

DOI: <https://doi.org/10.36719/2706-6185/50/28-44>

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Digital Management and its Role in Improving Health Services in Algeria

Abstract

This study aimed to analyze the effectiveness of digital management applications in improving healthcare services and enhancing the performance of Algerian hospitals, in line with the recent trends of various institutions towards modernizing and updating their activities by relying on modern technology solutions. The Algerian government has been keen to implement digital management in various public institutions and administrations, such as health institutions, with the aim of improving their performance and providing high-quality healthcare services. Based on this and based on Algeria's experience in digitizing the healthcare sector, this study concluded that the healthcare sector is still at the beginning of its digital transformation, despite its adoption of certain systems and technologies, such as telemedicine, the digital (electronic) medical record and health information systems for examination and treatment, as well as human resources. This calls for intervention to benefit from various experiences and studies on the importance of adopting digital management solutions in a manner that serves all technical and administrative activities, ensuring that healthcare institutions make optimal use of their resources and improve the quality of services provided.

Keywords: *Digital management, public sector, healthcare, artificial intelligence applications, technological transformation, public relations*

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Rəqəmsal idarəetmə və Əlcəzairdə səhiyyə xidmətlərinin təkmilləşdirilməsində onun rolu

Xülasə

Bu araşdırma müxtəlif qurumların müasir texnologiya həllərinə əsaslanaraq fəaliyyətlərini modernləşdirmək və yeniləmək istiqamətində son tendensiyalarına uyğun olaraq, səhiyyə xidmətlərinin yaxşılaşdırılmasında və Əlcəzair xəstəxanalarının performansının artırılmasında rəqəmsal idarəetmə tətbiqlərinin effektivliyini təhlil etmək məqsədi daşıyır. Əlcəzair hökuməti müxtəlif dövlət qurumları və idarələrində, məsələn, səhiyyə müəssisələrinin fəaliyyətini yaxşılaşdırmaq və yüksək keyfiyyətli səhiyyə xidmətləri göstərmək məqsədilə rəqəmsal idarəetməni tətbiq etməkdə maraqlıdır. Buna əsaslanaraq və Əlcəzairin səhiyyə sektorunun rəqəmsallaşdırılması təcrübəsinə istinadən, bu araşdırma belə nəticəyə gəlib ki, teletibb, rəqəmsal (elektron) tibbi qeydlər, müayinə və müalicə üçün səhiyyə informasiya sistemləri, eləcə də insan resursları kimi müəyyən sistem və texnologiyaların qəbuluna baxmayaraq, səhiyyə sektoru hələ də rəqəmsal transformasiyanın başlanğıcıdır. Bu, rəqəmsal idarəetmə həllərinin bütün texniki və inzibati fəaliyyətlərə xidmət edəcək şəkildə qəbul edilməsinin vacibliyini göstərir. Bunun üçün müxtəlif təcrübə və araşdırmalardan faydalanmaq, səhiyyə müəssisələrinin öz resurslarından optimal istifadə etməsini və göstərilən xidmətlərin keyfiyyətini yüksəltməsini təmin etmək məqsədilə müdaxilə tələb olunur.

Açar sözlər: Rəqəmsal idarəetmə, dövlət sektoru, səhiyyə, süni intellekt tətbiqləri, texnoloji transformasiya, ictimaiyyətə əlaqələr

Introduction

Taking advantage of modern technology is one of the most important goals pursued by most institutions and societies. This trend is evident in light of the increasing, diverse, and interconnected interests of individuals, while taking into account the speed at which these needs are met. Modernizing administration through digitization represents a new and advanced management model that raises the level of administrative performance and efficiency, thereby improving the work environment to facilitate all services provided to individual beneficiaries.

Digital administration is considered the first decisive step in the transition to electronic services, based on the optimal use of information and communication technology solutions and applications. This is to find ways to address the challenges facing traditional administration. It has become imperative for governments to engage in the various stages of implementing strategies for this modern administrative model and to use the outcomes of modern technology as tools and means to upgrade the activities of public institutions to improve the services provided, ensuring high quality.

Research

In light of the imperative to move towards digital and paperless administration, the Algerian government prepared a draft law on digitization. In mid-July 2023, a multi-sectoral joint committee was established. This project, which primarily aims to improve public administration performance and contribute to enhancing the performance of public services, will be developed. The Ministry of Digitization and Statistics announced this project at a coordination meeting on digitization as a tool for enhancing coordination and ensuring the quality of public services. The aim is to develop a national digitization strategy within the framework of devoting administrative modernization to the success of the digital transformation in Algeria, improving communication, and generalizing the use of information and communication technologies to increase the efficiency of public service management and improve the management of the economic sector.

Study Problem:

In light of what was presented in the introduction, the study's problem is evident, which can be formulated in the following main question: How effective is digital management in improving the quality of health services in Algeria?

Study Objectives:

- To demonstrate the importance of the shift toward digital management by employing modern information and communication technology solutions in the health sector and its crisis management.
- To shed light on the concept of health service quality, its importance, and the dimensions of its measurement.
- To identify the requirements and components of implementing digital management to improve the quality of health services in the health sector in Algeria.

Study Methodology and Divisions:

In light of the study's problematic and in pursuit of its objectives, we relied on the deductive approach, with its two tools: description and analysis. The descriptive approach was used to address the various basic concepts and perspectives of the study's variables, while the analytical approach was used to analyze the various data sources used to enrich the study's subject matter. This approach utilized a variety of references and scientific research. We approached this study through four axes. The first axis addressed the conceptual framework of digital management and the requirements for its implementation. The second axis was devoted to the quality of health services and their measurement dimensions. The third axis addressed the relationship between digital management and improving the quality of health services. Finally, the fourth axis addressed the application of digital management in the field of health services in Algeria.

