

The Reality of Digital Transformation in Health Institutions, the Public Hospital Institution in Adrar as a Model

واقع التحول الرقمي في المؤسسات الصحية - المؤسسة العمومية الاستشفائية بأدرار نموذجا

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Abstract:

This study delves into the realities of digital transformation within health institutions, it clarifies the concept of it with particular focus on healthcare .it investigates the digital technologies that are driving this process, including applications developed by the Ministry of Health.

Adopting a descriptive and analytical methodology, enriched by personal interviews, the research scrutinizes the practical implementation of digital transformation in public hospitals, serving as a representative model for broader health institutions.

This study underscores the imperative role of digital transformation in healthcare, enhancing service quality, refining diagnostic processes, and enabling the efficient management of data through electronic medical records and national databases.

Keywords: digital transformation, digital health, digitization, electronic medical file.

JEL Classification Codes: O31 , P46 , Q55

ملخص:

تناولت هذه الدراسة واقع التحول الرقمي في المؤسسات الصحية، حيث أصبح التحول الرقمي ضرورة ملحة في جميع المجالات والتخصصات، وتم توضيح مفهوم التحول الرقمي بصفة عامة وفي المؤسسات الصحية بصفة خاصة ومعرفة التقنيات الرقمية المساعدة في عملية التحول الرقمي والتطرق إلى أهم التطبيقات التي أطلقتها وزارة الصحة.

واعتمدنا المنهج الوصفي والتحليلي، الأكثر ملاءمة لوصف وتحليل المشكلة المطروحة، وكذلك الاعتماد على المقابلة الشخصية حتى تتمكن من الاطلاع على الواقع الفعلي للدراسة ومجريات سير العملية داخل المؤسسة العمومية الاستشفائية كنموذج للمؤسسات الصحية.

وخلصت الدراسة إلى أهمية التطبيقات الرقمية في تحسين خدمات الرعاية الصحية لا سيما فيما يتعلق بتحسين جودة رعاية المرضى. من ناحية، وتقديم حلول مبتكرة لتعزيز وتحسين تقنيات التشخيص، كما أن الملف الطبي الإلكتروني يساعد على المتابعة الصحية وبصفر ورقة والحصول على قاعدة بيانات وطنية تحتوي على جمع المعلومات والاستفادة منها في العديد من الأمور.

كلمات مفتاحية: تحول رقمي، صحة رقمية، رقمنة، ملف طبي إلكتروني.

تصنيفات JEL : O31 ، P46 ، Q55 .

INTRODUCTION:

The repercussions of the Corona pandemic since late 2019 have casted a shadow over the entire world in various fields. Based on the emergency changes, the world has been forced to resort to scientific research and rely on information and communication technology, as the use of technological means has given a great opportunity for digital transformation, which has been of great interest to most countries and Algeria in particular. It has prepared comprehensive strategies for this transformation in various fields and sectors, and the Digital Infrastructure Authority and the widespread use of digital technologies.

Digital transformation is a process aimed at enhancing an entity by making significant changes to its core characteristics through the integration of advanced information, computing, and communication technologies. This transformation influences various dimensions, such as the acquisition of digital resources, the development of digital growth strategies, the restructuring of organizational frameworks, and the establishment of appropriate metrics and objectives. One of the most critical areas where digital transformation is making a profound impact is in the service sector, particularly in healthcare, given its vital importance to the population. A key example of this impact is the advent of digital health, which involves the use of information and communication technologies to enhance human health, improve healthcare services, and promote the overall well-being of individuals. Additionally, digital public health represents the incorporation of digital technologies into public health systems, with the goal of advancing public health outcomes and increasing the efficiency of services. (Iyamu et al., 2021).

Organizations operating within the service sector must prioritize all factors that contribute to the delivery of high-quality services. Leveraging digital transformation and its diverse applications is essential for enhancing service quality, securing a competitive and profitable edge. The benefits of digital transformation, including increased accuracy, speed, and cost-efficiency, make it a crucial strategy for organizations aiming to excel in today's fast-paced and competitive environment.

