalent in traditional management of paper transactions that disrupt the process of administrative transactions, which made organizations suffer from continuous pressure and forced them to enter this era and react to change using the necessary tools that were provided to them. To stay ahead of the curve.

Change in organizations has become a must, due to the new values imposed by the concept of electronic management, which do not allow wasting time, continuing at only one pace, and killing thought and creativity. Talents must be exploited, invested in, and restructured, and a new, contemporary intellectual environment must be created. To grow and continue, rely on the human element and realize its importance as the most important resource in organizations, given the work it performs within them, which makes it the basis for developing its performance or not, and working to train and form it, and give it the necessary capabilities to keep pace with these technological developments and what the latter brings. Its functional performance has the advantage of saving time, effort, and cost.

Given the scientific and technological acceleration and development occurring in society, contemporary management has been obligated to search for modern methods and technologies that work to keep pace with the development of this modern and renewable world. Electronic management is considered one of these methods, as it has the efficiency and effectiveness to confront these challenges. The technologies, communication networks, and applications it provides enable it to achieve a high level of performance.

In this context, it has become inevitable for organizations seeking to achieve success, stability, and excellence in their performance, to search for the basic factors that contribute to this success, and to pay attention to providing all the resources that fall within the requirements for this shift, the most important of which are human resources, and this can only be done by While realizing the importance and status of human capital as the real capital to achieve its goals, this forces it to reconsider its investment and structure by providing most of the capabilities necessary to develop the work environment, develop its thought, capabilities, and academic qualifications, generate its energies, and encourage it to have a spirit of initiative and intellectual creativity to reach positive organizational symmetry. Including developing its performance and achieving desired goals, relying on the electronic management philosophy that enables organizations to make a radical change in the way employees interact, which is considered an entry point for

career development by shortening routine procedures that contribute to wasting time, effort, and excess costs, in addition to To allow the greatest possible freedom to decide on their tasks and work style and to benefit from their creative abilities and qualifications.

Algeria, like its counterparts in other countries, did not deviate from the principle of Electronic Transformation in light of these tremendous transformations. It witnessed many changes during the reform campaign it undertook, to move from the classical concept to the modern electronic concept that aims to modernize the services provided to achieve the well-being of society and adapt to its new surroundings, which is getting more advanced day by day.

Based on the above, the following primary issue can be brought up:

"To what extent does Electronic Transformation contribute to improving the performance of Algeria's higher education and scientific research sector?"

1.1. General Hypothesis: It is assumed that the adoption of Electronic Transformation significantly contributes to improving the performance of Algeria's higher education and scientific research sector by enhancing administrative efficiency, ensuring transparency, reducing bureaucratic procedures, and supporting the quality of educational and research outputs.

1.2. Significance of the Study: This study is significant because it sheds light on the role of Electronic Transformation in enhancing the performance of Algeria's higher education and scientific research sector. It contributes to filling the gap in the literature by providing empirical insights into how digital tools and processes can improve administrative efficiency, transparency, and decision-making within universities. The study also has practical importance as it provides guidance for policymakers, university leaders, and stakeholders on the effective implementation of e-administration strategies to strengthen institutional performance and align with international standards.

1.3. Objectives of the Study

- To examine the extent to which Electronic Transformation contributes to improving the overall performance of Algeria's higher education and scientific research sector.
- To identify the key areas where e-administration enhances efficiency, such as simplifying administrative procedures, improving transparency, and reducing bureaucracy.
- To analyze the impact of Electronic Transformation on the quality of services provided to students, faculty, and researchers.
- To explore the challenges and barriers facing the adoption of Electronic Transformation in Algerian universities.
- To propose practical recommendations for strengthening the integration of e-administration and maximizing its benefits in the higher education and research sector.

1.4. Research Methodology: This study adopts a descriptive and analytical approach to examine the contribution of Electronic Transformation to improving the performance of Algeria's higher education and scientific research sector. The descriptive aspect allows for a clear presentation of the current reality of e-administration practices within Algerian universities, while the analytical component enables an in-depth assessment of their effectiveness and impact on institutional performance.

The study relies on both primary and secondary data sources. Secondary data are collected from previous studies, official reports, policy documents, and statistical records related to digital

transformation in higher education. Primary data may be gathered through surveys and structured interviews with university administrators, faculty members, and staff, in order to capture perceptions and experiences regarding the implementation of Electronic Transformation.

A purposive sampling method will be used to select universities and participants that reflect diverse institutional contexts within Algeria. The data collected will be analyzed using both qualitative and quantitative techniques. Qualitative data will be thematically analyzed to identify key patterns and challenges. In contrast, quantitative data will be processed using statistical tools (e.g., SPSS) to measure relationships between the adoption of e-administration and indicators of institutional performance.

This methodological framework enables the linkage of theoretical insights with practical evidence, thereby providing a comprehensive understanding of the extent to which Electronic Transformation can enhance efficiency, transparency, and service quality in the Algerian higher education and research sector.

1.5. Previous studies:

Arabic studies:

Study One: Dakhane Hassyna (2025), ***The Mechanism of Digital Transformation in Higher Education: University of M'sila Case Study***, *Journal of Economics and Rural Development*, Algeria, March 2025. This study aimed to formulate a strategic model for digital transformation applicable to the University of M'sila. It relied on the analysis of quantitative data collected from the university to assess institutional digital readiness. The findings showed that digital transformation is progressing at a slow pace, primarily due to universities being compelled to implement measures without sufficient planning before the COVID-19 pandemic. The study recommended the establishment of a comprehensive strategic framework that includes digital infrastructure, staff training, and institutional planning to keep pace with future changes.

Study Two: Dallaa Dalila & Belhaoues Salima (December 2024), ***Activating Digital Education in Algerian Universities – Between Reality and Challenges***, *Afaq Journal of Management and Economics Sciences*, Algeria. This study focused on analyzing the current state of digital education in Algerian universities. It revealed that opportunities for digital transformation remain limited due to weak infrastructure, unstable internet connectivity, and insufficient training among faculty members. The authors recommended strengthening technological infrastructure, providing continuous training for teaching staff, and developing appropriate digital content to enhance the effectiveness of online education.