Axis One: A General Introduction to Digital Management and Its Requirements

The shift toward digitized management is an inevitability imposed by global changes. Integration, participation, and the use of information have become determinants of organizational success. Scientific progress and the ongoing demand to raise and improve the quality of outputs and ensure the safety and security of operations necessitate a shift toward digital management. The concept of digital management is a modern concept and terminology introduced by the tremendous revolution in information and communications technology (ICT). This revolution has brought about a significant and significant transformation in organizational performance and contributed to improving productivity and service delivery.

1- Definition of Digital Management:

The concept of digital management refers to a new methodology based on the comprehensive understanding, conscious use, and positive investment of modern information and communications technologies in exercising the basic functions of management at various organizational levels in contemporary organizations (Boudi, 2010, May 12–13). Digital management is management through the network. Digital management is the management of electronic flashes composed of binary elements, rather than the management of objects. The latter and their associated elements are primarily tangible, while digital objects are intangible. Things are real, while digital objects are virtual. Digital management, quite simply, is the management's use of information and communications technology to manage, improve, and develop various administrative processes within organizations. Its implementation will lead to paperless management, without space, without time, and without rigid organizations (Mostafa, 2011, p. 60).

Digital or electronic management is defined as a system based on the computerization of management, i.e., its complete reliance on electronic methods instead of the traditional approach. Among its tools is email, which enhances communication between managers and the employee team in all tasks within the organization, as well as facilitating communication between other organizations externally (Encyclopedia, 2023, September 15).

Digital management also represents an open approach to managing virtual activities and activities, which differs from all the foundations, principles, and mechanisms of modern management, which has a narrow spatial approach. Digital management is the skillful and professional management of the intangible, using digital minds, technologies, digital spaces, and digital feelings (Al-Daqa, 2021, September 15).

Within digital management, the concept of digital analysis emerges in light of the enormous volume of data available about customers through digital applications. Organizations increasingly need to build partnerships with entities specialized in analyzing this data according to appropriate

standards. This helps these institutions study all customer actions across all digital networks to understand customer behaviors, patterns, and expectations regarding the organization. This is achieved through analytical systems. This enables institutions to make appropriate decisions based on customer reactions and expectations through successful interactive processes and recommendations for the necessary actions to achieve better performance (Al-Daqa, 2021).

2- Requirements for the Successful Implementation of Digital Governance in Government Institutions:

The digital governance project also requires the creation of a conducive environment for its nature to ensure success and continuity and avoid the pitfalls of failure. Therefore, the success of this project must take into account several requirements, including the following: (Fghoul, 2019, pp. 72–73)

- Appropriate infrastructure, including a modern communications and data network and an advanced wired and wireless communications infrastructure capable of ensuring communication and information transfer between institutions and individuals.

- Availability of the digital means necessary to benefit from the services provided by digital governance, through which we can communicate and interact with it, such as networks, laptops, tablets, smart phones, and other means, while taking into account the rationalization of their acquisition costs.

- Availability of the necessary number of internet service providers at reasonable prices to expand the scope of use and interaction with digital governance.

- Training and capacity building, i.e., training employees on controlling computer equipment, managing networks and connectivity, managing databases, and all the information necessary to properly manage and direct digital administration.

- Providing adequate funding to cover periodic maintenance procedures, training human resources, maintaining a high level of service delivery, and keeping pace with technological developments.

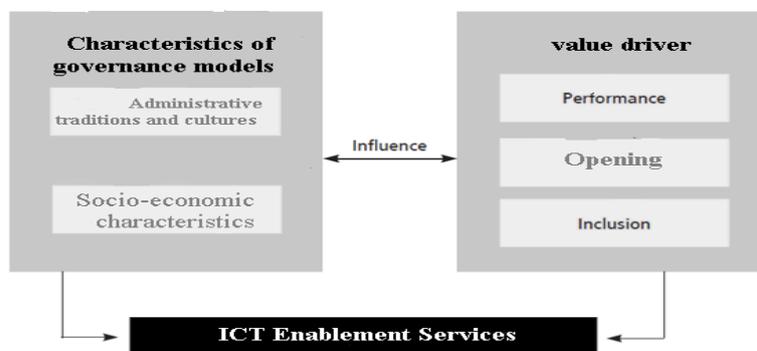
- Providing political will to create the necessary and appropriate environment for work, oversee implementation, and evaluate progress achieved.

- Governing legislation and laws that facilitate the work of digital administration, confer legitimacy and credibility on it, and all legal consequences arising from its implementation.

- Providing a high level of digital security and confidentiality to protect personal national information.

- A comprehensive marketing and advertising plan to promote the use of digital administration, highlight its advantages, and highlight the need for all human resources to participate and interact with it. This campaign involves all available media outlets within the organization.

Figure. (01) Digital Management Structure.



Source: Feghouli Janat, *Human Resources Management in the Age of Digitization, A Case Study of Algeria Telecom*, PhD Thesis, Third-Year Management Sciences, Specialization in Human Resources Management, Faculty of Economics, Business, and Management Sciences, University of Algiers 3, 2018/2019. p. 75.

The figure illustrates the structure of digital governance. We note that the latter is based on the characteristics of governance models, represented by administrative traditions and cultures, which encompass the totality of customs and traditions that the institution believes in, the behaviors practiced in performance, and their adaptation to digital changes. The other characteristics are socioeconomic characteristics, which clarify values, gaps, and statistically significant differences, as well as the mutual influence of these characteristics and the value driver dimensions represented by performance, openness, and inclusion.

