Journal of Constitutional Law and Political Institutions
ISSN :2600-6286 / E-ISSN :2661-7706
Vol.: 09/ N°: 01 (2026)
P39-62

The Digitization of Algeria's Health Sector: Challenges, Constraints, and Strategic Pathways for Reform

رقمنة القطاع الصحي في الجزائر: بين التحديات الراهنة والحلول الاستراتيجية

PhD. S. Naimi Djelloul Houcem Eddine[1],Governance and Sustainable DevelopmentLaboratory, Lounissi Ali University Blida 2 (ALGERIA), dh.naimi.etu@univ-blida2.dz

Dr.Laghouati Yasmine [2], Governance and Sustainable DevelopmentLaboratory, Lounissi Ali University Blida 2 (ALGERIA),docteur.yasmine@yahoo.com

Received02/14/2026 Accepted:03/05/2026Published:20/06/2026

Abstract :

This paper aims to identify the internal factors that impede the digitalization of the health sector in Algeria. Among the major challenges are the shortage of qualified staff, low awareness of technology, and poor knowledge of digital technologies. In addition, there is a lack of an integrated and comprehensive legal and regulatory framework. Financial problems, security problems, and geographical problems are also obstacles to digitalization. To overcome these problems, this paper presents some solutions, both practical and strategic, to overcome the obstacles to digitalization. In addition, it proposes the development of a unified electronic medical record to facilitate the development of an effective and high-quality digital health system in Algeria.

Key words: digitalization, digital transformation, digital health, obstacles.

الملخص:

تهدف هذه الورقة البحثية إلى تسليط الضوء على أهم التحديات والصعوبات الجوهرية التي تعترض مسار رقمنة القطاع الصحي في الجزائر، وتتجلى في نقص الكفاءات المؤهلة وضعف الوعي والمحدودية المعرفية في المجال التكنولوجي، فضلا عن غياب إطار قانوني وتنظيمي متكامل بالإضافة إلى التحديات المالية والأمنية والجغرافية التي بدورها تؤخر عملية التحول الرقمي في هذا القطاع الحيوي. وفي ضوء هذه المعطيات تقترح الدراسة جملة من الحلولالإستراتيجية ترتكز على الاستثمار في البنية التحتية التكنولوجية وبناء رأس مال بشري إلى جانب توظيف تقنيات الذكاء الاصطناعي في القطاع الصحي وإنشاء ملف طبي موحد للمريض بهدف تمكين الجزائر من بناء منظومة صحية رقمية متكاملة تساهم في تحسين جودة الخدمات الصحية وتطوير القطاع بشكل عام.

الكلمات المفتاحية:الرقمنة؛ التحول الرقمي؛ الصحة الرقمية؛المعوقات.

1. Introduction:

In recent decades, the world has experienced profound changes driven by the digital revolution. This revolution has reshaped work patterns and service delivery across multiple sectors, particularly in healthcare, which continues to be a central pillar of human and social development.The integration of digital technology into health systems has become a strategic necessity to achieve a comprehensive digital transformation aimed at improving service quality and facilitating access to medical information.

In this regard, Algeria—both at the governmental and societal levels—seeks to keep pace with the digital revolution in its health sector. This effort stems from the strong belief that digital transformation is the key to reforming the entire health system. This vision is evident in the launch of several digital platforms and initiatives. However, despite their importance, these efforts face numerous complex and interrelated challenges that limit the benefits of digitization. These obstacles extend beyond technical aspects to include legislative, regulatory, and human factors, as well as issues concerning the protection of medical data. Such challenges increase the complexity of achieving full digital transformation.

Given these constraints, there is an urgent need to develop practical solutions and comprehensive strategies that can overcome these difficulties. These solutions would allow Algeria to effectively align with global trends promoting digital health development.

Based on this background, the central research questionis:

What are the main challenges hindering the digitization of Algeria's health sector, and what measures can be adopted to ensure an effective digital transition?

The following sub-questions stem from this problem:

- What is the concept of digitization and digital health?
- Whatare the key areas of digitalization currently applied in Algeria's health sector?
- What challenges are hindering digitization, and what potential solutions can be implemented?

Importance of the Study:

This study is important because it provides a theoretical overview of the main

variables related to digitization and its associated elements. It also offers an objective and analytical perspective on the challenges facing the digitization of the Algerian health sector. Furthermore, it proposes future solutions derived from previous research and empirical studies that can contribute to overcoming these challenges.

Objectives of the Study:

This study seeks to achieve the following objectives:

- To clarify the theoretical concepts of digitization and digital health.
- To review the most significant digital technologies and applications within the Algerian health sector.
- To analyze the main challenges hindering the implementation of digital transformation in Algeria's health system.
- To propose practical, evidence-based solutions to overcome these obstacles, drawing on the researcher's insights and empirical data.

2. Key Concepts about Digitization

This section provides an overview of the main theoretical and practical concepts related to digitization, moving from general definitions to their application in the health sector, particularly in terms of requirements, challenges, and enabling conditions.