The Research Problem

Building on the preceding discussion, the central issue that this research seeks to address is encapsulated in the following primary question:

- What is the current state of digital transformation in health institutions in Algeria?

This overarching question gives rise to several related sub-questions:

- What is the definition of digital transformation, and what are its key indicators?
- How is digital transformation being implemented in health institutions, and what does the concept of digital health entail?
- What are the most critical digital technologies utilized in the healthcare sector?

Objectives of the Research

Based on the preceding discussion, the objectives of this research paper are as follows:

- To explore and define the concept of digital transformation.
- To highlight the strategies and methods for achieving digital transformation within health institutions.
- To identify the challenges and barriers that health institutions face in the process of digital transformation.

- To develop a future plan aimed at overcoming the obstacles impeding the digital transformation of health institutions.

The importance of the study:

The significance of this research is grounded in several key considerations:

- The global shift toward the adoption of modern technological tools and applications across various sectors.
- This study aligns with both global and national efforts to implement digital transformation within governmental bodies and institutions, with a particular focus on health institutions.
- Health institutions represent one of the most critical sectors in need of digital transformation, especially in light of the rising incidence of diseases and the increasing number of patients, particularly in government hospitals.
- Leveraging the benefits of digital transformation while addressing the obstacles and challenges faced by health institutions is essential, as these actions are necessitated by the rapid pace of technological advancement.

Literature Review

Digital transformation in healthcare has emerged as a pivotal force, reshaping the landscape of medical services and health information systems. The importance of electronic health records as a cornerstone of this transformation is underscored in a study by Salah Kamal (2022). The research delves into the critical role of digitization in enhancing the quality of healthcare delivery. It emphasizes the necessity of creating an electronic health records for each citizen, linked to their national identification number, and advocates for the development of a comprehensive national digital platform for health information systems. Such a platform would serve as the primary portal for health-related information and services, positioning it as a fundamental component in the future of healthcare.

The global response to the COVID-19 pandemic has further highlighted the significance of digital health applications. A study by Bouzana and Hamdoush (2022) examines the shift towards emerging digital health applications as a mechanism to combat the spread of the virus. By adopting a descriptive and comparative analytical approach, the study reveals the efforts of the World Health Organization in promoting digital health tools to mitigate the outbreak of COVID-19. The findings suggest that the utilization of digital health applications, particularly in countries like China and South Korea, has played a crucial role in enhancing the efficiency of healthcare services during the pandemic. However, the study also identifies significant digital and ethical challenges that need to be addressed to optimize these tools' effectiveness.

Building on the discourse of digital transformation, the study by Stoumpos, Kitsios, and Talias (2023) offers an in-depth analysis of technology acceptance and applications in healthcare. Through a systematic bibliographic review, the study provides a comprehensive understanding of healthcare digitization, focusing on the adoption of standardized practices for further development. The research posits that telemedicine, as a component of digital health transformation, will play a crucial role in enhancing digital security and strengthening technical information systems. This approach is essential for fostering global acceptance and integration of digital health innovations.

Collectively, these studies highlight the transformative potential of digital technologies in healthcare. They underscore the necessity of strategic implementation and the consideration of ethical challenges to fully realize the benefits of digital health initiatives.

In our study, we will examine the reality of digital transformation within health institutions, addressing both the applications and challenges associated with their implementation. Special attention will be given to the application of these digital tools within health institutions in Algeria, providing a localized perspective on the broader trends identified in the literature.

Methodology of the study

This study employs a descriptive and analytical approach to effectively describe and analyze the core issue. Additionally, personal interviews are utilized to gain insights into the actual implementation of digital transformation within public hospitals, which serve as a representative model for health institutions.

The study

This study is organized into three main themes:

1. Digital Transformation:

- This theme provides an overview of digital transformation, including its definition, implementation steps, stages, outcomes, indicators, and the tools and techniques involved.