Second Axis: Quality of Health Services: Concepts and Classifications

Service quality is one of the most important and vital factors in health institutions, as it helps them achieve success and stability, enhance competitiveness, and outperform in the long term.

1-Defining Health Services:

The word "service" is rich in meanings and has multiple concepts, which has led many to encounter difficulties when defining it in business management literature. In its basic meanings, it can be synonymous with "industry," "output," "offering," or "process." However, if we consider the "service process," which also means "service," we find that it is linked to several other concepts, such as: service delivery, interpersonal interaction, and it can also mean performance in its general sense, or the consumer's experience of the service (Ghichi, 2010, p. 5). Universities provide education, not university seats. Airlines provide transportation, not airplane seats. Insurance companies provide protection and security, not paper or a contract containing multiple signatures. Hospitals provide healthcare, not hospital beds. Banks provide financial security, not checkbooks and accounts. Film production and distribution companies provide entertainment, not film reels. Health services can be defined as a set of functions that directly satisfy human needs related to survival and continuity, and indirectly relate to other societal functions, such as economic, educational, and social functions, enabling the beneficiary (patient and companion) to adapt to the environment by providing support for their environmental, sensory, and psychological capabilities, enabling them to achieve the desired performance (Abdulrazzaq, 2011, p. 287). Health services can also be defined as all services provided by the health sector at the state level, whether therapeutic services directed at individuals or preventive services directed at society and the environment, or the production of medicines, medical preparations, prosthetic devices, and other services with the aim of raising the health level of citizens and treating and protecting them from infectious diseases. Accordingly, health services are limited to two types of services: therapeutic services, which aim to eliminate and treat diseases through examination, diagnosis, and treatment, and preventive services, which aim to protect people from diseases and epidemics (Bahri & Radi, 2021, p. 215).

2- Quality of Healthcare Services:

The first person to use the concept of quality of service in the field of medicine was British nurse Florence Knight, who supervised healthcare provision in military hospitals during the Monkey War. She introduced simple performance standards into her work, which led to a significant decrease in the number of deaths in that hospital. Quality in healthcare services includes technological advancements, modern treatment, effective medication, affordability, increased number of healthcare providers per patient, and efficiency and effectiveness in service delivery (Shibl, Selim, et al., 2021). The Joint Commission on Accreditation of Healthcare Organizations (JCAH) defines quality as the degree of adherence to generally recognized contemporary standards of good practice and the expected outcomes of a specific service, diagnosis, or medical problem (Al-Ashqar, Ben Jomaa, et al., 2021, p. 607).

There is also general agreement that the concept of quality in healthcare services includes two fundamental aspects (Al-Ashqar, Ben Jomaa, et al., 2021, p. 607):

- The technicality of care, or the cognitive and technological aspects of medical care and the techniques and methods used in medical care;
- The art of care, the behavioral aspect of care, which refers to the behavior of service providers and their interactions with beneficiaries of healthcare services.

3- The Importance of Healthcare Service Quality:

Among the most prominent indicators that can be used to demonstrate the importance of quality in healthcare services are the following (Shibl, Selim, et al., 2021, p. 503):

- Service has become so closely linked to quality that it has become necessary to adopt a number of measures to measure the impact of patient satisfaction through the link between the service provided and quality. This led to the adoption of a measure called SERVQUAL, which is a series of multidimensional measures based on identifying the gap between what the beneficiary perceives of the service and what they expect. Therefore, it is impossible to analyze healthcare service marketing without examining its quality.

- Quality has become a key dimension that is adopted as a basis for measuring and influencing the level of quality.

- Quality in healthcare services is an important indicator in measuring the level of patient satisfaction with the healthcare service provided by any healthcare institution. It also affects the level of responsiveness to what the beneficiary expects from that service.

- Quality in healthcare services is subject to continuous improvement through a specialized department within the organizational structure of the healthcare institution, aiming to achieve comprehensive and integrated performance.

4- Dimensions of Measuring the Quality of Health Services:

Many studies have agreed on five dimensions for measuring the quality of services, including health services: responsiveness, reliability, safety, tangibility, and empathy. However, the World Health Organization has clarified in its reports that the elements of quality of health services include the following seven dimensions (Abu Al-Awf, 2021a, pp. 36–37):

- Effectiveness, by making data-based health care services available to those in need;
- Safety, by avoiding harm to the people receiving care;
- Person-centeredness, by providing care that responds to individuals' preferences, needs, and values within health services organized with a focus on people's needs;

- Timeliness, by reducing waiting periods and delays that are sometimes harmful to both health service beneficiaries and providers;

- Equity, by providing the same quality care to all beneficiaries;

- Integration, by providing coordinated care at all levels, including at the provider level;

- Efficiency, by maximizing the use of available resources and avoiding waste.

Third Axis: The Relationship of Digital Management to Improving the Quality of Health Services

1- Digital Health Services and the Telemedicine Project:

The World Health Organization, in its March 2020 Global Health Document notes that the concept expresses a field of knowledge and practice related to the development and use of digital technology to improve health. The organization considers digital health to be more comprehensive than telehealth, as it encompasses the digital beneficiary who is connected and interacts with multiple smart tools, media, and advanced technologies to support health services. It focuses on the interconnectedness of health systems based on computerized tools, smart applications, and data analytics applications among policymakers, health users, and beneficiaries (Abu Al-Awf, 2021b, p. 41). It also refers to the cost-effective and safe use of information and communications technology to support health and related fields, including healthcare services, health surveillance, health writing, education, knowledge, and research in the health field. Healthcare contributes approximately 10.40% of the global GDP, and e-health exports reached nearly \$80 billion in 2017. E-health relies on artificial intelligence, big data, cloud computing, electronic medical records, and telehealth. Its advantages may include (Bishari, 2020, p. 584):

- Improving the quality of care;

- Cost efficiency and resource planning;

- Enhancing databases and evidence for timely use;

- Monitoring epidemics and identifying them geographically and demographically, as was the case with the COVID-19 crisis;

- More accurate diagnosis, follow-up, and treatment of patients.