2.1 The Concept of Digital Transformation

The term digital transformation refers to a profound shift associated with adopting and using digital technologies to redesign business models and organizational processes. This transformation aims to create a qualitative improvement in service delivery, making it faster and more efficient. It also represents a comprehensive organizational reform intended to simplify administrative procedures and enhance the quality of services provided, leading to what is known as digital maturity or digital access(Deboushi & Razzaq, 2024, p. 579).

Digital transformation can also be defined as a strategic reorganization of institutional activities, processes, and skills to fully exploit the opportunities provided by digital technologies. It goes beyond the mere adoption of digital tools and encompasses a deep cultural and structural change (Madani & Madani, 2025, p. 670).

In this sense, digital transformation represents the broader framework within which digitization operates as a practical and operational process.

2.2 The Concept of Digitization:

According to Saeed Yaqtin, digitization is the process of converting documents from paper form into digital formats. In this process, texts, images (static or moving), and sounds are encoded into numerical data, allowing them to be processed, stored, and transmitted through information systems. From this perspective, text digitization involves converting printed or handwritten materials from their traditional paper-based form into a digital format that can be displayed and interacted with on electronic screens.(Faraj, 2009, p. 11)

Other scholars define digitization as an administrative approach that eliminates the use of paper in institutional and procedural operations. It is viewed as an effective means of enhancing organizational performance and efficiency. This system relies on harnessing modern digital technologies and tools. (Abdillawi, 2017, p. 38)

From these definitions, it can be concluded that digitization is the process of transforming paper-based data, information, and files into an electronic format that can be read, stored, and managed through digital systems , thereby constituting a key operational component of digital transformation. Thus, while digital transformation is strategic and comprehensive, digitization represents its practical implementation at the operational level.

2.3 The Concept of Digital Health:

As an application of digitization within a specific sector, digital health illustrates how these concepts are implemented in practice. According to the World Health Organization (WHO), digital health is an umbrella term encompassing electronic health (eHealth) and other advanced fields involving modern technologies, such as computer science, artificial intelligence, and big data analytics. Digital health technologies are now considered essential tools for providing health services and supporting various aspects of public health at a large scale (Zidane & Bin Kadi, 2023, p. 160).

Similarly, some scholarsdefine digital health as the process of converting patient-related health data and information from traditionalformats into digital ones that can be stored, transferred, and automated for different medical and administrative purposes according to specific needs(Bin Akkoush & Lakhal, 2025, p. 164).

Based on these definitions, digital health can be understood as the application of digital technologies in the health field to improve the quality, accessibility, and efficiency of health services, particularly in contexts such as Algeria where the adoption of such technologies remains in progress.

2.4 Digitization Application Requirements:

Having outlined the conceptual foundations, the following section presents the main practical requirements necessary for implementing digitization, especially within the health sector.

Government departments and institutions have increasingly moved toward digitizing their printed collections to make them accessible to everyone. This shift is essential and requires a set of foundational capabilities and prerequisites that together form the basis for successfully completing the digitization processand overcoming its associated challenges. These requirements can be summarized as follows:

Qualified Human Resources:

The success of digitization largely depends on the presence of competent and well-trained personnel. This process requires the coordinated effort of many individuals across information institutions, from administrators to staff members in various departments. Their skills, expertise, and technical competence play a decisive role in ensuring the quality and sustainability of digitization projects (Mehri, 2005-2006, p. 80).

Legislative Requirements:

The success of any digitization initiative also depends on the existence of a solid legal framework. Clear laws and regulations are needed to support and legitimize the digitization process and to define how digital documents can be accessed and used by institutions, agencies, and citizens. A comprehensive legal framework ensures that the process is organized, transparent, and capable of safeguarding the rights of all parties involved(Hafidhi, 2008, p. 26).

This is particularly important in the health sector, where data protection and patient confidentiality require specific regulatory attention in Algeria.

Security Requirements:

As hacking, cyber espionage, and data breaches become more sophisticated, developing strong security policies has become imperative. Effective technical and organizational measures must be implemented to ensure the confidentiality, privacy, and protection of digital data. Institutions must establish robust

cybersecurity systems to prevent unauthorized access and to safeguard sensitive information from threats that could compromise the integrity of digital assets (Al-Wafi, 2019, p. 155), especially in managing sensitive health data.

Political Requirements:

Achieving meaningful digital transformation requires strong political awareness and commitment. This includes demonstrating a clear political will to support strategies of electronic transformation and to back digital management projects. Policymakers should provide both financial and moral support to institutions to help them overcome obstacles and successfully implement digital programs(Zidane & Bin Kadi, 2023, p. 155). This support also includes allocating sufficient funding and investment to sustain digital health initiatives.