2. Digital Transformation in Health Institutions:

- This theme offers an examination of the application of digital transformation within health institutions, focusing on how these entities integrate digital technologies to improve service quality and operational effectiveness.

3. The Reality of the Algerian Experience in Health Institutions:

- This section evaluates the current state of digital transformation in Algerian health institutions, analyzing practical implementations, successes, and challenges in this specific context.

1- Digital Transformation:

The adoption of modern technology and techniques has led organizations to implement new operational methods and introduced concepts such as digital transformation. This section will explore the concept of digital transformation, detailing the steps required to develop and execute a digital transformation strategy. It will also examine the stages of digital transformation and their resultant outcomes, as well as the indicators used to measure the progress and effectiveness of these efforts. Additionally, the discussion will cover the tools and techniques utilized in the process of digital transformation.

1-1 The concept of digital transformation

Digital transformation refers to the transition from traditional methods to electronic systems for managing and preserving information. This process involves a comprehensive understanding of current practices and selecting the most appropriate digital solutions for the specific context of the transformation (Hassen, 2021). It is further described as the process of changing how individuals manage, think, and act in their work environments, aiming to enhance these environments through the use of information and communication technologies (Kecheti, 2021). Additionally, digital transformation involves shifting institutions from conventional

practices to those driven by digital technologies, which fosters innovation in products, services, and management methods. This shift requires developing a digital strategy to explore new revenue streams, evaluating digital opportunities, and addressing investment needs within the digital market, accompanied by a commitment to management change (Said & Redif, 2022). Collectively, these definitions illustrate that digital transformation is a comprehensive strategy encompassing various activities and levels of management, leveraging digitization tools such as computers, software, and the Internet to achieve efficiency and create added value, ultimately driving organizational excellence.

1-2 Steps to do a digital transformation strategy

The development of a digital transformation strategy is a complex process that involves several critical steps, each designed to ensure a seamless transition from traditional to digital systems. According to Belkaissi (2024), the first step in building an effective transformation strategy is to **develop a vision and strategy**. This involves creating a forward-looking vision for the institution's transformation and crafting a strategy that aligns with this vision while establishing measurable objectives to track progress.

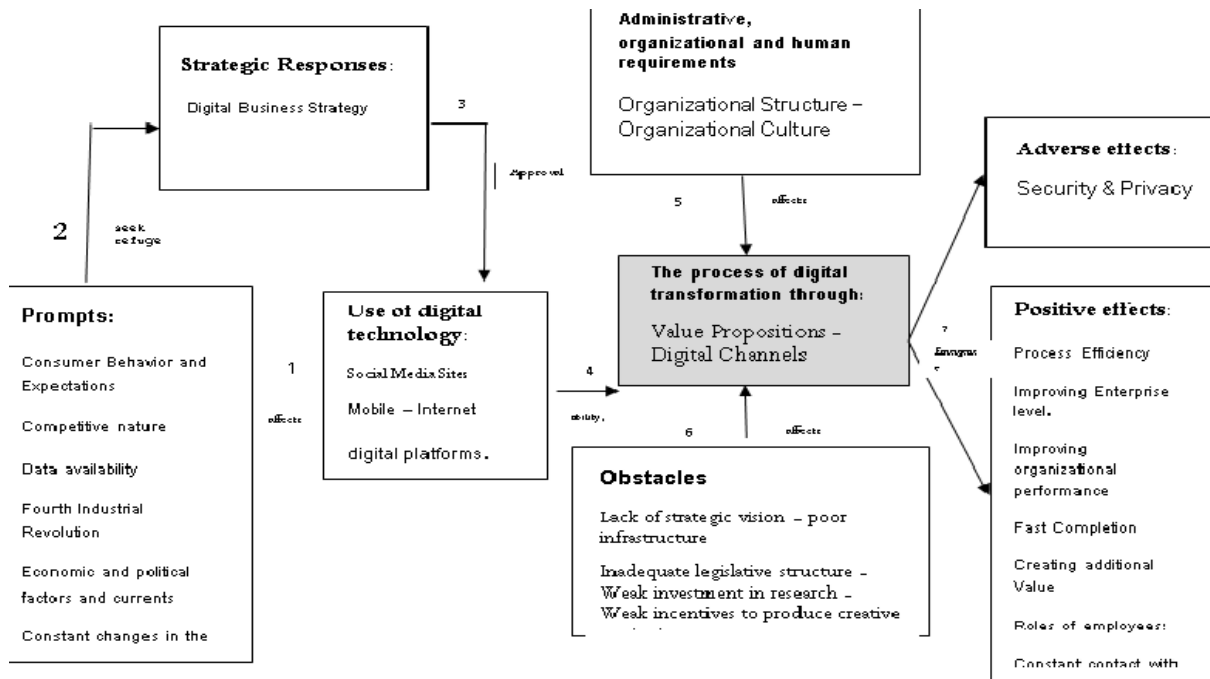
Once a vision and strategy are in place, the next step is the **assessment of the current situation**. This step requires a thorough analysis of the existing technology infrastructure and an evaluation of how technology is currently being used within the organization. This assessment is crucial in identifying gaps and opportunities for improvement, thereby laying the groundwork for the subsequent stages of the transformation process.