Study Three: El Ferouali, S. & Ouhadi, S. (February 2024), ***Digital Transformation in Moroccan Higher Education: A Literature Review***, *African Journal of Management, Engineering and Technology*, Morocco. The objective of this study was to provide an exploratory and analytical review of the current state of digital transformation in Moroccan universities. It employed a qualitative interpretive approach to investigate both achievements and challenges. The study concluded that Moroccan universities are showing gradual progress toward digitization; however, this progress is hindered by weak theoretical and organizational frameworks. It recommended strengthening a clear conceptual and practical framework and supporting implementation through training and qualified institutions.

Foreign studies:

Study One: Tafraouti, Y. & Boujida, F. (February 2025, online publication), ***Digital Transformation and Internationalization in Higher Education: A Sociological Study of Artificial Intelligence at Mohamed I University****, Morocco*, in *Internationalization of Higher Education and Digital Transformation*, Palgrave Macmillan, Switzerland. This study aimed to explore the sociological dimensions of artificial intelligence in enhancing cultural capital and the scientific context within higher education. Using a qualitative methodology based on observation and structured interviews with students at Mohamed I University, the authors found that digital transformation strengthens integration within the international academic system, provided that inclusion and cultural identity factors are supported. The study recommended integrating artificial intelligence into university policies while preserving local contexts.

Study Two: Chahid, A., Ahriz, S., El Guemmat, K., & Mansouri, K. (February 2025), ***Digital Transformation in Higher Education Obstacle Assessment and Development of Strategies against Cybersecurity Threats: The Case of Moroccan Universities***, *Engineering, Technology & Applied Science Research*, Morocco. The objective of this study was to identify and classify the barriers to digital transformation in Moroccan universities and analyze their relation to cybersecurity threats. By applying the Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP), the researchers revealed disparities in the prioritization of obstacles and their interconnections with cybersecurity risks. The study recommended the development of integrated strategies that consider these interdependencies to achieve effective protection of digital infrastructures.

Study Three: Spring Santos, L. F. (December 2023), ***Internationalisation in the Digital Transformation: A Scoping Review***, *Higher Education Quarterly*, Germany. This study sought to investigate the impact of digital transformation on the internationalization of universities since the COVID-19 pandemic. It employed a systematic review methodology covering a wide range of studies. The findings highlighted that digitalization has accelerated academic internationalization through remote learning and knowledge exchange. The study recommended developing flexible digital educational structures that can sustain long-term international engagement.

Similarities:

- **Focus on digital transformation**: All previous studies, whether Arab or foreign, addressed the issue of digital transformation in higher education, which is also the main focus of my study.
- **Common objectives**: Most studies shared key goals such as improving the quality of university education, enhancing institutional efficiency, and developing universities' ability to adapt to technological changes—objectives that align with those of my study.
- **Highlighting challenges**: Previous studies emphasized common obstacles such as weak technological infrastructure, lack of qualified human resources, and absence of prior strategic planning, which are the same issues my study seeks to address.
- **Applied dimension**: Prior research often relied on analyzing the realities of universities (through case studies or analytical reviews), which is also the basis of my study, as it links theoretical insights with practical applications.

Differences:

- **Methodology**: Some previous studies (such as Dakhane, 2025) used a descriptive-analytical method based on quantitative data from a single case, while my study adopts a broader comparative analytical framework that integrates multiple contexts (Arab and foreign).
- **Geographical scope**: Most prior studies examined a single national context (e.g., Algeria, Morocco), whereas my study compares experiences across different contexts, combining both local and global perspectives.
- **Time frame**: Some previous research dates back to 2023 and 2024, while my study benefits from the most recent findings and references (2025), giving it greater contemporaneity.
- **Focus area**: Certain foreign studies (such as Tafraouti & Boujida, 2025) concentrated on artificial intelligence and university internationalization, while others (such as Chahid et al., 2025) focused on cybersecurity. My study, however, seeks to provide a more comprehensive analysis of digital transformation in terms of administrative efficiency and institutional performance.

In light of the above similarities and differences, it becomes evident that while previous studies have substantially contributed to understanding digital transformation in higher education, they often remain confined to single-case or sector-specific analyses. My study distinguishes itself by adopting a comparative and integrative perspective that bridges Arab and international contexts, thereby offering a broader understanding of how digital transformation impacts administrative efficiency and institutional performance. This approach not only updates the discussion with the most recent findings from 2025 but also highlights the structural and contextual gaps that hinder effective implementation. Consequently, my study addresses a clear research gap by synthesizing diverse experiences into a comprehensive analytical framework and proposing practical recommendations that are adaptable across different educational environments.

2. The reality of Electronic Transformation in Algerian universities

The use of Electronic Transformation at the university has a major role in improving the quality of university services (educational and administrative), so that it benefits all parties who benefit from the work of the university. Students who study there receive better services than before, which makes it easier to access them without the hassle of traveling.

2.1. Requirements for applying electronic management in Algerian universities

The success of implementing electronic management in universities is linked to the necessity of providing a set of requirements, which are as follows:

- Developing traditional education systems by including technology and its applications within curricula and curricula during the various stages of education, and paying attention to innovative thinking in education at its various stages to prepare and qualify a graduate who has accumulated creative cognitive skills and abilities and is concerned with the desire for achievement, the pursuit of excellence, taking risks, innovation and innovation, and accepting and absorbing change;
- Holding training courses for employees to keep pace with the shift towards electronic management;
- Analyzing the prevailing organizational culture in institutions and determining the changes required to be made in the values and beliefs of employees, their customs, traditions, and

behaviors at work, which represent a cultural gap that must be overcome to spread the culture of electronic work.