Telemedicine refers to the provision of healthcare, consultations, diagnosis, and treatment in real time between the doctor, patient, and consultant, either via video or computer. Telemedicine also refers to educating both patients and staff through continuing education. The most important areas of telemedicine use include home healthcare, surgery, and distance medical learning via teleconferences. Healthcare organizations may benefit from employing digital management or e-business solutions, including access to suppliers regardless of their location, reduced supply and storage costs, improved operations, new ways of doing business, competitive advantages, and reduced medical errors (Al-Dhunaibat, 2014, p. 537).

2- Digital technologies underlying the healthcare sector:

These technologies are classified into technologies that employ electronic communication with other related institutions and technologies used for electronic internal business management. Among the most important technologies that healthcare institutions may need are the following:

2-1- Block chain technology: This technology is a decentralized database that maintains a constantly growing list of ordered blocks, each representing successive records that are encrypted and linked together. This technology aims to make the data contained within the interconnected block chain tamper-resistant by employing electronic encryption processes. This technology can be leveraged in the healthcare sector by using it to develop a platform for recording healthcare data according to international standards and criteria, while taking into account the privacy of patients and their data. This aims to provide the information necessary for conducting analyses, studies, and health research.

2-2- Cloud Computing Technology: The term cloud computing refers to computer resources and systems available on demand over the network that can provide a number of integrated computer services without being restricted to local resources in order to facilitate the user. These resources include space for data storage, backup, and self-synchronization. They also include software processing capabilities, task scheduling, email push, and remote printing. When the user is connected to the network, he can control these resources through a simple programming interface that simplifies and ignores many of the details and internal processes (Kallo, 2015, September 15). This technology can be leveraged in the healthcare sector, given that the healthcare system is vast, diverse, and extremely complex. It encompasses numerous integrated entities, including health insurance companies, hospitals, medical staff, laboratories, pharmacies, patients, caregivers, and other entities, all of which must operate within numerous government regulations for the system to be effective. It is also important that important information be exchanged quickly, accurately, and confidentially, securely, as patient information is highly sensitive and highly private. Its sharing must be handled using innovative technologies and tools, a feature made possible by cloud computing. Cloud computing offers numerous advantages, such as reducing healthcare costs, improving the quality of services provided to patients and their caregivers, and providing rapid access to information while maintaining privacy, ensuring its security, and enabling retrieval.

2-3- Big Data Technology: Big data is defined as a dataset whose size exceeds the capacity of typical database tools and programs to capture, store, manage, and analyze. To extract the value of big data, we need to develop new techniques and methods for analyzing it (Gentsch, 2019, p. 12). There are many tools and technologies used for big data analysis, such as Hadoop, Apache, SPA HANA, STROM HPCC, Cognos, MongoDB, and Pentaho. However, Hadoop is among the most popular of these tools due to its tremendous ability to quickly store and process huge amounts of any type of data, in addition to its computing power and flexibility in storing the largest possible amount of data (Estrada & Ruiz, 2016, p. 5). Analytics can be leveraged in the healthcare sector through its role in improving healthcare services, which require accuracy, efficiency, and speed to provide the best services to patients, from diagnosis to treatment and ending with prescriptions. This is achieved by analyzing patient record data and comparing it with previous records. Big data analysis can also help in making quick and accurate decisions and provide rapid feedback on a patient's condition.

2-4- Information Systems: The existence of an integrated information system provides for the exchange of information between the various members of the working frameworks in the health institution, as hospital information systems are considered one of the most important advanced programs that directly serve all health care activities, including administrative ones, thus ensuring that the health institution has complete control over all its activities and resources. The success of these advanced systems does not depend only on the careful testing of the equipment and software for storing, processing and retrieving information, but rather their success depends largely on the extent of their suitability for the various users who provide health care services, from doctors to administrators, as the vision and priorities of each of these categories differ, as do their information needs and the way each of them benefits from these systems (Kebiche, 2020, p. 7). For example, the hospital management program (Medi Master) is an integrated electronic hospital management system that manages all medical departments and financial management within private hospitals. It aims to organize hospital work electronically, allowing access to patient data and monitoring of their condition while in the hospital. This program organizes healthcare services for patients in the best possible way, on the one hand, and facilitates the physician's work by medically recording the patient's condition (complaints and symptoms - examinations, tests, and x-rays - operations - diagnoses - physician orders and follow-up on their implementation - monitoring the patient's progress - medications and medical recommendations). This facilitates monitoring the development of the patient's health condition and ensures accurate and rapid performance. Furthermore, the information system in healthcare institutions consists of inputs, processing, outputs, and a set of systems to describe the process of collecting and analyzing comprehensive data, including:

- **The examination and treatment system: It includes:**

* The electronic medical record: Advances in healthcare and information technology have led to the design and invention of computer-based electronic medical records, all of their advanced capabilities for storing, processing, and transmitting information via modern information networks and communication methods. The American Medical Association defines it as an information repository or a digital medical record containing all of a patient's personal and diagnostic information, medical history, vital signs, treatments, and adjustments, laboratory data (blood typing, hormones, enzymes), radiology (X-rays, CT scans, and ultrasounds), digital video presentations (ECGs, arterial catheterizations), and examination and treatment orders. It relies on computers, all of their capabilities for storing, processing, and transmitting data via information networks and modern communication methods. However, they have been developed to operate on voice commands, where the patient's name is spoken, and the device displays all of their health information and current condition, thus providing a continuous record of patient care and health status (Salem & Hussein, 2013, p. 203). The most important feature of this record, and what gives it importance, is the ability to allow physicians direct access to orders, facilitate access to patient information and reports, record their notes, review all administrative and other procedures for the patient, and obtain test results. Its advantages include (Al-Ghazali, 2022, June 10):

- The medical record is available for viewing from multiple locations at all times by authorized individuals only;

- Digital patient data can be displayed, converted, and processed in multiple formats;

- Accuracy of the information contained in the record, thanks to the availability of restrictions within the electronic medical record system.