Administrative Requirements

For digitization to be effectively implemented, traditional administrative mechanisms must be restructured to align with the principles of modern public administration. The main administrative requirements include:(Al-Failat, 2004, p. 31)

- **Modernizing organizational structures:** Public administration units must be redesigned to create more flexible and adaptable frameworks that facilitate digitization.
- **Redistributing competencies:** Administrative responsibilities should be reassessed and redistributed across departments to ensure efficient digital transformation by identifying functions that can be automated or digitized.
- **Reorganizing communication systems**: Modern digital technologies should be used to enhance communication between departments, simplify procedures, and improve coordination.
- **Developing training programs**: Continuous and regularly updated training initiatives are essential to equip employees with the necessary digital skills and to keep pace with technological advancements.
- **Encouraging decentralization:** Empowering teams and promoting collaborative, decentralized management enhances efficiency and innovation.
- **Promoting a new organizational culture:** Institutions should adopt values that foster creativity, adaptability, and proactive engagement in the digital environment.

Technical Requirements:

Implementing digitization effectively requires providing essential tools and infrastructure, such as computers, scanners, digitization software, and secure data storage systems. The technical framework for digitization includes both physical and virtual components, which can be divided as follows(Boumarwan, 2014, p. 20):

- **Solid infrastructure:** This includes all wired and wireless connections, computer systems, and basic information technology components necessary to facilitate digital operations and data exchange.
- **Soft infrastructure:** This refers to software systems, operating platforms, and digital applications that support electronic processes and services.
- **Communication networks:**These networks ensure efficient information exchange and are divided into three main types:
  - ✓ **The Internet:** A global information network that interconnects numerous computer systems, enabling seamless data exchange as if functioning within a single system.
  - ✓ **The Intranet:** A private internal network that allows information sharing among an organization's departments and employees. It is accessible only to authorized staff and helps streamline internal communication and workflow.
  - ✓ **The Extranet:** A controlled network that connects multiple organizations working on joint projects, allowing them to share information securely while maintaining the privacy of each organization's internal network.

In the context of the Algerian health sector, such technical systems may include electronic health records and telemedicine platforms, which illustrate the practical application of digitization efforts, although their implementation remains uneven.

3. Aspects of Digital Orientation in the Health Sector in Algeria

Digitization in the Algerian health sector encompasses a range of modern digital applications and technologies designed to enhance the quality and efficiency of health services. It represents a strategic shift toward improving governance, accessibility, and the overall performance of healthcare delivery, particularly in response to increasing population needs and public health challenges. This transformation is reflected in several key manifestations that

illustrate the scope of digital change occurring within the sector (Mahboub & Ramadana, 2024, pp. 194-196).

3.1 Portals and Electronic Platforms:

This section presents a range of digital tools developed by the Ministry of Health, which can be broadly categorized into administrative management systems, epidemiological monitoring platforms, and remote healthcare services. These tools contribute to improving governance, data management, and service delivery in the health sectorby facilitating real-time access to information, enhancing coordination between institutions, and supporting informed decision-making.

Electronic Portals:

- **RH Portal (sante.gov.dz):** One of the most significant electronic platforms launched by the Ministry of Health, specifically designed to serve public institutions. It provides an integrated set of digital services aimed at effectively and transparently managing the professional paths of health sector employees,thereby improving administrative transparency and workforce management.
- **PROMOTION Portal (promotion.santé.dz):** Launched in March 2021 by the Ministry of Health, this platform enables the periodic and systematic updating of employee data and the monitoring of promotion eligibility in alignment with the principles of good governance and administrative efficiency, which contributes to fairness and consistency in career advancement.
- **COVID Portal (covid.santé.gov.dz):** Developed in response to the COVID-19 pandemic, this portal allows health authorities to monitor vaccinated individuals. After completing the second dose, the system updates the individual's health record, granting access to an official, internationally recognized vaccination certificate, thus improving vaccination tracking and supporting public health control measures.
- **Compulsory Disease Authorization Portal (mdo.sis.dz)**: Known as the Système de Déclaration des Maladies à Déclaration Obligatoire (MDO), this system serves as an effective digital mechanism for collecting, classifying, and coordinating epidemiological data across health institutions to prevent and control epidemics, thereby strengthening early detection and response capabilities.

- **DHIS Portal (dhis.sis.gov.dz):** This digital platform serves three primary purposes: tracking medical equipment and ensuring its regular maintenance; monitoring patients receiving home care; and organizing the operations of mobile health convoys, which enhances resource allocation and continuity of care.

Electronic Platforms:

- **Remote Medical Consultation Platform:** Provides free health consultation services via electronic media such as smartphones and computers. Patients can book and follow up on appointments virtually, thereby reducing congestion in health institutionsand improving access to healthcare services, especially for remote populations.
- **COVID-19 Monitoring Platform:** A digital tool launched by the Ministry of Health to track and monitor developments in the epidemiological situation of the pandemic in Algeria. It provides accurate, real-time data on infection, recovery, and mortality rates, supporting timely decision-making and public health interventions.
- **DOKTA Digital Platform:** Designed to connect patients with healthcare providers efficiently, this platform allows users to quickly find qualified doctors, access their schedules directly, and receive continuous follow-up through alerts and notifications, thereby improving patient engagement and continuity of care.
- **SEHA-TECH Digital Medical Appointment Platform:** An integrated digital system linking patients, hospitals, and pharmacies. It aims to simplify the electronic management of medical appointments and facilitate the immediate search for pharmacies, including their geographic locations, which enhances service coordination and reduces delays in care delivery.