Environmental analysis is another vital component of a successful digital transformation strategy. As outlined by Belkaissi (2024), this involves a comprehensive examination of the institution's work environment, including a detailed assessment of the technological tools currently in use. The goal of this analysis is to understand how these tools can be integrated or upgraded to support the development of robust digital systems.

User experience design is a step that focuses on the end-users of the digital transformation. This involves designing the digital experiences that the organization intends to offer to its customers, and benchmarking these experiences against those provided by other institutions. By prioritizing user experience, organizations can ensure that their digital transformation efforts meet the needs and expectations of their customers.

Finally, the **preparation of infrastructure** is a crucial step that sets the stage for the successful implementation of the digital strategy. Amina (2022) emphasizes the importance of engaging specialists in digitization, data analysis, and experienced leadership to guide the transformation. Additionally, developing a skilled team that can adapt to future changes is essential, as is fostering a new organizational culture that aligns with the transformed processes. This step ensures that the institution is not only equipped with the necessary technology but also has the human resources and cultural readiness to embrace the changes brought about by digital transformation.

Figure (1): Stages and results of digital transformation



Source: (Rabehi, 2022)

Figure 1 outlines the stages, obstacles, requirements, and outcomes of digital transformation initiatives, emphasizing the critical role of digital technologies in value creation through digital channels and networks. In response to societal shifts and industry-level changes, organizations adopt digital transformation strategies that leverage technology to redefine traditional value creation processes, maintain competitive positions, and enhance customer service. Success in digital transformation demands not only technological adoption but also organizational and human elements, including changes in structure, culture, and mindset. Additionally, political, social, and psychological factors—such as fostering teamwork, promoting continuous learning and innovation, securing financial support, and tailoring information technology implementations to specific administrative needs—are essential. The figure also underscores the importance of research and development in overcoming obstacles and driving effective transformation.

1-3 Indicators of digital transformation

To assess a country's status in the digital economy, the United Nations Technical Committee has developed a set of indicators designed to measure the digital divide across various sectors. These indicators assist countries in formulating effective strategies for the information and communication technology (ICT) sector. Chaouchi and Khelouf (2023) highlight some of these key indicators:

Table 01: Indicators of digital transformation

Indicator	Objective	main axes
Standards	-The level of ICT development. - Digital divide (differences between countries). -The development of the potential of ICT and the extent to which countries are able to take advantage of it to promote growth and development.	- Access to ICT(number of telephone service subscriptions, number of cellular service subscriptions, international Internet bandwidth) - Use of information and communication technology (percentage of individuals using the Internet) - ICT skills (adult literacy rate, secondary and tertiary enrolment rate)
Network Readiness Index	Measures the ability of countries to leverage ICT to increase competitiveness and wellbeing	- Technological structure (political and organizational structure, business and innovation structure) - Digital readiness (infrastructure, affordability) - Usage (single use, business use) - Impact (economic impact, social impact)

