



## The contribution of digital transformation in improving the quality of Comparative Study of Healthcare Institutions in :healthcare services Khenchela

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### **Abstract:**

This study evaluates the impact of digital transformation on healthcare service quality in Khenchela, using a comparative approach. By conducting a comparative study between healthcare institutions, the researcher compared health system indicators in Khenchela and projected global experiences and practices, placing these experiences in the context of Algeria. The results revealed a significant positive relationship between digital transformation and healthcare service quality, with notable improvements in medical record management, reduced patient waiting times, simplified appointment scheduling, increased diagnostic accuracy, and faster access to patient information. The comparative analysis showed varying levels of digital transformation implementation across institutions, which negatively impacted service quality due to disparities in infrastructure readiness and staff efficiency. The study recommends enhancing technological infrastructure, providing comprehensive training for healthcare workers, and establishing unified digital protocols across healthcare institutions in Khenchela to ensure consistent improvements in service quality.

**Key Words:** Digital Transformation, Healthcare Quality, Information Technology, Digital Systems, Health Institutions.

**JEL Classification :** I18, O33, L86

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### **Introduction**

In an era marked by rapid technological advancement, the healthcare sector stands at the crossroads of traditional practices and digital innovation. Digital transformation has emerged as a crucial pathway for healthcare institutions to enhance their service quality, operational efficiency, and patient care outcomes.

This transformation is particularly significant in developing countries, where healthcare systems face mounting pressures to modernize their services while managing resource constraints.

### **Research Problem**

The central research problem can be articulated through the following question:

"How does the implementation of digital transformation impact the quality of healthcare services in private medical institutions in Khenchela province, and what are the key dimensions that influence this transformation?"



This main question gives rise to several sub-questions:

- What are the essential components and technologies driving digital transformation in healthcare services?
- How do private medical institutions in Khenchela province currently implement digital transformation initiatives?
- What is the relationship between digital transformation and the quality dimensions of healthcare services?
- What challenges and opportunities exist in the digital transformation of healthcare services in the region?

### **Aims of the Study**

This research aims to:

- Examine the current state of digital transformation in private healthcare institutions in Khenchela province
- Assess the impact of digital transformation on healthcare service quality
- Identify the critical success factors and barriers in implementing digital healthcare solutions
- Provide evidence-based recommendations for healthcare providers seeking to enhance their digital capabilities

### **Research Objectives**

The specific objectives of this study are to:

#### **1. Analytical Objectives:**

- Analyze the current digital transformation practices in selected private healthcare institutions
- Evaluate the relationship between digital transformation implementation and healthcare service quality metrics
- Assess the readiness of healthcare providers for digital transformation

#### **2. Practical Objectives:**

- Develop a framework for implementing digital transformation in healthcare services
- Identify best practices for integrating digital technologies in healthcare delivery
- Propose strategies for overcoming barriers to digital transformation

#### **3. Strategic Objectives:**

- Contribute to the body of knowledge regarding digital transformation in healthcare services
- Provide actionable insights for healthcare administrators and policymakers
- Foster understanding of the role of digital transformation in improving healthcare service quality.

### **Significance of the Study**

This research holds particular significance as it:



- Addresses a critical gap in understanding digital transformation's impact on healthcare service quality in the context of developing regions
- Provides practical insights for healthcare institutions seeking to modernize their services
- Contributes to the broader discussion of healthcare digitalization in emerging markets
- Offers evidence-based recommendations for policy development and implementation strategies

The findings of this study will be valuable for healthcare administrators, medical professionals, policymakers, and researchers interested in the intersection of digital transformation and healthcare service quality improvement.

## **I. Fundamentals of Digital Transformation**

Digital transformation is not merely an option, but a necessity and an inevitable trend that will continue to shape our world and future. Therefore, organizations that take the initiative to adopt this transformation, invest in digital technologies, and develop their employees are the ones that will reap the benefits of this transformation and secure their place in the future world.