Overall, these portals and platforms illustrate how digital technologies are being leveraged to improve accessibility, transparency, and responsiveness within the Algerian healthcare system. While these portals and platforms primarily focus on digital access, communication, and real-time monitoring, the following section introduces internal management programs used within public health institutions, thus providing a clearer functional distinction between the two categories.

3.2. Digital Management Programs in Public Health Institutions:

In contrast to the previously presented portals and platforms, this section focuses on internal digital management programs that support administrative, clinical, and logistical operations within health institutions. These systems are mainly used by healthcare staff to enhance efficiency, data processing, and service organization.

Public health institutions in Algeria have adopted a variety of digital management programs designed to improve efficiency, data management, and service quality. Among these are the following (Zedaira, 2022, p. 876):

1. PATIENT System:

The Patient information system was developed in the late 1990s to operate within the MS-DOS environment using an edit-based interface. It is a multifunctional program designed to manage various reception office activities in health institutionsand plays a key role in organizing patient data and improving service delivery.

Its main functions include:

- Registering incoming and inpatient data.
- Organizing and managing the daily activities of medical units and hospital stays.
- Monitoring the activities of the Maternity Department, including births, deaths, and discharges.
- Completing billing procedures related to all types of medical sponsorship.
- Handling administrative processes related to social security.

2. IPPHARM System:

The IPpharm software, in use since the early 1990s, was also developed to function within the MS-DOS environment through an edit interface. It specializes in managing and tracking the movement of medicines and inventory control at the level of hospital central pharmacies.

3. EPSPK-DSS Health Activities Program:

This information system compiles and manages a comprehensive record of documents, reports, and statistics produced by the Sub-Directorate of Health. It also tracks and organizes both the quantitative and qualitative outcomes of health activities, providing managers with an effective tool for extracting health indicators and monitoring institutional performance.

4. User Management Software (EPSPK-PERS):

Developed internally by institutional engineers, this system is based on an Access database and a simple interface built with Visual Basic. It is designed to manage user-related administrative affairs. The program offers several features that simplify data retrieval, eliminating reliance on paper archives. It enables the accurate extraction of reports, data, and statistics — including information on employees, leave records, and other administrative details — with high precision and efficiency.

5. The Waiting Loop Program (File d'attente):

The Waiting Loop Program operates through an internal network managed by the reception office. It is designed to regulate patient flow and enhance service quality within health institutionsby reducing overcrowding and optimizing waiting times. The system includes:

- A smart ticket printer, which assigns serial numbers to patients according to the type of service required.
- A visual guidance system, displayed on large digital screens that dynamically broadcast information and guide patients transparently, thereby reducing waiting times.
- Networked computers in medical units, each equipped with printers for issuing prescriptions and test results.

A distinctive feature of this program is its reliance on a digital medical record for each patient or companion from the moment of registration at the reception office. The record is then directed to the relevant department and continuously updated with all medical data and results upon discharge.

This digital system allows for the creation of a comprehensive medical file containing personal information, diagnoses, laboratory results, and radiological findings—providing a complete view of the patient's health statusand supporting more accurate and efficient medical decision-making. Moreover, it enables physicians to access test results directly through the network without the need for printed reports. The program also prioritizes emergency cases, thus enhancing medical care delivery and improving the overall efficiency of performance within public health institutions.

4. Obstacles to the Application of Digitization in the HealthSector in Algeria

Despite Algeria's ongoing efforts to digitize its health system, this process continues to face significant obstacles that have prevented the achievement of its intended goals. Reports indicate that digitization in the Algerian health sector remains limited, fragmented, and lacks full integration. This situation highlights the need for an in-depth analytical study to identify and understand the underlying challenges. These obstacles can be categorized into several key dimensionsincluding technical, human, regulatory, security, financial, and geographical constraints, which are interrelated and collectively affect the success of digital transformation.

4.1. Technical Constraints:

The Algerian health sector, similar to other public sectors, encounters multiple technical difficulties that hinder the effective implementation of digitization initiatives(Ben Djomaa & Snoussi, 2023, p. 610), and these challenges are further exacerbated by human and organizational limitations.

Problems related to the Internet:

The following points summarize the main issues related to connectivity and telecommunications infrastructure:

- Internet services in Algeria are often unstable and inconsistent, which has had a negative impact on the implementation of various digitization projects, as reliable connectivity is essential for real-time data exchange and system integration. This instability particularly affects future plans to integrate digital platforms into health institutions, as the success of these initiatives requires a robust and high-speed Internet network capable of supporting large digital systems.
- The telecommunications infrastructure still relies on traditional copper cables instead of fiber-optic technology. This reliance significantly limits Internet quality and capacity, preventing the country from meeting the demands of digital transformation.
- Administrative mismanagement of Internet services, along with the lack of adoption of successful international models, further hampers progress. Moreover, the monopoly held by Algeria Telecom in the field of communication technology has restricted competition, diversity, and

service efficiency.