- ❖ administrative structure for improved Electronic Transformation, which calls for reorganizing the administrative pyramid, defining the boundaries of authority, responsibility, and tasks, as well as establishing new departments or dissolving or combining current ones;
- ❖ establishing a committee to carry out the process of creating the project's strategy for Electronic Transformation and enlisting the aid of research and consulting organizations to take part in the study and create plans;
- ❖ Developing an integrated plan for comprehensive communications between all parties, developing and renewing electronic management programs, and focusing on technical capabilities;
- ❖ Spreading the culture of e-learning in the local community;
- ❖ Students' access to scientifically accurate educational resources quickly and safely;
- ❖ Organizing workshops and study days for target groups on the use of e-learning tools and modern technology in universities;
- ❖ Human resources must be available who have experience and skill in the field of knowledge and information, and the ability to deal with electronic management.
- ❖ Rehabilitating and upgrading current human cadres, to maintain high levels of skill, by holding training courses and various training programs in the electronic field;
- ❖ Spreading information awareness among every student and employee at the university to form an informed audience that can deal with modern technologies, and the availability of an effective system to identify persons authorized to access computerized information;
- ❖ Maintain backup copies of data in safe places, and use original programs to secure and protect information.
- ❖ Availability of clear and deterrent policies for employees who violate the security and integrity of information.

Users of Electronic Transformation at the university must have a set of skills, including (Zeenat , 2016, p. 50)**:**

- ❖ The skill of using email to exchange messages, documents, information, and data using a computer.
- ❖ Availability of the skill of using online chat programs that help to talk with others through various social networking sites;
- ❖ Availability of the skill of using the World Wide Web, which represents the center of global information, through which text, audio, and visual information can be obtained through electronic browsing;
- ❖ Skill in using various computer applications such as word processors, databases, electronic spreadsheets, graphics programs, and multimedia;
- ❖ The ability to develop and innovate with modern technology, and the ability to use scanners and digital cameras;
- ❖ The ability to install and maintain computer equipment, accessories, and communication networks;

- ❖ Skill in dealing with local communication networks in carrying out supervisory tasks, and the ability to transfer, send, and receive electronic files.

2.2. Barriers to electronic management implementation in Algerian academic institutions

The application of Electronic Transformation faces some obstacles that should be taken into consideration when moving towards its application in universities, the most important of which are the weakness of electronic culture among university employees, the lack of confidence in electronic means, in addition to the linguistic obstacle represented by the fact that most electronic programs depend on the English or French language. The shortage of the human element of programmers and technicians, and the resistance of some managers with limited capabilities to the shift towards Electronic Transformation, in addition to some other obstacles. The obstacles facing the university administration when it applies Electronic Transformation can be classified through what was observed or obtained from the universities in question. The study is as follows:

- ❖ Weak infrastructure suitable for implementing the electronic management project, in addition to the weakness of qualified human resources to implement this project.
- ❖ The high cost of media and communication network technologies and programs;
- ❖ The obsolescence of the devices available in the university environment and the failure to update and maintain them periodically;
- ❖ A lack of programs to protect devices at the university from viruses that threaten them.
- ❖ Most or some of the university's employees and professors have a significant weakness in the technological aspect, in addition to some of them having what is known as resistance to change.
- ❖ Lack of supporting sites to provide oversight and protection to avoid destruction by Internet vandals;
- ❖ The lack of powerful electronic copying programs that are difficult to hack as an alternative to the traditional photocopying system for books.
- ❖ The high cost of special devices to connect the library to an internal communications network and the Internet.
- ❖ High costs of obtaining digital information sources from international libraries;
- ❖ Lack of financial resources necessary to provide infrastructure for purchasing hardware and application software, computer development, website creation, and network connectivity;
- ❖ The lack of sufficient financial allocations to train workers and students in the field of information systems;
- ❖ High costs of maintenance services for devices;
- ❖ The program stops during periods of important work pressure, such as the period of recording and reviewing students' points, the period of extracting final results, and preparing school certificates, etc.
- ❖ Not activating the daily attendance and dismissal of students and employees;

2.3. Applications of electronic management in Algerian academic institutions

Applying Electronic Transformation in universities does not mean using computers in education, teaching, or administrative work only, but it means managing the administrative and educational process within the university using computers and various electronic devices. The goal of applying Electronic Transformation is to improve the educational process and increase

its effectiveness while dealing with... A huge amount of data, some of which is relevant to students and others to employees, lecturers, department heads, deans, and others. The application areas at the university can be divided into:

2.3.1. In the administrative field, which in turn is divided into:

2.3.1.1. Concerning student affairs: Student affairs means: "Everything related to students and their affairs at the university, from registration and general and private data according to what the university has the right to obtain, as well as what concerns students within the university community, and what is related to their educational and health level, and their social conditions." Which helps the university do its part towards them (Al-Hasanat, 2011, p. 46)." Among the electronic management services applied in Algerian universities regarding this part, we find:

- ✓ Registration of students electronically;
- ✓ The professor places the students' points on a special website at the university that allows each student to view them electronically, through the university administration granting the student a secret number and their registration number that enables them to enter what is known as the student space. However, not all universities apply this, but there are many of them. It still follows the traditional method, which is to hang it on the university wall.
- ✓ Preserving and archiving student records electronically, such as social and health records for students;
- ✓ Building an advanced university database for students to make the most appropriate decisions and classify them according to colleges.
- ✓ Request to change regiments, departments, and specializations electronically;
- ✓ Create a private email for each student.
- ✓ Receiving students' opinions and suggestions electronically through various sites, whether e-mail or other social networking sites;
- ✓ The distribution of students according to groups and cohorts in various specializations is available electronically on the university's website.