### **1- Definition of Digital Transformation**

The term digital transformation is a modern concept as it gradually replaces the concept of digitization. The latter dates back to the emergence of the Internet, which is also the primary technology of the twenty-first century. Its nature, structure, and use have evolved over time. The concept of digitization has long been associated with the term digitalization, which refers to the latest technological revolutions. Thus, the term digital transformation is fully linked to the size of the organization, taking into account both technological innovations and strategic and human dimensions. (Yahiaoui&Grabassi, 2019)

Digital transformation is defined as: "that transformation which requires a business model and technical and digital capabilities that are combined to innovate digital products and creative services compared to traditional methods of service delivery, as well as improving operational efficiencies, reducing costs, and acquiring a larger segment of customers and audience to outperform competitors." (Hamdi, 2023)

Another definition considers digital transformation: "a comprehensive and integrated process that requires the collaboration of all parties and institutions within the state, whether governmental or non-governmental, working within a clear and specific strategy that defines the sectors, institutions, priorities, and standards necessary to complete the digital transformation process, with a legislative and legal framework that ensures optimal implementation of this strategy." (Guerin, 2023)

Through the previous definitions, it can be said that digital transformation is the process of integrating digital technology in all aspects of practical and administrative life, leading to fundamental changes in how work is done and information is interacted with. Digital transformation includes the use of modern technologies such as artificial intelligence to improve efficiency and productivity,



develop services, and enhance user experience. Digital transformation is not limited to updating technical systems only, but also includes redesigning business and administrative processes, changing organizational culture, and achieving continuous innovation. Digital transformation aims to improve performance, increase competitiveness, and facilitate access to information.

## **2- Reasons for Digital Transformation**

To achieve a better level in providing and receiving services and to satisfy customers, especially in light of the tremendous development that the world is witnessing in the technological field, it has become necessary to transition to using digital technologies instead of traditional processes. Among the most important reasons for digital transformation are the following: (Rahmani, 2021)

**2.1- Development of Computer and Its Applications:** The successful experience of computer applications has drawn attention to the great potential for utilizing them in management. It only requires uploading certain decisions, laws, files, and transactions to the information network, then providing the system with a specific program that facilitates the electronic circulation of this data and its use by individuals and institutions. This technical progress in the field of computing has positively contributed to modernizing administrative theories and concepts, helping to move them away from the rigid traditional pattern and pushing them towards greater adoption of this modern technology.

**2.2- Development of Communications:** Electronic communications have witnessed significant development that has contributed to facilitating business management at lower costs and with less effort, compared to the past necessity of spending a lot of money and time to send or execute information. This progress has positively impacted the performance of administrations, enhancing their ability to monitor, which helped improve service levels and quickly identify areas suffering from service deficiencies. It has also given management more possibility for direct communication with clients, which enhances trust between citizens and administration.

**2.3- Increasing Citizens' Expectations and Pressure on Administration for Better and Faster Services:** With citizens' growing awareness of their right to access information and understand the mechanisms of political and administrative decision-making, it has become necessary for administration to seek greater speed in work. This requires taking advantage of technical and digital applications to remove causes of slow administrative processes and eliminate routine and bureaucracy, contributing to finding innovative solutions that save time and facilitate decision-making and transaction completion with higher efficiency.

## **3- Digital Transformation Technologies**

Digital transformation encompasses various constituent technologies that can be used within organizations to ensure effective progress and increase productive efficiency, including:

**3.1- Block chain:** Blockchain technology can be defined as an encrypted information system based on a decentralized database distributed across all network-organized devices, to record all transaction data and modifications in a



way that ensures all relevant parties agree on the data's validity. The power of block chain technology lies in two fundamental criteria: decentralization and high transparency in managing transactions of all types, such as payments and bank transfers, real estate and national identity registration, asset and document exchange, voting processes, and more. (Balnour&Dawaba, 2022)

**3.2- Big Data:** This refers to a massive amount of complex data that achieves high levels of distribution, huge data sources, ultra-high speed, and great variety, exceeding the capacity of traditional software and computers to store, process, and distribute. It is often available in real-time and takes various forms if understood more deeply and better used in decision-making processes. (Al-Ghubairi& Hassan Hassan, 2019)

**3.3- Internet of Things (IoT):** This is a system of interconnected devices connected to the network or with each other, where data exchange occurs without necessarily requiring human-to-human interaction, sometimes referred to as smart devices. IoT devices use software and hardware for data processing, sensors, actuators, and network interconnections. (Khadra&Khaira, 2022)