- Slow connection speeds, frequent service interruptions, and poor coverage—resulting partly from delays in activating submarine cables—have made it difficult for medical personnel to effectively use electronic health systems.

Technological Problems:

- The development of medical software remains difficult due to the absence of a clear strategic vision specifying the types of programs required, as well as the lack of technical standards and operational guidelines. This ambiguity not only slows innovation but also negatively affects the quality of digital healthcare services.
- Limited Arabic language support in medical software creates additional barriers for Arabic-speaking users, reducing accessibility and inclusivity in digital health applications.
- Some imported medical technologies are difficult to operate due to insufficient training and the absence of specialized centers that teach effective use of these devices.
- Maintenance of computers and medical equipment also poses a problem, as the shortage of qualified technical experts prevents the continuous and efficient operation of digital systems, which in turn lowers the quality of healthcare services.
- Finally, the lack of modern and advanced technological tools remains one of the most significant obstacles to improving medical performance.

4.2. Human Constraints:

The human factor represents one of the most critical challenges facing the digitization of the health sector in Algeria. These obstacles can be summarized as follows (Massaad, 2024, pp. 90-91) and are closely linked to the technical limitations discussed above, as insufficient skills hinder the effective use of digital systems.

Lack of Qualified Competencies:

The shortage of qualified administrative and technical personnel in digital technology is a major barrier to digital transformation. Health institutions require well-trained professionals who can understand, apply, and manage modern technologies efficiently to enhance performance and support the transition toward digital health. According to the Algerian Digital Health Organization Report

(2023), only about 30% of health workers possess advanced technical skills, which indicates a significant gap in digital capacity and explains the slow adoption of technological systems. This significant gap between existing competencies and the required digital expertise highlights the urgent need for comprehensive capacity-building programs.

Lack of Awareness and Limited Technological Knowledge:

Many health sector employees face difficulties in using digital tools effectively, which negatively affects their performance and productivity. The World Health Organization (2021) reported that approximately 60% of healthcare providers have never received technical training related to digital system use, highlighting the urgent need for structured training programs. This high percentage not only reflects a lack of training but also reveals a deeper structural problem that threatens the success of technological investments in healthcare infrastructure.

Resistance to Change:

A considerable number of doctors and health professionals have resisted adopting digital systems due to fears of losing their jobs, income, or professional status. Additionally, concerns about how these technological shifts may alter their daily work routines have contributed to their reluctance, with some practitioners continuing to prefer paper-based systems over electronic records. Such resistance slows the pace of digital adoption and creates institutional inertia within health organizations.

Unequal Distribution of Human Resources:

Algeria faces a major imbalance in the geographical distribution of medical staff. Most healthcare professionals are concentrated in major cities, while rural and remote areas suffer from a severe shortage of doctors and nurses. Reports from the Algerian Ministry of Health (2023) indicate that nearly 80% of physicians work in urban centers, leaving rural regions with limited access to medical care, which further limits the effectiveness of digital health solutions in underserved areas. This uneven distribution weakens the overall efficiency of the healthcare system and reduces the quality of services available to rural populations.

Language Barrier in Digital Technology:

The rapid pace of digital transformation has revealed the language barrier as a major challenge. Most digital platforms, software, and systems are developed primarily in English, which limits accessibility for non-English-speaking

healthcare workers. This creates both psychological and cognitive barriers, preventing many professionals from fully engaging with these technologies (Hamdi, 2008, p. 108).

Lack of Training Programs in Digital Technology:

The shortage of specialized training programs in digital technologies remains a pressing issue in Algeria's health sector. The limited availability of such programs reduces the efficiency of healthcare staff in using digital tools, including electronic health records, telemedicine systems, and hospital management applications. Without continuous professional development, healthcare workers struggle to adapt to rapid technological changes, which weakens the potential of digitization to improve healthcare quality(Ben Djomaa & Snoussi, 2023, p. 611).

4.3. Regulatory and Legislative Impediments:

The main regulatory and legislative barriers can be summarized as follows:

- Weak planning and coordination at the senior management level in the implementation of digitization programs.
- Absence of necessary organizational reforms to keep pace with digital transformation—whether through introducing or merging departments, redefining competencies, or clarifying functional relationships among different units—to ensure workflow efficiency and integration of institutional tasks.
- Lack of institutional coordination among various administrative bodies and departments, leading to non-standardization of devices, systems, and software used. This fragmentation obstructs the integration of operations and hinders overall performance in managing health facilities.
- Unclear vision regarding the implementation of digitization projects among decision-makers and implementers.
- Persistence of traditional bureaucratic methods, characterized by rigid hierarchies and slow decision-making processes. These outdated structures act as barriers to the digital transformation that depends on flexibility and rapid responsiveness to change(Ben Djomaa & Snoussi, 2023, p. 610).
- Deficient statistical monitoring of needs and priorities related to digital transformation in the health sector.
- Absence of a central authority responsible for supervising and coordinating national digital transformation initiatives, which leads to

fragmentation and duplication of efforts.