2.3.1.2. Special for personnel affairs: Here, personnel affairs mean the affairs of all employees of university institutions, including administrators, professors, deans, department heads, and others, who perform key functions within these institutions according to the tasks assigned to them. Following up on personnel affairs is considered a process that requires a lot of effort and time, as many... Amendments must be constantly entered into the employee's records in terms of new appointments, transfers, and promotions, and what is related to financial matters, social security, and other similar matters (Awad , 2008, pp. 57-58). In this part, the most important tasks can be summarized as follows:

- ✓ Providing various services needed by professors and administrative workers electronically;
- ✓ Follow up on performance evaluation through application programs for performance follow-up;
- ✓ Publish lecture schedules and practical works and distribute them with the least effort and time possible;
- ✓ Saving employee data and providing them with the necessary services.

2.3.1.3. Specific to university affairs: The Electronic Transformation, through its special applications, plays a major role in taking care of the various university affairs and its upcoming needs through the information it provides, and helps in identifying its current needs and

estimating its future needs through the statistical information it provides and the services it provides (Al-Hasanat, 2011, p. 47). Different types, including, for example:

- ❖ Rapid interaction between all parties present at the university, and their familiarity with everything that happens there, is easily understood.
- ❖ Disseminating programs for all departments and all years for students and professors to prepare for and interact with each other, and to develop them by presenting the problems and difficulties they encounter in some subjects.
- ❖ Exchanging documents, information, systems, and instructions electronically;
- ❖ Building a system for issuing magnetic cards to students, staff, and library;
- ❖ Recording all administrative communications, including export and import transactions, and photographing them digitally;
- ❖ Announcing the university's various activities through its website and its social media account;
- ❖ Carrying out all administrative work within the university through the electronic university administration program;
- ❖ Updating data on the university's website;
- ❖ Keeping backup copies of electronic information in safe places;
- ❖ Assistance in referring to letters and information related to administrative affairs with speed and accuracy that is not available in traditional administration, which does not use computer technology.

2.3.2. In the educational field, the process is defined as a series of steps designed to produce a product or deliver a service. It is also known as a phenomenon that indicates some events, as it begins with one event and ends with another event. The process is described by the state it represents. If it is business, it is called a business process. However, if it is a university education, it is called the university educational process. Based on what was mentioned above (Ammari, 2017-2018, p. 154), the most important electronic works in the university educational field can be mentioned as follows:

- ❖ Establishing and developing computer laboratories at the university to be consistent with the courses in the academic plans;
- ❖ Automating the lecture system, so that all academic lectures are available on the university's student services website;
- ❖ Helping lecturers automate their courses;
- ❖ E-learning for distance learning master's students and others;
- ❖ Using the computer and its technologies as an educational method and subject;
- ❖ Not restricting academic hours, as the educational material can be placed on the Internet and students can obtain it from anywhere and at any time.
- ❖ It allows students to access information and databases on the World Communications Network, communicate directly with their colleagues and academic supervisors, participate in dialogue groups or scientific discussions and forums, and raise their questions and comments electronically.

Academic supervisors can be called on the Internet if necessary, or if there is a shortage of their number somewhere. Meetings with students can be organized via the Internet at a normal cost, and notes can be discussed electronically.

2.3.3. In the library field: Electronic management, or the shift from traditional libraries to libraries that offer their services electronically, was implemented by university libraries in response to the rise of electronic technologies, such as computers and their components and information and communications networks, to improve performance and make better use of their resources. It is believed that university libraries are scientific establishments that seek to supply information services and their sources to Thus, this study aims to introduce you to all aspects of the use of electronic management in university libraries. Efforts made by the university library include:

- Offering computerized listings and lending services online;
- The ability to access student notes remotely and electronically;
- Editing books that are sent and received by the library, as well as electronic mail exchanges;
- All references and sources in the library are electronically recorded in records, assigned serial numbers, and arranged in lists;
- Creating an electronic database of books, journals, theses, and university dissertations that are connected to the library's electronic catalog, as well as creating electronic lending forms and cards.

Accordingly, it can be concluded that Electronic Transformation in universities offers numerous advantages, chief among them the provision of privacy, security, confidentiality, speed, and accuracy in storage, as well as the ability to effectively and efficiently respond to the needs and preferences of the educational process's beneficiaries, thereby ensuring their satisfaction and offering comprehensive services at the lowest possible cost, effort, and time. Transparency in job performance, the removal of routine and bureaucratic processes, and the maintenance of services over the Internet without requiring frequent visits to the university (Haroush, June 2015, p. 27).

3. Field study design and planning.

The field study must be presented as the first prerequisite.

3.1. Details and resources for acquiring them: Since the information needed to address the main problem was primarily information gathered by Algerian university staff and not found in library books or earlier research, as is the case with secondary information, we knew the kind of information we would like to gather from the problem.

3.2. Field study approach: In order, for us to answer the main problem and sub-questions, and to ensure the validity of the hypotheses, we conducted a personal interview with some officials in some universities, in an attempt to find out the applications of electronic management in the universities under study so that we can thus know the existing elements that can It affects the performance of these institutions and the elements that are not present in them. After that, we prepared a questionnaire to survey a group of managers about their evaluation of electronic management, and then chose a sample from the same sector to facilitate and control this study, in addition to the fact that this sector is implementing the electronic management project. Widespread, noticeable, and advanced.

3.3. Data and the resources for acquiring it: Since the information needed to address this issue is mostly gathered from individuals who are present at higher education institutions, the sort of information we would like to gather was established by the major concern that was expressed.

Like secondary information, this kind of information cannot be found in libraries or earlier research.

3.4. The sample and population under study: We will attempt to address the research population and sample in the following ways through the planned study:

3.4.1. The population under study: The study population consists of professors employed at universities in Algeria and professors who hold administrative positions there and who have great knowledge of electronic management applications. The required statistics were obtained from the Ministry of Higher Education.

3.4.2. Study sample: Regarding the sample size, many research studies have shown many methods for determining the sample size. To achieve the purposes of this study, a questionnaire was designed and distributed to a sample of professors at universities in Algeria and professors who hold administrative positions that the study is based on Based on a field survey of the universities under study, we took a sample of (377), after which the sample was distributed based on the quota sampling method, and therefore the results of this study can be adopted and generalized with a confidence interval estimated at 95% and accepting 5% as sampling error.