**3.4- Artificial Intelligence:** This is a computer program capable of making balanced decisions based on the current context, and it is an advanced technology that contributes to managing operations and tasks with more sophisticated and intelligent mechanisms than the humans who created it and gave it knowledge and sensory components, helping it achieve automatic learning and self-development. AI aims to make computers advanced enough to simulate human cognitive functions. (Nazim Hassan & May Ablahad, 2023)

**3.5- 3D Printing:** This consists of industrial processes using different materials for layer-by-layer manufacturing, also known as additive manufacturing. It is a process that supports design and innovation, relying on digital files and additive manufacturing technologies to develop products, visualize data, and rapidly print models, where this technology is used to keep pace with developments. (Resham, Boufidjeline, &Bouanaka, 2022)

**3.6- Cybersecurity:** This is the protection of networks, information technology systems, operational technologies, and their components including devices, hardware, and software, and the services they provide and data they contain, from any unauthorized breach, disruption, modification, entry, use, or exploitation. The concept of cybersecurity includes information security, electronic security, and digital security. The importance of this type of security lies in protecting countries' vital interests, national security, citizens, and critical infrastructure. (Al-Otaibi, 2023)

To achieve complete digital transformation, organizations must use the aforementioned technologies to transition from the traditional to the digital phase, where they contribute to achieving customer satisfaction and ensuring increased operational efficiency by encouraging employees to rely on these digital technologies, which will bring abundant profits to the organization.



#### 4- Benefits of Digital Transformation

Digital transformation has numerous benefits, most importantly: (Bouatli, 2023)

- Changing work models and advancing thinking methods;
- Achieving radical improvement in services provided to individuals in health, education, safety, and security, while enhancing their experiences and productivity;
- Improving efficiency, reducing spending, and streamlining procedures, while implementing new services quickly and flexibly;
- Reshaping how people live, work, think, interact, and communicate, relying on available technologies;
- Providing a strategy to create higher competitive value, advanced work teams, and sustainable culture of creativity;
- Enabling faster innovation to achieve desired results and progress toward success;
- Utilizing modern technologies to be more aware and flexible in work, with the ability to predict and plan for the future.

Digital transformation also has many other benefits, which include: (Al-Mufdi, 2020)

- Replacing traditional processes with digital ones;
- Increasing time for development thinking;
- Changing work models and mindsets;
- Increasing workflow efficiency and reducing errors;
- Accelerating daily work methods;
- Implementing new services quickly and flexibly;
- Improving quality and developing performance;
- Increasing productivity and improving products;
- Increasing beneficiary satisfaction;
- Improving return on investment.

## II. The Conceptual Framework for Healthcare Service Quality

Healthcare service quality is considered one of the most important indicators of societal progress and prosperity. It is not merely providing treatment to patients but rather a comprehensive process aimed at investing in individual and community health and happiness, as well as achieving welfare. This section will address the concept of healthcare service quality, its objectives, some factors and indicators, as well as the dimensions of healthcare service quality.

### 1- The Concept of Healthcare Service Quality

From a patient's perspective, healthcare service quality is defined as what the healthcare institution provides in terms of compassionate and respectful treatment. While physicians view it as the various advanced knowledge, sciences, and medical skills they practice, the institution owners consider it as obtaining the best staff and facilities to provide service to customers optimally. The institution's management sees it from the perspective of achieving efficiency in service delivery. (Al-Alwani, 2018)



Healthcare service quality is also defined as: the degree of compliance with generally recognized contemporary standards for good practice of expected outcomes for a service, procedure, diagnosis, or treatment of a specific medical problem. (Hammadou& Ben Aichaoui, 2018)

Healthcare service quality has also been defined as: the level of perception achieved from performance results about health service compared to what it was in a previous stage. Healthcare service quality represents a set of designed policies and procedures aimed at providing health services to beneficiaries in a systematic and objective manner, which contributes to providing opportunities to improve patient care and attempt to solve their problems through scientific methods in the right place at the right time at the lowest possible cost. (Khan &Jagbelu, 2020)

Through the previous definitions, we can say that healthcare service quality means providing appropriate healthcare to the appropriate patient at the appropriate time and in the appropriate manner, taking into account the patient's needs and expectations, and using the best available resources to achieve the best possible health outcomes.