- Lack of a robust legislative framework to support digital transformation in healthcare. The absence of comprehensive laws regulating data protection, privacy, cybersecurity, and licensing procedures represents a critical gap.
- Non-recognition of the legal validity of electronic documents as official evidence remains a serious obstacle to establishing confidence in digital transactions, thereby restricting their widespread use across different domains(Houcine, 2011, p. 195).

4.4. Security Obstacles

Security concerns constitute another major challenge to the success of digital transformation in the Algerian health sector. These include:

- The increasing risk of security breaches targeting hospital information systems, potentially leading to data disclosure, patient privacy violations, and disruption of medical management systems—particularly those handling sensitive data such as patient files, laboratory results, and appointment scheduling.
- The widespread adoption of remote working models and digital tools, which heightens vulnerability to cyberattacks.
- Limited cybersecurity infrastructure: Algeria continues to lag in adopting effective security systems capable of controlling and preventing hacking attempts. According to the Journal of Cybersecurity and Health (2023), approximately 42% of health institutions experienced cyberattacks within the past two years, revealing the fragility of the digital security framework and its limited capacity to confront escalating cyber threats (Massaad, 2024, p. 87).
- Lack of specialized cybersecurity professionals, which hinders health institutions' ability to respond effectively to growing digital risks.
- Human errors represent a major obstacle to protecting health data—arising either from unintentional misuse or deliberate information leaks. Such errors severely compromise patient confidentiality, undermine the credibility of the health system, and diminish service quality(Boutaba & Boucti, 2024, p. 235).
- According to Kaspersky (2024), Algeria recorded more than 13 million hacking attempts in 2024—an increase of 17% compared to 2023. The

report highlighted that cybercriminals exploited popular platforms such as TikTok and Telegram to target users, steal personal data, and install malware, reflecting the increasing sophistication of cyber threats.(Kaspersky, 2024)

4.5. Financial Constraints:

The Algerian health system relies predominantly on direct public funding. The health budget ranks fourth in the national financial envelope after the Ministry of National Defense, the Ministry of National Education, and the Ministry of the Interior and Local Authorities. This traditional mode of financing constitutes a heavy burden on the public treasury, prompting the state to seek alternative mechanisms to reduce fiscal pressure—most notably through the development of an updated contractual system.

However, the effective implementation of this system requires the comprehensive integration of digital mechanisms within health institutions, as it depends on the dynamic flow of health information across three interrelated levels.(Menad & Mhammed, 2025, p. 239):

- **Level 1:** Enhancing communication and data exchange among departments within the same health institution.
- **Level 2:** Strengthening digital coordination between various health institutions at the national level.
- **Level 3:** Promoting complementarity in health information exchange among health institutions, structures, and social security bodies.

Achieving this digital integration would improve the effectiveness of the contractual system and contribute to enhancing health financing efficiency and optimizing resource management.

In addition, several other financial obstacles persist(Ameur & Cheikh, 2025, p. 451):

- Insufficient financial resources allocated to the infrastructure required for digital health projects.
- Limited funding for training and professional qualification within the health sector.
- High costs associated with modern medical and digital equipment as well as information security systems.
- Weak financial incentive mechanisms, which adversely affect the motivation and performance of health workers.

These financial limitations highlight the need to consider alternative solutions such as public-private partnerships and international cooperation to support digital health initiatives.

4.6. Geographical Constraints:

Algeria's vast geographical expanse represents a significant barrier to achieving balanced digital transformation across all regions. The key geographical constraints include:

- The difficulty of ensuring equitable deployment of digital infrastructure across all areas of the country.
- Limited accessibility to remote and isolated regions, which complicates the implementation of digital health initiatives.
- Harsh natural conditions, such as extreme temperatures and sandstorms, which hinder the maintenance and operational continuity of digital installations.
- Weak communication and internet networks in rural and southern regions compared with urban areas.
- The high cost of infrastructure installation and technical support in geographically isolated zones.

These geographical disparities reinforce the digital divide, thereby affecting the equitable delivery of health services and limiting the national integration of digital health systems, especially in underserved regions where access to care is already limited.

5. Solutions to Overcome Digitization Obstacles in the Algerian Health Sector:

The digital transformation of Algeria's health sector faces multiple structural, financial, and technical challenges. To address these, a set of practical and scientifically grounded solutions must be adoptedin order to ensure a sustainable, efficient, and inclusive digital health system.

A 2024 study published in the Journal of Environmental Studies and Sustainable Development identified several strategic directions for developing digital health transformation in Algeria (Massaad, 2024, pp. 95-96) which can be grouped into infrastructure, human resource, and governance-related interventions:

- Developing a national strategy for digitization: The government should adopt a comprehensive plan with clear objectives, adequate resources, and

effective coordination mechanisms to ensure the interoperability of digital systems across all hospitals and health facilitiesand to define national priorities, whether focusing first on high-density urban centers or ensuring gradual nationwide coverage. The plan should also include strategic partnerships with academic institutions and research centers to develop innovative and sustainable technological solutions tailored to the health sector's needs, drawing on successful international experiences such as Estonia's integrated digital health system.