4. Preparing the questionnaire: To know the impact of applying Electronic Transformation on the performance of Algerian universities, a model was used that is based on studying several components, to know the relationship between these components, as well as how they contribute to the formation of Electronic Transformation at the university.

Based on these elements, the questionnaire's questions were created, using the 19SPSS software when needed, and according to the research methodology.

4.1. Specifying the questionnaire's goals: There are primary and secondary objectives. Finding the relationship between the variables is the primary objective to validate or refute the hypotheses and provide responses that address the primary issue, which is summed up in the fundamental question: **"To what extent does Electronic Transformation contribute to improving the performance of the higher education and scientific research sector in Algeria?"**

Research Questions:

- To what extent does electronic transformation contribute to improving the efficiency of Algerian university administrations?
- Do demographic factors (gender, qualification, experience) affect perceptions of electronic transformation?
- Does participation in training influence perceptions of efficiency?
- What is the overall impact of electronic transformation on university performance

The secondary goals are to determine the extent to which the components influence the effect of implementing electronic management on performance in Algerian scientific research and higher education organizations.

4.2. Determine the study hypotheses: The study hypotheses served as the foundation for the questionnaire's design, and it was from these that the questions were chosen to demonstrate whether or not the hypothesis was true. The following are the study's hypotheses:

- The averages of study responses on electronic transformation and performance at Algerian institutions do not differ statistically significantly based on the gender variable at a significance level of $0.05 \geq \alpha$;

- The averages of the respondents' responses regarding electronic transformation and enhancing performance in Algerian university administrations, because of the academic qualification variable, do not differ significantly at the significance level of $0.05 \geq \alpha$;
- At the statistical significance level of 0.05, electronic transformation has no discernible impact on raising performance in Algerian university administrations.

B- The second main hypothesis: There is no statistically significant impact of electronic management and performance improvement in Algerian universities.

4.3. Defining queries: Because the five-point Likert scale is one of the most used tools for evaluating trends, and because each component of assessing trends has a lot of factors related to it, the questionnaire's preparation was heavily reliant on tables.

5. Are preliminary tests

In addition to the required statistical checks, the researchers used arbitrators to perform a series of tests on the questionnaire to determine its validity.

5.1. The questionnaire's validity: We presented the questionnaire to a panel of experienced arbitrators who are faculty members in the Faculty of Economic Sciences, Commercial Sciences, and Management Sciences at Yahya Fares University in Medea and Bouira to ensure that it was legitimate and that its contents were adequate. After that, they shared their thoughts on the appropriateness. The degree of accuracy and integrity of the questionnaire's verbal and scientific definition of words, as well as how well it meets the study topic and the achievement of its objectives.

5.2. The resolution variables' stability: The stability of the resolution was assessed in the study using the Cronbach Alpha stability coefficient; a Cronbach alpha score greater than 0.60 is considered satisfactory. As can be seen in the accompanying table, the findings showed that the stability value was high:

Table 1: Cronbach's Alpha to gauge the resolution's stability

Coefficient	alpha coefficient	Constancy
Questions	0.898	**0.947**

Source: Researchers' preparation based on SPSS 19 program findings

Table 01 makes it evident that the stability value and alpha coefficient were both high, at 0.898, indicating the stability of the resolution variables.

- Test Distribution Normality: To determine if the data had a normal distribution, the Smirnov-Kolmogorov test (S-K) was employed. The findings are displayed in the table below:

Table 2: displays the normal distribution test results.

Questionnaire themes	Test value	Sig
Electronic management at the university	1.169	0.130
The role that Electronic Transformation plays in raising academic achievement	0.844	0.474
The questionnaire as a whole	0.788	0.565

Source: Researchers' preparation based on SPSS 19 program findings

The aforementioned table demonstrates that the probability value (Sig) for every research region is higher than the 0.05 level of significance ($0.788 > 0.05$), indicating that the data

distribution for these areas is normal. Parametric tests are then employed to address the study's hypotheses.

5.3. Validity of internal consistency: validity of the internal consistency of the questionnaire intervals. The internal consistency of the questionnaire questions was assessed using the arithmetic mean for each axis and the survey sample of 125 items. Next, the correlation coefficient between the expression and the axis was calculated. We will calculate the internal consistency for the two portions of the questionnaire (Electronic Transformation and the performance of Algerian institutions) to include Electronic Transformation on the first axis. The second axis is the contribution of Electronic Transformation to improving the standard of Algerian universities.

5.3.1. The reliability of the electronic management items' internal consistency in Algerian institutions (Part One):

We spoke about using the Pearson correlation coefficient to show the level of internal consistency among the paragraphs that make up this axis, which consists of a group of paragraphs (numbers 01 through 08), to assess the overall stability of these axes.

Table 3: Pearson correlation coefficient for the research questionnaire's first section

Electronic management at the university	correlation coefficient	Sig	The result
The college has an electronic system through which students are monitored academically from entry to exit.	**0.548	0.000	**D**
Registration deadlines, the academic program, and the six-semester exam schedule are announced electronically.	**0.809	0.000	**D**
Students' grades are saved via an electronic program, and requests to review student grades are submitted electronically.	**0.852	0.000	**D**
The process of supervising and discussing notes and theses at the university takes place electronically.	**0.716	0.000	**D**
The use of the visiting professor system is activated in some specializations and standards that are not widely available electronically.	**0.716	0.000	**D**
The college equips its pedagogical and scientific facilities with the latest electronic devices and knowledge.	**0.709	0.000	**D**
The college adopts the electronic library project and seeks to develop it.	**0.737	0.000	**D**
The library contains an electronic database that is accessible online and connected to several colleges.	**0.689	0.000	**D**

Source: Researchers' preparation based on SPSS 19 program findings

The aforementioned table indicates that the total number of Electronic Transformation items in university administrations is statistically significant for each item. Based on this, the questionnaire items are deemed to be truthful and internally consistent with their intended purpose.