## **2- The Importance of Healthcare Service Quality**

The importance of healthcare service quality can be mentioned in the following points: (Al-Haj &Hawas, 2021)

- Fulfilling patient desires and satisfying their needs;
- Acquiring and enhancing competitive capability;
- Achieving long-term strategic objectives;
- Leading to increased consumer satisfaction and market share, which in turn leads to increased returns;
- Improving competitive ability locally and internationally;
- Applying quality principles throughout all production or service stages will lead to minimizing costs to the lowest level.

## **3- Factors Affecting Healthcare Service Quality**

Providing high-quality healthcare service is very difficult, especially since consumers are patients and in most cases have varying perceptions. Patients who have previously dealt with the healthcare institution and noticed certain differences in the level of healthcare service provided can negatively affect the healthcare institution. Therefore, the management of the latter must try to analyze patients' expectations by understanding their expectations, which is the only way that enables them to achieve high quality in the provided healthcare service. Also among the factors affecting healthcare service quality is employee performance; where the healthcare institution management sets specific standards for healthcare service quality and then ensures their adequate training to understand how to perform their work, their proper interaction with patients, as well as working with team spirit, politeness in responding to patient inquiries, and to obtain this type of services, field training and formation must be of high level to ensure the result. (Sifi, 2020).



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#### 5- Indicators for Evaluating Healthcare Service Quality

There are several indicators used to evaluate the quality of healthcare services in healthcare institutions, including: (Kwadik, 2022)

- The extent of existing short-term and long-term plans for the institution and the degree of implementation and commitment to these plans;
- The presence of clear and consistent policies that are implemented in the healthcare institution with continuous evaluation;
- The existence of various statistical rates, such as staff turnover rates, patient satisfaction levels, and provision of suitable working conditions;
- The ease of access to various types of healthcare services;
- The presence of human resources according to needs, as well as the quality of services provided compared to human resource rates both quantitatively and qualitatively;
- The level of patient satisfaction with healthcare services provided to them;
- The extent of utilizing available resources to provide healthcare services;
- Other rates such as bed occupancy rates.



### III. Comparative Study of Healthcare Institutions in Khenchela

We will conduct a field study on three health institutions in the wilaya of Khenchela.

#### 1- Introduction to Al-Balsam Al-Shafi Institution

It is a private facility with an administrative nature, having legal personality, financial independence, and limited liability. It comprehensively and sequentially handles the healthcare needs of Khenchela province residents and neighboring provinces. This institution is a medical diagnostic center "Al-Balsam Al-Shafi," a medium-sized facility located in Tariq Ibn Ziyad subdivision, near the bus station in Khenchela province. It includes three departments and attempts to use relatively modern technology - being open to modern technology - to facilitate routine procedures and enable some remote operations. All this is within the strategic vision of the center's director to achieve continuous developments under administrative and organizational flexibility that allows achieving goals and aspirations, adaptation, survival, and growth, unlike the usual Algerian institutions dominated by traditional management forms.

##### 1.1- Services of Al-Balsam Al-Shafi Institution

The medical diagnostic center "Al-Balsam Al-Shafi," like other institutions, has various coordinated services to achieve its outlined objectives of providing appropriate healthcare services to various seekers. The center contains three special units representing its services:

**a. Radiology and Medical Imaging Unit:** This department contains several medical devices led by a specialist in radiology and medical imaging, with a specialized paramedical team.

**b. Medical Laboratory Unit:** Led by a physician specialized in biology, with a specialized technical team.

**c. Medical Examination Diagnostic Unit:** This unit contains many medical examinations for: Endocrine diseases and diabetes (cell of specialized doctors), heart diseases (two doctors), women's diseases (one doctor), resuscitation and anesthesia (one doctor), neurological diseases (one doctor), pediatric diseases (one doctor).

#### 2- "Al-Tawfiq" Medical Laboratory

The laboratory was established on February 12, 2018, as a medical analysis laboratory, led by Dr. Ben Houria Tawfiq (Technical Director). Located in the Hospital District - Khenchela, with an area of 224m<sup>2</sup>, its missions include establishing specialized medical analyses. It is a private healthcare institution with administrative character, having legal personality, financial independence, and limited liability. It comprehensively and sequentially handles the healthcare needs of Khenchela province residents and its municipalities. The laboratory is considered a small institution, including only one department responsible for medical analyses, from blood sample collection to results extraction. It works on using modern technology, all within the laboratory director's strategy.