* Laboratory Information System: This system automates the work of medical laboratory laboratories, starting from receiving test requests by printing labels bearing the patient's name and a barcode to identify the sample type and date, to collecting, processing, and printing results after identifying the samples required for analysis and directing them to the various laboratory departments according to specialty, or to the relevant analysis devices, and collecting the results from them.

* Global Positioning System: A geographic information system that, through its mapping control, triples the speed at which ambulances reach the injured person. - Administrative and accounting information systems: This system encompasses all administrative departments related to

human resources, administrative control, accounting, and expenses, through which all systems are managed efficiently and effectively. It is noted that most applications in healthcare institutions related to information systems rely on issuing statistics and tables, without taking into account the development of information systems based on advanced technology in various medical fields.

2-5- Artificial Intelligence: Hospitals' reliance on artificial intelligence systems in the field of service and medical operations provides opportunities to raise their quality and appear modern and in step with the changing times. It also facilitates communication with the outside world in the field of medical research and direct contact requests for visual surgical procedures in various parts of the world, as it is useful in training processes (Nassif, 2010, p. 12).

Artificial intelligence can go beyond these limitations by streamlining operations across healthcare management boards. For example, human resources departments can use artificial intelligence to transfer employee information and provide insights into actionable decisions in real time. Finance departments can identify expenses and cost trends while processing invoices. For patients, previous authorizations and eligibility can be automated to reduce manual labor. Supply chain management can also be addressed by artificial intelligence to identify potential bottlenecks and gaps.

The use of artificial intelligence and machine learning in healthcare creates a number of data management features. By applying these tools to real-time data, reports and metrics on resource utilization can be generated automatically, significantly reducing operational and reaction time. Predictive modeling at both the micro and macro scales also ensures a better balance in resource utilization, as well as identifying situations and seasons when organizations need to scale up. With data-driven predictive modeling, organizations can plan for the future and ensure better care.

3- Contributions of Digitization to Improving Health Services:

Modern technology opens up broad horizons for rationalizing administrative work, provided awareness of the risks and challenges it entails is recognized, while relentless efforts are made to transform it into opportunities based on several approaches, including (Za'noun, 2023, p. 8):

- **The Digital Justice Approach:** Despite the efforts made, the digital divide continues to widen, given the disparities in access to quality IT equipment and high-speed internet coverage. This requires strengthening the ability of vulnerable groups to access e-government services, such as people with disabilities, the elderly, women, and youth, etc., by adopting new measures to bridge the digital divide, such as universal access to high-speed and very high-speed internet, while ensuring good service in this area. Furthermore, making artificial intelligence serve administrative development requires the development of attractive and accessible mobile applications and innovative digital systems that have a greater impact on the lives of prospective users. In addition, strengthening the interactive dimension of public platforms by providing specialized experts and consultants in electronic monitoring of visitors to national portals, tasked with accompanying users. The various stages related to obtaining public service.

- **E-governance approach:** This involves facilitating access for users to online administrative services by simplifying the user process, shortening the required steps, limiting the documents required to obtain services, and reducing the number of departments involved in service delivery. Additionally, it is necessary to develop a data interoperability platform that enables the linking of information databases across public administrations and the exchange of data and documents. In parallel, it is necessary to improve transparency, maturity, and effectiveness indicators and provide conditions for secure access to digital services.

The role of digitization in the governance of public health facilities may lie in the following (Brish, 2021, p. 249):

- Bridging the digital gap in health facilities by leveraging advanced information technology to deliver health services to citizens and hospital institutions in need, regardless of their location or the time of application;

- It facilitates the transfer of information in a short timeframe to enable the necessary action to be taken among all stakeholders in the healthcare sector. For example, during the COVID-19 crisis in Algeria, hospitals and laboratories were unable to provide timely RT-PCR test results due to the

sector's weak digitization process. This led to citizen dissatisfaction and created a gap of mistrust between them and the service provider.

- It achieves transparency through the implementation of electronic oversight, which ensures periodic accountability for all services provided.

- It achieves partnership by opening an electronic platform for all stakeholders, including healthcare associations and citizens, to address their concerns in a timely manner.

- The approach to managerial effectiveness: Creating the conditions necessary to implement e-governance, primarily by reviewing the organizational architecture to keep pace with the challenges of digitization and bringing about profound change in administrative structures, rather than merely superficially modernizing outdated equipment. This requires the creation of administrative departments specialized in analysis, processing, programming, and maintenance, capable of handling various technical matters related to the dissemination of information and digital applications. Furthermore, IT skills must be made a fundamental criterion in the recruitment of human resources, and digital professions that require special qualifications (information security, smart design, cloud computing, information engineering, and big data analysis) must be valued. This will enable the availability of competencies capable of adapting modern technology to the requirements of administrative work.