5.3.2. Validity of the paragraphs on how Electronic Transformation improves university performance (Part Two) in terms of internal consistency: We spoke about how the stability of this axis, which is made up of several paragraphs (from 01 to 13), may be determined by using the Pearson correlation coefficient to determine the level of internal consistency between its vertebrae.

Table 4: Pearson correlation coefficient for the research questionnaire's second section's items

Contributions of electronic management in improving the performance of university libraries	correlation coefficient	Sig	The result
Electronic management improves the efficacy and efficiency of administrative tasks while lowering job mistakes.	**0.337	0.000	**D**
Information systems are examined to verify compliance with security performance standards.	**0.662	0.000	**D**
Employees' performance is evaluated electronically.	**0.712	0.000	**D**
For the information security management system, the college uses ISO 27000 standards to safeguard data and use it to make choices that enhance performance.	**0.727	0.000	**D**
Scientific research can be conducted in a supportive work environment at the college. Additionally, it worries about and works to enhance the caliber of scientific information that students learn.	**0.779	0.000	**D**
The college welcomes and draws in international talent so that they can gain experience and expertise. Successful international experiences in the fields of education and electronic services are also advantageous to it.	**0.805	0.000	**D**
The institution welcomes fresh ideas and proposals from staff, instructors, and students.	**0.735	0.000	**D**
Modern electronic programs are used in the educational process.	**0.709	0.000	**D**
The technology used helps provide information to all departments, thus speeding up work and saving time.	**0.632	0.000	**D**
The performance standards used by the college can effectively measure employee performance.	**0.666	0.000	**D**
Electronic performance evaluation methods rely on objective models appropriate to the nature of the work.	**0.704	0.000	**D**
Relying on electronic management reduces the effort, time, and cost of implementing electronic services.	**0.503	0.000	**D**
Providing electronic services to beneficiaries wherever they are as quickly as possible	**0.534	0.000	**D**

Source: Researchers' preparation based on SPSS 19 program findings

As can be seen from the above table, every item about raising the overall effectiveness of university administrations is statistically significant, except for paragraph (03). Of these, the questionnaire's items are regarded as truthful and internally consistent with the criteria that were created to measure them.

6. The validity of the research tool's structural consistency: This is one way to assess the validity of the study tool, as it gauges how well the objectives it aims to accomplish are met.

Table 5: **The reliability of the research tool's structural consistency**

Questionnaire axes:	correlation coefficient	Sig	The result
Electronic management at the university	**0.851	0.000	D
The contribution of Electronic Transformation to improving the performance of Algerian universities	**0.752	0.000	D

Source: Researchers' preparation based on SPSS 19 program findings

According to Table 05, each axis's correlation coefficient with the overall rate of the questionnaire questions is statistically significant; as a result, the axis is regarded as truthful and in line with the criteria used to measure it.

6.4 Data analysis tools: To properly examine the information gathered from the survey procedure, we employed frequency tables, percentages, arithmetic mean tables, and standard deviation tables. To determine which hypotheses were true, we also employed the T-test analysis.

7. Presentation of the study results

We will talk about the presentation and analysis of the questionnaire results in this part. To do this, we will display and examine the respondent's card findings as well as the questions' results.

7.1. Description of the study sample: Following the collection of the required data from a sample of 125, it was coded, stored, and processed on a computer using Excel and SPSS software, which makes it easier to get results quickly. The outcomes are displayed in the tables and figures that were utilized. Show outcomes based on Excel and SPSS applications.

Displaying personal results: We initially do a descriptive analysis of the questions about the final responder to earn his trust before presenting the findings of the study material.

Table 6: Display of individual outcomes

PERSONAL RESULTS	Options	Repetition	The ratio
Gender	**Male**	81	**64.8**
	Feminine	44	**35.2**
Qualification	**vocational institute**	10	**08**
	Bachelor	78	**62.40**
	Master	29	**23.2**
	Magister	2	**1.6**
	PhD	6	**04**
Years of Experience	**Less than 5 years**	24	**19.2**
	From 5 years to 10 years	50	**40**
	From 11 to 15 years	29	**23.2**
	Older than 15 years old	22	**17.6**

Taking part in educational programs related to electronic management	**I did not participate**	77	**61.6**
	Once	27	**21.6**
	Twice	13	**10.4**
	more than twice	08	**06.4**
The number of training courses you have obtained in the field of improving university performance	**I did not participate**	77	**61.6**
	Once	27	**21.6**
	Twice	10	**08**
	more than twice	11	**08.8**
The score for each personal statement		**125**	**100**

Source: Researchers' preparation based on SPSS 19 program findings

7.2- Examination of the questionnaire's first axis: The five-point Likert scale used in the study must be explained before we can look at the responses to the questions that represent the Electronic Transformation of the institution in question.

Table 7: Likert Five-Point Scale

Degree:	**Strongly Disagree**	**not agree**	**neutral**	**Agree**	**Strongly Agree**
the level	1	2	3	4	**5**
arithmetic mean	1.79-1	2.59-1.80	3.39-2.60	4.19-3.40	**5-4.20**

Source: Abdel-Fattah Ezz Hussein, Introduction to Descriptive and Inferential Statistics, Algorithm for Scientific Publishing and Distribution, Jeddah - Saudi Arabia, 2007, p. 237

Table 8: The extent to which the assertions were accepted following the computerized administration

Electronic management at the university	**Arithmetic mean**	**Standard deviation**	**Average difference from the default average 3**	**T**	**SIG**	**sample direction**
01	3.01	1.273	3.008	26.415	0.000	**neutral**
02	2.92	1.189	2.920	27.465	0.000	**neutral**
03	2.82	1.180	2.816	26.673	0.000	**neutral**
04	3.10	1.241	3.096	27.901	0.000	**neutral**
05	2.86	1.220	2.864	26.237	0.000	**neutral**
06	2.48	1.126	2.480	24.626	0.000	**neutral**
07	2.62	1.126	2.624	26.045	0.000	**neutral**
08	2.98	1.208	2.976	27.545	0.000	**neutral**
the dimension as a whole	**2.8480**	**0.87249**	**2.84800**	**36.495**	**0.000**	**neutral**

Source: Researchers' preparation based on SPSS 19 program findings

It is clear from this table that the mean arithmetic values for every statement of the university's electronic management dimension were higher than the arithmetic mean (3). Consequently, they express the employees' agreement with these claims; nonetheless, the replies differ greatly. This is what the standard deviation shows.