## 2.1- Objectives of "Al-Tawfiq" Medical Laboratory

The laboratory seeks to provide various medical analyses unavailable in the area and requested by doctors, to facilitate patients by reducing their need to travel to neighboring provinces, and also to reduce sending blood samples to foreign countries, thus saving time and reducing costs for patients, especially when compared to the price they would pay if their sample was sent to another area, while getting the same result with less effort, shorter time, and lower cost.

## 3- "Al-Widad" Medical Surgical Institution Khenchela

"Al-Widad" clinic was established in 2012 as a medical surgical clinic, led by Dr. LAGHMASI Farid as its technical director. This clinic is located on Al-Azar Road, Khenchela, as a financially and morally independent institution. It contains several departments including medical imaging, medical analysis, medical examinations, and a surgical operations department.

### 3.1- Services of "Al-Widad" Clinic:

"Al-Widad" clinic consists of several departments:

**a. Medical Examination Department:** Specializing in: Obstetrics and gynecology, orthopedics, general surgery and specialized pediatrics, internal medicine and diabetes, pediatrics, anesthesia and resuscitation, gastroenterology, cardiology and vascular diseases, ENT, urology, and medical emergencies;

**b. Medical Imaging Department:** Located on the first floor of the clinic, this department contains several modern medical devices led by specialists in radiology and medical imaging, with a specialized paramedical team;

**c. Surgical Operations Department:** This department is headed by a medical team specialized in performing specialized and general surgical operations;

**d. Medical Laboratory Department:** Contains a physician specialized in medical analyses, where samples are collected in the morning and results are extracted in the evening, maintaining permanent credibility of medical analyses.

## 4. Current Status of Khenchela Institutions

Healthcare is a cornerstone of societal progress. In this context, the need for digital transformation is essential to improve service quality, reduce costs, and enhance patient satisfaction. This study presents a comparison between three healthcare institutions in Khenchela and reference institutions in Algiers or advanced countries.

### 4-1. Al-Balsam Al-Shafi Institution

- **Size:** Medium
- **Achievements:**
  - Adoption of modern technology for routine medical procedures, enhancing efficiency and patient care;
  - Capabilities for remote operations, allowing specialists to perform procedures from different locations;
  - Establishment of three specialized units equipped with digital diagnostic equipment, improving diagnostic accuracy and speed.



4-2. Al-Tawfiq Medical Laboratory

- **Size:** Small
- **Achievements:**
  - Utilization of modern technology for medical analyses, ensuring high-quality testing and results.
  - A strong focus on reducing regional healthcare gaps by providing accessible laboratory services to the community;
  - Implementation of digital sample processing systems, streamlining operations and minimizing turnaround times for test results.

4-3. Al-Widad Medical Surgical Institution

- **Size:** Large
- **Achievements:**
  - Presence of multiple specialized departments, offering a wide range of medical services to meet various patient needs;
  - Equipped with modern medical imaging equipment, facilitating advanced diagnostic capabilities;
  - Provides integrated laboratory services, ensuring comprehensive care from diagnosis to treatment.

Table1: Comparative Study

| Criteria            | Khenchela Institutions             | Reference Institutions (Hospitals in Algiers or Advanced Countries) |
|---------------------|------------------------------------|---------------------------------------------------------------------|
| Digital Diagnostics | Limited (Basic Equipment)          | Advanced (Use of AI and Image Analysis)                             |
| Data Management     | Mixed Paper and Electronic Records | Integrated Electronic Records with Data Analysis                    |
| Telemedicine        | Experimental in Specific Areas     | Widely Adopted (Example: France or Canada)                          |
| Staff Training      | Limited Training Programs          | Ongoing Training Programs on Modern Technologies                    |

Source: by author

5. Main Challenges in Khenchela

- **Infrastructure:**
  - Weak communication networks and intermittent electricity supply.
- **Organizational Culture:**
  - Resistance to change from some staff, hindering the adoption of new technologies.
- **Funding:**
  - High dependency on limited government support, affecting investment opportunities in modern technology.