Source: Prepared by the researcher based on the study of (Chaouchi. & Khelouf, 2023)

1-4 Digital Transformation Tools and Techniques

Digital transformation in organizations is driven by a variety of advanced tools and techniques that facilitate the modernization of processes and enhance operational efficiency. Among these, big data analytics, blockchain, cloud computing, artificial intelligence, robotics, and social networks are particularly prominent.

Big data analytics is a foundational tool in digital transformation, enabling the management and storage of vast amounts of data. As Mehemoud (2022) notes, the key advantages of big data analytics are its capacity to handle large volumes of data (volume), its ability to process data at high speeds (velocity), its capability to manage diverse types of data (variety), and its robust security features. These attributes make big data analytics indispensable for organizations seeking to leverage data-driven insights in their decision-making processes.

Blockchain technology represents another significant tool in digital transformation. As explained by Aaouice (2023), blockchain creates a secure and transparent chain between multiple participants, allowing them to conduct transactions without the need for intermediaries like banks or electronic payment networks. This decentralized approach ensures that all data and records within the chain can only be updated or altered with the consensus of all participants, enhancing security and trust among users. The encryption of these operations further ensures that only authorized participants within the chain can access and interact with the data.

Artificial intelligence (AI) is a transformative technology that simulates human intelligence within computers, enabling machines to mimic human thought processes.

According to Mehemoud (2022), AI is particularly valuable in solving complex problems quickly and accurately, such as in the field of accounting. Its ability to process vast amounts of data and perform tasks that traditionally required human intelligence makes AI a critical component of digital transformation, driving efficiency and innovation across various sectors.

The Internet of Things (IoT) is another crucial technology in the digital transformation landscape. Schwertner (2017) describes IoT as the infrastructure of the information society, which allows objects to be sensed or controlled remotely across existing network infrastructure. This connectivity creates opportunities for more direct integration of the physical world into computer-based systems, improving efficiency, accuracy, and economic benefits while reducing the need for human intervention. The internet of things thus enables organizations to optimize operations and enhance the functionality of their digital ecosystems.

Cloud computing is a key enabler of digital transformation, providing users with access to computing resources over the Internet. As Merkec and Aoude (2023) explain, cloud computing allows for the storage, processing, and management of data and applications on remote servers, regardless of their location. The benefits of cloud computing are manifold, including cost reduction, scalability, flexibility, security, and data privacy. These advantages make cloud computing an essential tool for organizations seeking to modernize their information technology infrastructure and improve their operational agility.

2- Digital Transformation in Health Institutions

The digital transformation of health institutions is a critical area of focus, particularly in the wake of the COVID-19 pandemic. Recognizing the growing importance of digital health, the World Health Organization (WHO) in March 2020, emphasized the broad implications of digital health and the key concepts that underpin it, highlighting the urgent need for health institutions to adopt digital transformation in medical practices.

2-1 Digital Transformation in Health Institutions and Its Benefits

2-1-1 Digital Transformation in Health Institutions

Digital transformation in health institutions refers to the systematic efforts to integrate new digital information and communication technologies into healthcare processes and services. According to Ricciardi et al. (2019), this transformation encompasses a broad range of activities aimed at revolutionizing patient care, business strategy, and organizational processes within health institutions. Technologies such as telemedicine, predictive analytics, artificial intelligence, and platforms for data storage and exchange, including electronic health records, are central to this transformation. These technologies have proven their potential to significantly improve healthcare services by enhancing medical diagnosis, treatment decisions, and overall patient care (Chehata, 2022).