Fourth Axis: Implementing Digital Governance in the Field of Health Services in Algeria

Algeria seeks to leverage IT solutions and employ them to build integrated communications between health sector actors, with the aim of facilitating procedures for providing high-quality health services.

1- The Reality of Digital Management in Algeria

Analyzing the reality of digital management in any environment necessarily requires studying the elements of the e-business infrastructure and its supporting entities, which constitute the standard for information technology systems and tools.

1-1- Evolution of Internet Use:

Internet service was introduced to Algeria in 1994 through the Center for Scientific and Technical Research and Information (CERIST), established in April 1986 by the Ministry of Higher Education and Scientific Research. Its mission at the time was to establish a national network and link it to regional and international networks. Initially, Algeria was connected to the Internet via Italy under a cooperation agreement with UNESCO, with an access speed not exceeding 9.6 KO, with the goal of establishing an information network in Africa (RINAF). Two years later, the connection passed through the French capital, Paris, and the access speed increased to approximately 64 KO. At the end of 1998, satellites were used to connect Algeria to Washington, increasing the access speed to 1 megabit per second, later increasing to 2 megabits per second. Internet traffic and the total number of subscribers during the first half of 2020 were estimated at 3,675,926 subscribers, representing a growth rate of 24.64%, distributed as follows (Regulatory Authority for Post and Electronic Communications, 2020, p. 7):

- The number of ADSL subscribers is estimated at 2,410,242 subscribers.
- The number of fourth-generation (LTE) subscribers is estimated at 1,202,586.
- The number of Wimax subscribers is estimated at 413.

The introduction of third-generation (3G) mobile phone service, which was launched in December 2013, has also been implemented by various operators holding a license to operate and operate a public wireless communications network (Mobilis, Ooredoo, Djezzy). This technology provides data transfer speeds of up to 2 megabits per second, with high quality, as data and voice are processed simultaneously. Consequently, third-generation internet service is much faster than any other type of internet service available in Algeria, such as ADSL and MSAN. This will enhance opportunities for the development of this sector and accelerate the growth of information and communications technology in Algeria.

Table No. (02): Shows the evolution of internet usage in Algeria relative to the population during the period (2015/2020).

Year	Number of Users	Population	Percentage for the Period	Usage Source
2013	6,404,264	38,813,720	16.50%	ITU
2014	6,669,927	38,813,720	17.20%	ITU
2015	11,000,000	39,542,166	27.80%	IWS
2016	15,000,000	40,263,711	37.03%	IWS
2017	18,580,000	41,063,753	45.20%	IWS

Source: Internet World Stats, *Algerian Internet Usage and Population Growth*, accessed on 06/10/2025 via the website: <http://www.internetworldstats.com/af/dz.htm>.

The table above shows that the number of internet users has witnessed significant growth since its introduction in Algeria. This growth has continued rapidly, with approximately 6,404,264 users in 2013, representing a penetration rate of 16.50%. This number rose to 18,580,000 users according to 2017 statistics. This number is expected to reach 32.9 million users by the end of 2023, with a penetration rate exceeding 70% of the population. At the same time, proficiency in internet use is considered the first step towards adopting digitization in various institutions and public administrations.

1-2- Mobile phone density development: This refers to the percentage of access to the mobile phone network. Mobile phone density represents an indicator of the trend in demand for mobile phone services and is measured by the ratio of the number of subscribers to the country's population. The following table illustrates the development of mobile phone density in Algeria from 2012 to the first quarter of 2021.

Table No. (03): Evolution of the density rate of cultural ethics for the period (2012 - 2021).

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021*
Penetration Rate	99.28%	102.11%	109.62%	107.96%	111.96%	109.96%	103.58%	104.65%	-

Source: Observatory of the Cultural Ethics Market, Regulatory Authority for Post and Electronic Communications via the website: www.arpce.dz.

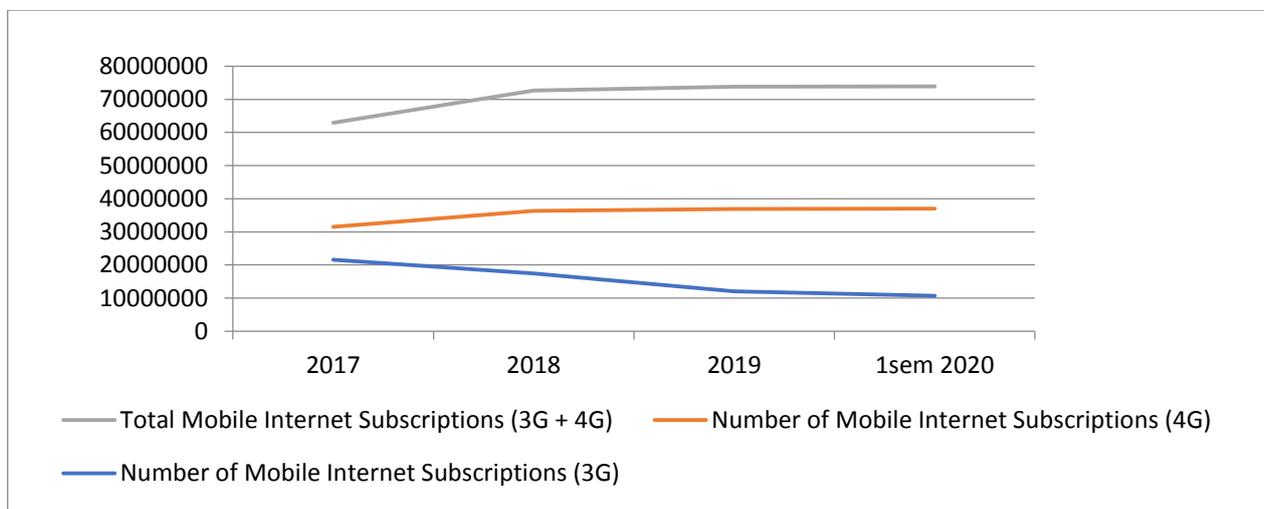
Teledensity has been on a steady upward trend, particularly in 2014, 2015, and 2016, due to the rapid increase in the number of third-generation (3G) network subscribers, the development of multi-SIM cards, and the introduction of fourth-generation (4G) technology. Thereafter, it experienced a remarkable stabilization, due to the stable position of the total mobile phone stock, on the one hand, and the stable population, on the other. It then experienced a slight decline due to the stability of the total mobile phone stock and the increase in population. It also experienced a slight net growth rate of 1.65% between 2019 and the first quarter of 2021.