Overall, the sample members' average reaction to electronic management was 2.8480, indicating that university staff members are interested in using modern IT. Based on the aforementioned, we deduce that, per the research scale, staff in Algerian university administrations had a high degree of electronic management. This is one of the elements that will support colleges' development and improvement.

7.3. The analysis of the second axis of the questionnaire.

In this section, we will examine the remaining questions' answers that illustrate how Electronic Transformation helps university administrations function better from the perspective of their staff at some institutions.

Table 9: Degrees of agreement with claims of how electronic management helps university administrations work better for the research sample

Electronic management at the university	Arithmetic mean	standard deviation	Average difference from the default average 3	T	SIG	sample direction
01	4.02	0.847	4.024	53.126	0.000	**agree**
02	3.65	1.002	3.648	40.702	0.000	**agree**
03	3.06	1.230	3.064	27.859	0.000	**neutral**
04	2.98	1.181	2.976	28.175	0.000	**neutral**
05	3.19	1.236	2.976	28.877	0.000	**neutral**
06	3.05	1.343	3.192	25.371	0.000	**neutral**
07	3.20	1.283	3.048	27.893	0.000	**neutral**
08	3.36	1.066	3.200	35.254	0.000	**neutral**
09	3.62	1.106	3.616	36.567	0.000	**agree**
10	3.22	1.104	3.216	32.565	0.000	**neutral**
11	3.42	1.072	3.416	35.643	0.000	**neutral**
12	3.97	1.008	3.968	44.032	0.000	**agree**
13	3.82	1.088	3.816	39.216	0.000	**agree**
the dimension as a whole	3.4265	0.77100	3.42646	49.688	0.000	**neutral**

Source: Researchers' preparation based on SPSS 19 program findings

There is a significant disparity in the responses; however, it is evident from this table that the majority of the phrases had arithmetic means higher than the scale's arithmetic mean (3), indicating worker agreement with these statements. The standard deviation illustrates this.

The average replies of the sample members on distant performance as a whole reached 3.4265, which leads us to the conclusion that university departments performed at a high level from the perspective of their employees, according to the study scale. This suggests that staff performance is good and that digitization may be used to further improve it.

8. Testing the hypotheses of the field study

After the data was collected, examined using the appropriate statistical methods, and taken into consideration in light of the hypotheses that this research aimed to test, we will discuss testing

the field study hypotheses and verifying their validity by looking at the analysis findings for each hypothesis.

8.1. Testing the first main hypothesis

8.1.1. Testing the first sub-hypothesis

H_0: The averages of study responses on electronic transformation and performance at Algerian institutions do not differ statistically significantly based on the gender variable at a significance level of $0.05 \geq \alpha$;

H_1: The gender variable causes statistically significant variations in the averages of research responses on electronic transformation and performance in Algerian universities at a significance threshold of $0.05 \geq \alpha$.

Table 10: Results of the "T-test for two independent samples" - Gender-

Questionnaire topics	Averages		T value	Sig
	Male	feminine		
Electronic Transformation at the university	2.7623	3.0057	0.071	0.790
The contribution of Electronic Transformation to improving the performance of university administrations	3.3162	3.6294	3.347	0.070
The questionnaire as a whole	3.0393	3.3175	0.832	0.364

Source: Prepared by researchers based on the outputs of the SPSS 19 program

The results of the T-test showed that there are no statistically significant differences in respondents' perceptions of electronic transformation and efficiency attributable to gender, as the significance value was greater than 0.05 (Sig = 0.364 > 0.05)

8.1.2. Testing the second sub-hypothesis

H_0: The averages of the respondents' responses regarding electronic transformation and enhancing performance in Algerian university administrations, because of the academic qualification variable, do not differ significantly at the significance level of $0.05 \geq \alpha$;

H_1: At a significance threshold of $0.05 > \alpha$, the average responses of the respondents regarding electronic transformation and enhancing performance in Algerian university administrations show statistically significant variations because of the academic qualification variable.

Table 11: Results of the "one-way variance" test - academic qualification-

Questionnaire topics	Averages			T	Sig
	Magister	PhD	Other	value	
Electronic Transformation at the university	2.9234	2.8104	3.2083	0.452	0.638
The contribution of Electronic Transformation to improving the performance of university administrations	3.4640	3.4142	3.4103	0.048	0.953
The questionnaire as a whole	3.1937	3.1123	3.3093	0.271	0.763

Source: Prepared by researchers based on the outputs of the SPSS 19 program

The results of the one-way ANOVA test indicated that there are no statistically significant differences in the sample's estimates regarding electronic transformation and efficiency attributable to academic qualification, since the significance value was higher than 0.05 (Sig = 0.763 > 0.05)

8.2. Test the second main hypothesis.

Hypothesis H_0: At the statistical significance level of 0.05, electronic transformation has no discernible impact on raising performance in Algerian university administrations.

Hypothesis H_1: At the 0.05 level of statistical significance, electronic transformation has a statistically significant impact on how well Algerian university administrations execute.