The digital transformation of healthcare involves the ongoing process of converting public health services and procedures into digital formats. This transition requires the creation and continuous updating of essential infrastructure, including hospital information systems, electronic medical records, mobile health applications, and public health monitoring tools. The goal of this digitization effort is to modernize and streamline healthcare delivery, making it more efficient, accessible, and data-driven (Iyamu et al., 2021).

2-1-2 The benefits of Digital Transformation for Health Institutions

The implementation of digital transformation in health institutions offers numerous significant benefits that contribute to the overall improvement of healthcare systems. As highlighted by Emmanouel et al. (2024), these benefits are multifaceted and include the following:

- **Fundamental System Transformation:** Digital transformation plays a crucial role in fundamentally reshaping healthcare systems, enhancing their flexibility and efficiency. By integrating digital technologies, healthcare institutions can adapt more readily to changing patient needs and evolving medical practices.
- **Reduction of Bureaucracy:** One of the key advantages of digital transformation is the reduction of bureaucratic processes within healthcare institutions. By decreasing paperwork and minimizing unnecessary patient movement, digital systems streamline operations and improve the overall patient experience.
- **Improvement in Quality of Life for Vulnerable Groups:** Digital transformation has a profound impact on the quality of life for vulnerable populations. It enables direct communication between patients and healthcare professionals, ensuring that those who are most in need receive timely and effective care.
- **Enhanced Access and Diagnostic Accuracy:** The adoption of digital technologies facilitates easier access to healthcare systems for all citizens. Moreover, it enhances diagnostic accuracy, which is crucial for supporting appropriate and effective treatment options.
- **Elevated Quality of Services and Cost Reduction:** Digital transformation contributes to elevating the quality of healthcare services by improving the efficiency of medical processes. This increased efficiency not only enhances patient care but also helps reduce operational costs.
- **Empowerment of Healthcare Professionals:** Finally, digital transformation equips healthcare professionals with new knowledge, skills, and competencies. By staying current with technological advancements, healthcare providers can offer better care and improve patient outcomes.

2-2 Digitization and its Effects and Objectives on the Health Field:

2-2-1 The Concept of Digitization:

Digitization in the healthcare sector involves the systematic integration of digital technologies into the production and delivery of healthcare services. This process aims to reorganize and innovate the ways in which care is provided, requiring both organizational and cultural changes. It encompasses a wide range of technological advancements, including the use of computers, electronic health records, home patient monitoring systems, electronic medical devices, and computer-assisted visualization and decision support systems. These technologies collectively support health promotion, disease prevention, primary and specialized care, long-term social care, and self-care (Ricciardi et al., 2019).

2-2-2 Effects of Digitization in Health Services

The impact of digitization on health services is far-reaching and transformative. The World Economic Forum, as cited by Ricciardi et al. (2019), identifies several key effects of healthcare digitization:

- ✓ **Patient-Centric Care:** Digitization empowers patients to take greater control over their health and the health of their families. This shift towards patient-centered care enables

individuals to be more engaged and informed about their healthcare decisions.

- ✓ **Industry Transformation:** The introduction of digital technologies is redefining business models in the pharmaceutical, biomedical, and medical sectors. This transformation fosters innovation and enhances the competitive advantage of healthcare organizations.
- ✓ **Preventive Focus:** Digitization shifts the emphasis from diagnosis and treatment to prevention and proactive health management. By focusing on prevention, healthcare systems can reduce the incidence of diseases and improve overall population health.
- ✓ **Optimization:** Digitization allows healthcare systems to deliver services that are high-quality, efficient, equitable, affordable, and accessible. By managing the digital transformation of health services effectively, healthcare providers can optimize their operations and outcomes.
- ✓ **Home-Based Care:** The ability to deliver healthcare services at home is one of the significant outcomes of digitization. This shift reduces the need for hospital visits and allows patients to receive care in a more comfortable and convenient setting.
- ✓ **Systemic Changes:** Digitization brings about fundamental changes in how healthcare is organized, funded, and delivered. It also alters the roles of healthcare professionals and patients, leading to a more collaborative and integrated approach to care.
- ✓ **Service Evolution:** The types of health services offered and the processes through which they are delivered are evolving due to digitization. This evolution is driving the development of new and innovative healthcare solutions.