Table No. (04): Shows the evolution of mobile internet subscribers.

Year	2017	2018	2019	2020 (Preliminary)
Number of Mobile Internet Subscriptions (3G)	21,592,863	17,422,312	11,989,157	10,637,991
Number of Mobile Internet Subscriptions (4G)	9,867,671	18,920,289	24,922,271	26,329,792
Total Mobile Internet Subscriptions (3G + 4G)	31,460,534	36,342,601	36,911,428	36,967,783

Source: Mobile Market Observatory, Regulatory Authority for Post and Electronic Communications via the website: www.arpce.dz

Figure No. (05): Shows the evolution of mobile internet subscribers.



Source: Mobile Phone Market Observatory, Regulatory Authority for Post and Electronic Communications, through the official website: (www.arpce.dz).

This increase is due to the moderate growth of the mobile phone market, the increase in Algeria's population, the use of digitization, and the move toward digital management.

1-3- Development of Mobile Internet Subscribers:

Through Table No. (03), translated into Figure No. (02), which explains to us one of the indicators of digital management in Algeria, specifically mobile internet, which is dominated in Algeria by the three operators (Mobilis, Djezzy, and Ooredoo), in a cycle that witnesses fierce competition to provide coverage and speed of internet flow, recording a significant increase in its third and fourth generations during the first half of 2020, as the total number of subscribers reached more than 36 million subscribers. This slight increase is 0.15% compared to 2019, and this is despite the decrease in the number of mobile phone subscribers. We also note that there is a reluctance to use the third generation network and a move towards the fourth generation network to ensure better flow speed. This is in line with the trend towards the digital transformation of various institutions, remote work, and the provision of self-services.

1- Stages of implementing a digitization system in healthcare institutions:

The digitization of the healthcare sector and the use of digital technologies to collect, analyze, and store health data, along with the provision of remote healthcare, aims to enable citizens to access quality healthcare by improving the health services provided and enhancing the efficiency of healthcare operations, particularly by facilitating access to data and, consequently, making timely treatment decisions. This can only be achieved if individuals have a medical record and a national

identification number that they follow throughout their lives. At the healthcare institution level, the digitization system has been implemented in stages, including (El Djazair El Jadida Newspaper, 2023, September 10):

- Digitizing healthcare institutions, including emergency departments and multi-service clinics, by adopting an electronic medical system that allows tracking of patients' progress within these facilities, starting with organizing waiting lines according to the severity of the patient's condition, then proceeding to medical examination rooms and laboratory and radiology centers, and finally obtaining a digital prescription.

- Generalizing the use of the same system (an electronic medical system) across all hospital facilities, where a secure database for each patient is established containing all the procedures performed. - Launching the electronic order form, which has been fully accessible to all public health institutions, has already been received at the central pharmacy annexes of hospitals. This modern tool will streamline costs, respond promptly to requests from health institutions, save time and effort, and conserve financial resources.

- Connecting all public health institutions using fiber optic technology, in coordination with Algeria Telecom. This process will allow for the exchange and sharing of patient files between these institutions and medical teams.

- Enabling citizens to access all their medical data through a digital platform, as well as to schedule specialized medical appointments remotely, avoiding the hassle of searching and traveling, through an easy-to-use mobile application that includes all medical specialties available at health institutions.

2- Health Information Systems in Algeria:

The health information system in Algeria consists of several systems, including the following (Zidan & Ben Kadi, 2023a, p. 165):

- **Human Resources Information System:** The Public Health Human Resources Information System (Rh Santé Dz) is a comprehensive web-based human resources management platform dedicated to the public health sector in Algeria. Approved in November 2014, it was designed by Spider Network, a company specializing in web application development and programming.

- **Compulsory Disease Declaration Information System:** This platform contains all patient information and personal data (gender, age, address, and hospitalization status) related to diseases requiring compulsory declaration, such as viral and bacterial meningitis, viral hepatitis, brucellosis, and others.

- **Maintenance Information Systems:** This includes data related to the maintenance and monitoring of medical and paramedical equipment.

- **Electronic Vaccination File Information Systems:** This digital platform provides access to vaccinated person data and all information related to the type and date of vaccination. - The application related to health activities: This is one of the most important applications in the health information system, as it includes all medical and obstetric activities, as well as daily, monthly, quarterly, and annual reports and statistics for both patients and healthcare users.

Through the efforts made and through the Health Information System (SIS DZ), Algeria seeks to bridge the digital gap in healthcare facilities by investing in advanced information and communications technology to provide necessary and effective healthcare services to beneficiaries through the hospitals they need, regardless of their location or time of visit.