- Enhancing digital infrastructure: Significant investments are needed to modernize communication networks, update digital systems, and provide modern medical and information technologies to improve service quality and institutional performance, particularly through the expansion of fiber-optic networks, cloud-based systems, and high-speed connectivity in rural and southern regions.
- Developing human capital: Comprehensive training and professional development programs should be established to strengthen the technical and digital skills of health professionals, including continuous education, certification programs, and partnerships with universities and international organizations.
- Promoting awareness and education: Awareness campaigns and educational programs should be organized for all stakeholders—including medical staff, administrators, and patients—to highlight the importance of digitization in improving healthcare quality and to reduce resistance to technological changeby targeting each group according to its specific needs and level of digital literacy.

Similarly, a study by Ammar Zidane and Hassan Bin Kadi in the International Journal of Legal and Political Research proposed additional strategies to reinforce digitization effectiveness in the Algerian health sector:(Zidane & Bin Kadi, 2023, p. 168)

- The government should provide financial and moral support to users of the national health information system (SIS DZ).
- Continuous development of the central database within the Ministry of Health should be ensured to align it with the various organizational and administrative levels of hospitals.
- Specialized monitoring teams with strong expertise in the health field should be recruited to supervise and ensure optimal system use—particularly during the data entry phase.
- Scientific forums and seminars should be intensified to enhance the digital competence of healthcare professionals and promote best practices in digital

health management, while also facilitating knowledge exchange at national and international levels.

Building on these findings, additional recommendations can be proposed to deepen the digital health transformation process in Algeria:

- Investing in digital infrastructure: Establish a comprehensive national strategy to improve communication networks, particularly in underserved rural and southern regions, in direct response to the geographical constraints identified earlier.
- Investing in human resources: Implement continuous training programs for all health sector personnel and involve them in early stages of digitization projects to ensure smoother adaptation.
- Developing a unified medical profile: Introduce a unique identification number for every patient to link medical data across all health institutions, facilitating access and improving diagnostic accuracy while ensuring strict data protection and privacy safeguards.
- Employing Artificial Intelligence (AI): Leverage AI technologies to enhance diagnostic precision, accelerate drug discovery, and analyze large-scale medical data efficiently through applications such as predictive analytics, clinical decision support systems, and virtual health assistants].
- Encouraging innovation and partnerships: Foster collaboration between government bodies and health technology companies while supporting Algerian startups to innovate in digital healththrough funding mechanisms, incubation programs, and international partnerships.
- Incentivizing medical staff in underserved areas: Offer targeted grants and incentives to medical professionals in rural and southern regions to promote equitable healthcare distribution, such as housing support, career advancement opportunities, and financial bonuses.
- Establishing a legal framework for data protection: Enact robust data protection and privacy laws aligned with international standards to enhance public trust in digital systems.
- Adapting successful international experiences: Draw on global models such as the Chinese and Estonian digital health systems to localize best practices and promote international cooperation for knowledge exchange and capacity buildingwhile adapting these experiences to Algeria's socio-economic and institutional context.

6. Conclusion:

In light of the foregoing analysis, it can be concluded that the digitization of the health sector in Algeria represents a strategic necessity to keep pace with global transformations in healthcare and to enhance the efficiency, accessibility, and quality of health serviceswithin an integrated and modern digital health ecosystem. Nevertheless, the path toward full digital transformation continues to face multiple challenges—technical, human, financial, and security-related—that hinder the achievement of the desired outcomes.

The persistence of weak digital infrastructure, limited technological competencies, resistance to change among personnel, and inadequate financial resources collectively underscore the need for a comprehensive and coordinated national approachthat translates strategic objectives into concrete implementation measures. These challenges, however, should not be viewed as insurmountable barriers; rather, they constitute opportunities for institutional reform and sustainable development. Success in this endeavor depends largely on modernizing digital platforms, equipping health institutions with advanced technologies, strengthening cybersecurity frameworks, and ensuring the protection of sensitive health datathrough clear regulatory mechanisms and effective monitoring systems.

To enhance clarity and avoid redundancy, these success factors can be summarized as a combination of governance, infrastructure development, and human capacity building.The effectiveness of Algeria's digital health transformation ultimately relies on strong political will, strategic coordination among the various stakeholders, and the active involvement of citizens in embracing technological change, supported by clear institutional leadership and accountability mechanisms. Through these concerted efforts, it is possible to lay the foundations for a robust, integrated, and sustainable digital health system that aligns with international standardsand incorporates tools such as electronic health records, telemedicine platforms, and data-driven decision-making systems.

Accordingly, the following recommendations are proposed to support the development and implementation of digital transformation policies in the Algerian health sector:

- Enhance the quality and accessibility of Internet services, with particular attention to rural and desert regions where digital infrastructure remains weak, including the expansion of fiber-optic networks and high-speed connectivity

solutions.