### III. Digitalization as a Vital Tool in Addressing Complex Health Challenges

Digitalization has become a crucial tool in addressing complex health challenges such as population growth and inequality in access to healthcare services. According to the World Health Organization (WHO, 2021), digital solutions contribute significantly to improving the quality of care while reducing costs. In Algeria, the healthcare system faces structural challenges, including overcrowding and inadequate coverage in remote areas, making it a fertile ground for implementing effective digitalization strategies.

#### 1. Global Best Practices in Health Service Digitalization

- **The Estonian Model:** Estonia is considered a leader in electronic health records (EHR), connecting all health institutions through a unified platform. This system has led to a 30% reduction in medical errors (World Bank, 2020). The extensive use of EHR has facilitated better patient management, streamlined operations, and enhanced data accuracy across healthcare facilities.
- **India and Technological Platforms:** India launched the National Digital Health Mission (NDHM) in 2021, relying on digital identities to connect patients with service providers (Mishra et al., 2022). This initiative aims to create a comprehensive digital health ecosystem, enabling real-time data sharing and promoting transparency in patient care.
- **Telemedicine in Africa:** In Rwanda, telemedicine platforms have improved access to services in rural areas through the use of drones to deliver medicines (Gates Foundation, 2019). This innovative approach addresses not only geographical barriers but also enhances prompt medical intervention, particularly for time-sensitive health issues.

#### 2. The State of Health Digitalization in Algeria

Algeria has begun taking preliminary steps toward digitalization through projects like the Health Information System (SNIS), aimed at electronically connecting hospitals. However, a study conducted by Algeria's Ministry of Health (2023) indicates that progress remains limited due to a lack of technological infrastructure and weak funding. Additionally, the system suffers from a lack of coordination between sectors and an absence of a clear legal framework governing digital health initiatives.

While Algeria has the potential to significantly benefit from health digitalization, several inherent challenges must be addressed. Strengthening infrastructure, enhancing funding mechanisms, and establishing clear regulatory frameworks will be crucial steps in ensuring that digital health solutions achieve their intended outcomes and contribute to a more equitable healthcare system.

#### 3. Potential Impacts on the Algerian Healthcare System

- **Improving Efficiency:** The adoption of electronic health records can significantly reduce the time wasted on administrative procedures. Implementing digitized systems streamlines processes, allowing healthcare professionals to allocate more time to patient care rather than paperwork.



- **Access to Remote Areas:** The use of telemedicine can alleviate the issue of service concentration in major cities by providing healthcare access to rural communities. This technology enables consultations and follow-ups through virtual platforms, thus bridging the gap for individuals in underserved regions.
- **Challenges of Privacy and Security:** According to Mehra and Singh (2021), the implementation of digitalization necessitates the enhancement of data protection laws. As digital records increase, the risks of data breaches also grow, requiring a robust legal framework to safeguard patient information.

#### 4. Key Challenges

- **Digital Divide:** A significant barrier to successful digital health initiatives is the lack of high-speed internet access in rural areas. Without reliable connectivity, many potential users may be excluded from benefiting from telehealth services.
- **Resistance to Change:** Continuous training is needed for healthcare professionals to effectively use digital tools (WHO, 2022). Some individuals may resist adopting new technologies due to comfort with traditional methods, making training essential for successful integration.
- **Limited Funding:** Developing the necessary infrastructure for digital health solutions requires substantial investments. The current financial constraints within the Algerian healthcare system may hinder the progress of digitalization efforts.

#### 5. Recommendations

- **Strengthening Public-Private Partnerships:** Collaborating with private sector stakeholders can bolster funding for digital projects. These partnerships can facilitate investment in both technology and infrastructure.
- **Developing Training Programs:** Establishing continuous education and training programs for healthcare professionals in collaboration with international universities can enhance the workforce's competence in digital health tools. This approach ensures that staff are well-equipped to navigate the evolving landscape of healthcare technology.
- **Enacting Clear Legislation for Data Protection:** It is crucial to issue clear regulations to protect patient data. Establishing a legal framework will enhance patient trust in digital health systems, encouraging their wider adoption.