3- Components of implementing digital management to improve the quality of healthcare services:

Considering the quality of healthcare services as one of the strategic performance indicators in healthcare institutions, many countries, such as Algeria, seek to advance the healthcare sector and provide quality healthcare services by various standards. This is achieved by focusing on a set of components, including the following (Zidan & Ben Kadi, 2023b, pp. 161–162):

- Digital healthcare technology: This includes all basic and technological mechanisms and equipment, such as computers, internet networks, intranets, extranets, and everything related to information and communications technology related to the healthcare sector.

- Electronic operations at the level of health departments: These are electronic efforts that aim to redesign health administrative work using modern technical tools through a digital platform in the health field.

- **E-health strategy:** This involves developing and advancing the e-health vision by identifying healthcare institutions' priorities and identifying capabilities to develop future plans that contribute to the development of essential healthcare services. This is achieved through encouraging a culture of collaborative work, sharing health information and data, and coordination among staff to improve service delivery.

- **Improving the performance of administrative services in the healthcare sector:** This is done to ensure that the needs of beneficiaries are met through in-depth analysis and effective assessment of their needs, which are identified through the institution's electronic relationships.

- E-health structure: This is a network of information systems for digital management in the healthcare sector, based on an advanced technical and information base and a culture that values innovation, initiative, and efficiency in the delivery of healthcare services.

- **Digital administrative leadership for healthcare institutions:** This represents the competencies and skills capable of innovation, knowledge creation, and finding the necessary solutions in a timely manner.

4- Quality of Health Services in Light of the Digitization of the Health Sector:

The role of digital management is highlighted by its significant and effective contribution to improving the quality of health services provided by fulfilling patients' hopes and aspirations, implementing integrity and transparency, and supporting the principle of accountability. It also emphasizes strict monitoring of the progress of health services provided to patients, ensuring reduced waiting times and speedy delivery of health services without compromising their quality. This is achieved by providing all necessary material and human resources, as well as modern technologies, to improve the quality of health services (Ahmed, 2023, p. 73).

What digitalization has achieved in institutions in general, and health institutions in particular, is the principle of equality in the provision of health services without bias towards one person over another. This prevents the phenomenon of favoritism known in Arab societies, especially Algeria, and allows for the establishment of many positive principles and foundations that improve the quality of services provided through the design of digital management policies and strategies, in addition to the provision of basic electronic services and equality in their provision for all (Khalassi & Nasri, 2025, June 20).

Providing healthcare services ensures the satisfaction of beneficiaries with the performance of the health system, achieves the efficiency of this system, ensures a balance between its costs and the services provided, and its ability to formulate future strategies that ensure the stability and continuous development of the health sector and improve the quality of its services. This will not be achieved without the effective application of digital management, which will establish transparency, rationality, oversight, and efficiency in the management of this sector, for which the Algerian government has long allocated a large budget that is consumed without achieving its set goals. Therefore, it has become necessary to digitize this sector through a gradual shift towards digital management, as this is the most effective way to manage this sector in accordance with the principles of rationality, avoiding wasting public funds without achieving the established plans and providing services that meet the required quality. The process of digitizing healthcare facilities includes several steps, including converting paper files into digital formats, storing digital health information in secure databases, developing computer programs and applications to manage and use this information, modernizing healthcare systems, and providing the necessary training for employees on the use of new technologies. Furthermore, digitizing the pharmaceutical supply chain has contributed to improving the quality of healthcare, fostering better cooperation between the various actors in the system, providing medicines, and managing inventory more efficiently. This is in light of efforts to digitize public administration, to which successive governments have given great importance since the launch of the E-Algeria project in 2013.

Conclusion

The connection between administrative work and modern technology solutions, both information and communication, has led to the emergence of a direct relationship between digital management, as one of the outcomes of this technology and employee performance. This leads to improved work performance and the provision of high-quality services based on well-known measurement criteria (responsiveness, reliability, security, tangibility, and empathy). Healthcare institutions are required to keep pace with the developments of the modern technology era and adopt the various solutions and applications it imposes, particularly those related to digital solutions.

On this basis, this study concluded with the following set of results and recommendations:

- The shift towards implementing digital management contributes to reducing the negative forms of public service and bureaucratic procedures associated with traditional management. This is achieved through the quality of services provided, which are characterized by high quality and flexibility, allowing for the rebuilding of trust.

- Services provided under the shift towards digital management are characterized by flexibility, meaning the ability to change and transform the scope of information provided via networks and websites. Digitizing healthcare facilities is an essential part of the digital revolution in healthcare. It is expected to improve the efficiency, effectiveness and quality of healthcare services and enhance access to online healthcare services.

- Healthcare institutions are working to recognize the importance of adopting digital management solutions by enhancing their technical and administrative activities and operations with various modern technological means.

- The quality of healthcare services provided, particularly those related to healthcare, strengthens the image of the healthcare institution in the minds of community members. Improving service quality has become a necessity, the importance of which increases with its ability to meet the needs and desires of its beneficiaries.

- The availability of electronic medical records for healthcare service beneficiaries contributes to improving the quality of healthcare services.

- The development of the health sector depends on the extent to which the quality of healthcare services is linked to the development of digitalization and its optimal utilization.

Recommendations:

- The need to develop legislation and administrative systems to align with the digital transactions imposed by digital management.

- Encouraging employees to further activate the shift towards digital planning to achieve the institution's objectives.

- Preparing specialized human resources in the field of information technology to ensure the smooth running of this system (an electronic medical system) and establishing a specialized unit to monitor it at the level of health institutions;

- The need for health institutions to strive to develop their human resources in the field of information and communications technology by encouraging training and development programs in this field.

- Continuously updating devices, networks and software to keep pace with the rapid developments in the field of information and communications technology and to ensure their suitability for the implementation of electronic human resources management in health institutions.

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Received: 13.04.2025

Accepted: 30.07.2025