- Allocate sufficient financial resources to support the implementation and maintenance of health digitization programsthrough diversified funding mechanisms such as public-private partnerships and international cooperation.
- Adopt and regularly update modern cybersecurity standards to protect patient data and ensure institutional resilience against potential breaches, including data encryption policies and secure information-sharing protocols.
- Redefine the geographical distribution of health sectors in proportion to their demographic and epidemiological characteristics to ensure equitable access to care, potentially through mobile health units and targeted infrastructure investments in underserved areas.
- Combat digital illiteracy by providing financial support and implementing continuous training programs aimed at improving the digital competencies of medical and administrative staff in health institutions, in collaboration with universities, training centers, and specialized institutions.
- Strengthen human resources by recruiting specialized professionals in digital health, cybersecurity, and artificial intelligence to ensure the sustainability and advancement of digital systems.
- Establish monitoring and evaluation mechanisms with clear performance indicators to assess the progress and impact of digital transformation initiatives over time.

In conclusion, the digitization of Algeria's health system is not merely a technological reform but a transformative process that requires sustained commitment, cross-sectoral collaboration, and a forward-looking vision centered on innovation, inclusion, and the protection of public health.

References:

Abdillawi, A. a.-S. (2017). The Importance of Digitization in the Modernization and Activition of the Public Service in Algeria. Journal Sawt al-Qanun, 7(1), 38.

Al-Failat, H. (2004). Electronic Public Adminstration Law. Amman, Jordan: wael Publishing and Distribution House,31.

Al-Wafi, R. (2019). The Impact of the Use og E-Management on the Quality of Services in Algerian Public Institutions - the Justice Sector as a Model. PhD thesis University of Messila. Management Sciences, Algeria,155.

Ameur, I., & Cheikh, A. (2025). Difficulties and Challenges Facing Digital Transformation in Algeria -Case Study. Algerian Journal of Public Finance, 15(1), 451.

Ben Djomaa, M., & Snoussi, Z. (2023). Digitization for the Reform of Algerian Public Hospitals - Opportunities and challenges. Journal of New Economics, 14(1), 610.

Bin Akkoush, S., & Lakhal, S. (2025). Digital Transformation in the Health Sector: Towards Enhancing the Quality of Health Services. Journal al-Maarif, 20(1), 164.

Boumarwan, S. (2014). E-Administration and Its Role in Improving the Performance of Government Departments. Riyadh : Law and Economy Library,20.

Boutaba, A. A., & Boucti, T. (2024). The Role of Cybersecurity in Enhancing the Health Security of States. Algerian Journal of law and political science, 9(2), 235.

Deboushi, A., & Razzaq, H. (2024). Digital Transfotmation of the Puplic Health Facility in Algeria:Mechanisms of Incarnation and Bets of Image Improvement. Journal El-Mieyar, 29(1), 579.

Faraj, A. (2009). Digitization Inside or Outside Information Institutions: A Study in the Proplems and Criteria of Selection. Majallat Dirasat al-Malumat, 4, 11.

Hafidhi, Z. (2008, March). Automated Systems and Their Role in The Development of Archival Services: An Applied Study in the Archive of the Municipality of Constantine. PhD thesis University of Mentouri constantine. Faculty of Humanities Department of library science, Algeria, 26.

Hamdi, M. B. (2008). Difficulties Facing the Use of Elctronic Administration in the Administration of Secondary Schools in Makka Al-Moukarrama. Magister thesis Oum Al- Qura University. Saudi Arabia, 108.

Houcine, H. M. (2011). E-Management:Concepts Characteristics and Requirements (éd. 1). Amman: Al-Warraq Foundation for Publishing and Distribution, 195.

Kaspersky. (2024). Consulté le September 04, 2025, sur Https://Me.Kaspersky.Com/Search?Query=%D8%A7%D9%84%D8%Ac%D8%B2%D8%A7%D8%A6%D8%B1.

Madani, Z., & Madani, B. (2025). Digital Transition in Algeria : Infrastructure Challenges and Social Inclusion in the Digital Age. Journal of Economic and Financial Research, 12(1), 670.

Mahboub, M., & Ramadana, F.-F. (2024). The Digitization of the Health Sector in Algeria Between the Opportunities for Change and the Challenges of Development. Journal Al-Moufakkir, 19(2),194-196.

Massaad, A. (2024). The Challenges of Digitizing the Health Sector in Algeria. Journal of Environmental Studies and sustainable development, 3(1), 87-96.

-Mehri, S. (2005-2006). Future, Digital Library in Algeria: A Study of the Reality and Aspirastions of the. Magister thesis University of Mentouri Constantine. Library science, Algeria,80.

Menad, N., & Mhammed, Z. (2025). The Contribution of Transformation Applications in the Health Sector in Algeria: Reality and Challenges. Algerian Journal of Public Finance, 15(1), 239.

Zedaira, C. E. (2022). Digitization of Public Health Etablishements: Case of EPSP Kais Wilaya of Khenchela. Journal of economic and financial research, 9(2),876.

Zidane, A., & Bin Kadi, H. (2023). The Algerian Experience in the Digitization of the Health Sector. International Journal of legal and Policy Research, 7(1),150-168.