**Table 2: Matrix of global healthcare digital transformation statistics**

| Category                       | Key Statistic                                                                          | Source               | Implication for Algeria/Khenchela                                                                   |
|--------------------------------|----------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------|
| <b>Digital Health Adoption</b> | 84% of countries have a national digital health strategy (only 47% fully implemented). | WHO (2023)           | Algeria should prioritize implementing its digital health strategy to align with global benchmarks. |
| <b>Telemedicine</b>            | 76% of hospitals in high-income countries use telemedicine vs. 35% in LMICs.           | World Bank (2023)    | Invest in telemedicine infrastructure to bridge Algeria's rural-urban care gap.                     |
| <b>Telemedicine</b>            | Telemedicine reduced hospital readmission rates by 38% in the U.S. and Europe.         | JAMA Network (2022)  | Adopting telemedicine could reduce costs and improve outcomes in Algerian hospitals.                |
| <b>EHRs</b>                    | 89% of U.S. hospitals use EHRs, reducing medication errors by 30%.                     | ONC (2022)           | Accelerate Algeria's SNIS system to replicate error-reduction benefits seen globally.               |
| <b>Cybersecurity</b>           | 93% of healthcare organizations globally experienced a data breach in 2022.            | HIPAA Journal (2023) | Urgent need for cybersecurity laws and protocols in Algerian healthcare institutions.               |
| <b>AI in Healthcare</b>        | AI could save the global healthcare sector \$150 billion annually by 2026.             | Accenture (2022)     | Pilot AI tools for diagnostics and resource optimization in Algerian hospitals.                     |
| <b>mHealth</b>                 | 5.4 billion people own mobile phones; 60% use health apps for chronic conditions.      | GSMA (2023)          | Leverage mobile penetration (Algeria: ~80% mobile ownership) to deploy mHealth solutions.           |
| <b>Workforce Training</b>      | Only 25% of healthcare workers in low-resource settings are trained in digital tools.  | WHO (2023)           | Prioritize digital literacy programs for Algerian healthcare professionals.                         |
| <b>Cost Efficiency</b>         | Digital health tools could save LMICs \$1.2 trillion by 2030 through preventive care.  | McKinsey (2021)      | Invest in preventive digital care to reduce long-term costs in Algeria's overburdened system.       |
| <b>Equity Gaps</b>             | 45% of patients in developing nations lack access to basic digital health services.    | ITU (2023)           | Address Algeria's rural digital divide (e.g., 35% internet coverage) to ensure equitable access.    |

Source: by author



## Conclusion

Digital transformations represent an exceptional opportunity for healthcare institutions in Khenchela to improve service quality, reduce costs, and increase patient satisfaction. However, the structural and financial challenges faced by these institutions, such as weak technological infrastructure and lack of funding, require strategic intervention from both government and private sectors. Successful global models, like Estonia's electronic healthcare system and India's digital health initiative, confirm that digitalization success depends on integrating several factors, including clear policies, infrastructure investment, staff training, and enhancing digital trust through data protection.

In the context of Khenchela, priorities can be identified by adopting a realistic roadmap that begins with updating digital infrastructure, such as providing high-speed internet in remote areas and developing unified electronic platforms for medical record management. Partnerships with the private sector must also be strengthened to attract investments and localize modern technologies. Simultaneously, this requires building human capacities through intensive training programs for healthcare workers, in collaboration with international institutions experienced in digital transformation.

Finally, the importance of the legislative framework cannot be overlooked. These efforts must be accompanied by strict policies to ensure health information security and patient privacy, taking into account global recommendations in this field. Through this approach, Khenchela can transform challenges into strengths and contribute to building a flexible healthcare system capable of meeting future requirements, reflecting a genuine commitment to achieving health equity and improving community quality of life.

## Recommendations for Enhancing Digital Transformation

### ***Strengthening Infrastructure:***

- Providing High-Speed Internet Access for Hospitals: This would enhance the capability to utilize health information systems effectively.
- Equipping Institutions with Smart Medical Devices: These devices would improve the quality of diagnosis and treatment.

### ***Building Human Capacities:***

- Training Staff on Digital Systems Usage: Through workshops and specialized courses.
- Enhancing Patient Digital Awareness through Awareness Campaigns: To educate them about telemedicine services and their benefits.

### ***Strategic Partnerships:***

- Collaboration with Global Technology Companies (e.g., Microsoft Health or Philips): To leverage their experiences and expertise.
- Learning from Countries that Successfully Transformed (e.g., Estonia in Electronic Health Records): To explore the feasibility of applying successful models locally.



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