A straightforward linear regression analysis test was employed to test this hypothesis and confirm whether rejection or acceptance had a statistically significant impact. The results are as follows:

- If, at the significance level of 0.05, the computed F value exceeds the tabular F value or the Sig value exceeds 0.05, accept the null hypothesis;
- If the computed F value is higher than the tabulated F value at the significance level of 0.05, or if the Sig value is less than 0.05, accept the alternative hypothesis;

The mathematical model for the first sub-hypothesis:

Performance in university administrations = A+B0 (Electronic Transformation)

Table 12: Simple linear regression analysis results

		Regression	The error	Total
sum of squares		7.465	66.245	73.710
degrees of freedom		01	123	124
mean of squares		7.465	0.539	
total morale	**F value**		13.860	
	Sig		0.000	
Partial significance (regression coefficients)		**Constant**	**Electronic management**	
	B	2.626	0.281	
	T	0.225	0.076	
	Sig	0.000	0.000	
interpretive ability	**R**		0.318	
	R^2		0.101	

Source: Prepared by the researchers based on the outputs of the SPSS program

With the degree of freedom being (1, 123) and the computed F value of 13.860 being greater than the tabulated F value of 1.425 at a significance level of 0.05, we can conclude from the results in the above table that the Pearson correlation coefficient between Electronic Transformation and performance in departments in Algerian universities reached R = 0.318, which is significant. The value of the Explanation coefficient is R2 = 0.101. This indicates that 10.1% of the improvements in performance may be attributed to electronic management, with other factors accounting for the other 89.9%.

Multiple regression coefficients B0 and A are tested for significance using the following rule: A regression coefficient is significant if its probability value (Sig) is less than 0.05, which corresponds to the computed "T" value.

Concerning the above table, we discover:

For the significance test A: The value of the probability of error Sig is equal to 0.000, which is smaller than 0.05, so a=2.626 is significant.

Regarding the significance test of B0: Because it is less than 0.05, the likelihood of a mistake, Sig value is equal to 0.000. As a result, the effect of B0 is considerable, meaning that an increase of one unit in performance results in a 0.281 increase in work in Electronic Transformation.

The mathematical model is: University administration performance is equal to 2.626 + 0.281 (Electronic Transformation).

Conclusion: At the level of statistical significance 0.05, we accept the alternative hypothesis H1, which states that Electronic Transformation has a statistically significant impact on enhancing university administration performance, and reject the null hypothesis H0.

9. Conclusion: Through the study we conducted, it became clear to us the importance of Electronic Transformation and its role in improving university performance from the point of view of Algerian university employees. The study we conducted showed that relationship.

Results of the study: The following conclusions were drawn from this investigation:

- The probability value (Sig) corresponding to the T-test for two independent samples is greater than the significance level of 0.05, i.e. (0.05<0.364) for electronic management and performance improvement in Algerian universities, and thus it can be concluded that "there are no statistically significant differences between the averages of the study sample's estimates on these fields and fields." Taken together, they are attributed to the genus.
- The probability value (Sig) corresponding to the one-way variance test is greater than the significance level of 0.05, i.e. (0.05<0.763), and thus it can be concluded that "there are no statistically significant differences between the average estimates of the study sample regarding these fields and the fields combined attributable to academic qualification";
- The Pearson correlation coefficient between Electronic Transformation and performance at the university reached R = 0.318, which is significant, as the calculated F value of 13.860 is greater than the tabulated F value of 1.425 at a significance level of 0.05 and the degree of freedom (1, 123) and the value of the interpretation factor R2 = 0.101, which means that Electronic Transformation 10.1% of the changes that occurred were explained by improving performance, and the remaining 89.9% were due to other factors;
- Electronic Transformation is closely linked to information and communication technologies (especially the Internet) in all administrative processes to improve the service and increase the efficiency and effectiveness of the University.
- Electronic management contributes to developing the technical skills and capabilities of workers and speeding up access to information through the electronic archive.
- Electronic management helps reduce the negative impact of personal relationships between employees and reduces the negative aspects of administrative bureaucracy.
- Electronic management works to avoid making mistakes and deviations.
- Electronic management contributes to providing a huge amount of information daily and at all times to direct the efforts and activities of employees.

Recommendations: We may offer several tips and ideas that, taken as a whole, help to improve university performance through the use of Electronic Transformation in light of the earlier findings and research. We suggest the following:

- The internal marketing method must be adopted in universities so that management workers accept the shift from traditional management to electronic management.
- Mindsets must be prepared primarily to encourage dealing with Electronic Transformation, as reality highlights and explains the resistance to change even among professors.
- Conducting training courses to improve the level of employees, especially those who do not use computers well, let alone electronic dealings, in addition to preparing special training courses to introduce what is known as e-learning and electronic management;
- Relying on specialized people to carry out important electronic transactions, and technicians and experts working in the field of information security.
- Improving Internet service, strengthening departments with human qualifications, and helping them develop their competence in the electronic field;
- Information security must be at the forefront of the attention of institutions in general and universities in particular because of its utmost importance as one of the most important challenges.
- The necessity of following up implementation step by step, and applying all scientific methods and methods to measure performance, evaluation, and follow-up of electronic management.
- Working to update everything related to the files of employees, professors, and students electronically, by what is internationally applicable;
- The university administration must provide a suitable work environment for employees and listen to their problems and suggestions in the electronic field.
- The necessity of providing legislation and laws that support the electronic environment;
- advancing the implementation of electronic management programs and projects by the requirements of our nation's current infrastructure, enticing the private sector to engage in the execution of certain projects per the highly precise and predetermined specifications, and making investments in information and communication technology;
- Designing programs and applications locally to suit the necessary variables, the work environment, privacy and confidentiality, information security, and providing high-tech security systems and their requirements;
- Benefiting from leading international experiences in this field and establishing mutual relations with them to benefit them more.

Suggested paragraph for the Conclusion: Despite the valuable contributions of previous studies on digital transformation and Electronic Transformation in higher education, a clear research gap remains. Most of the existing research has either focused on single-case analyses or addressed specific dimensions such as infrastructure, pedagogy, or cybersecurity in isolation. Few studies have provided a comprehensive and comparative analysis that integrates both local and global contexts while assessing their implications for institutional efficiency and performance. My study seeks to fill this gap by offering an updated, holistic perspective on the Algerian higher education and scientific research sector, highlighting its unique challenges and proposing actionable strategies tailored to its realities.

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