2-2-3 Objectives of Digitization in the Health Sector

The objectives of digitization in the health sector are primarily focused on improving the efficiency and effectiveness of healthcare delivery. According to Kaihlanen et al. (2023), the key objectives include:

- **Enhancing Professional Work Performance:** Digitization aims to improve the efficiency and productivity of healthcare professionals by streamlining processes and reducing administrative burdens.
- **Improving Information Flow and Utilization:** The flow, availability, and utilization of health information are enhanced through digitization, enabling more informed and timely decision-making in patient care.
- **Increasing Availability and Accessibility of Services:** Digitization promotes the increased availability, accessibility, acceptability, and quality of healthcare services. This objective is central to ensuring that healthcare is equitable and that all patients have access to the care they need.

2-3 Digital Health and its Applications:

2-3-1 Definition of Digital Health:

Digital health is a broad and multidisciplinary concept that encompasses the use of information and communication technologies (ICT) to improve the prevention, diagnosis, treatment, monitoring, and management of health-related issues. The European Commission defines digital health as tools and services that utilize ICT to enhance health outcomes by improving access to and quality of healthcare services, increasing efficiency across the health

sector, and promoting disease management and prevention. Digital health aims to provide equal access to healthcare for all patients, using effective digital tools to sustain health models and enhance resilience. It is characterized by security, confidentiality, efficiency, utility, fairness, reliability, connectivity, universality, privacy, and validity (Emmanouel et al., 2024; Kamel, 2023).

2-3-2 Technologies and Applications Related to the Health Sector

The implementation of digital health encompasses various technologies and applications, each contributing to different aspects of healthcare:

- **Electronic Health Records (EHRs):** EHRs are digital, real-time records of patient-centered health information and clinical care. These records are created and maintained by healthcare providers and are designed to systematically collect and share patient information across different healthcare providers and settings. EHRs support comprehensive and accurate clinical care by including detailed patient information, such as demographics, medical history, allergies, medications, diagnoses, procedures, test results, and reports (Marchant, 2019).
- **Telemedicine:** Telemedicine involves the remote provision of healthcare services using ICT, particularly when distance is a critical factor. It includes the treatment and prevention of diseases and injuries, research and evaluation, and continuous education for healthcare providers. Telemedicine aims to advance the health of individuals and communities by making healthcare more accessible and efficient (Kraus, Schiavone, & Pluzhnikova, 2022).
- **Artificial Intelligence (AI):** AI is used throughout the medical treatment value chain to facilitate knowledge management, monitor and evaluate patient health, propose treatment recommendations, and support decision-making regarding medical treatments and prescriptions. AI reduces medical errors and improves efficiency across the treatment process, from diagnosis to administrative tasks. It enables large-scale analysis of medical data, such as CT and X-ray scans, and speeds up decision-making processes (Konopik & Blunck, 2023).
- **Mobile Health (mHealth):** Mobile health refers to the use of mobile communication devices, such as smartphones, tablets, and wearables, for health services, information, and data collection. mHealth applications support diagnostic procedures and assist clinicians in making treatment decisions. These technologies are increasingly integrated into mobile and wireless healthcare delivery systems, enhancing the accessibility and efficiency of healthcare services (Abdel Wahab & Saad, 2022).
- **Mobile Phones:** Mobile technology plays a crucial role in remote healthcare management and communication. Reliable software applications on mobile phones facilitate information exchange between patients and healthcare providers, enabling remote patient monitoring and video conferencing for timely diagnosis and treatment (Tebeje & Klein, 2021).
- **Big Data:** Big data in healthcare includes clinical and laboratory data, medical observations, and machine-generated data from medical equipment or home surveillance sensors. This data is processed using techniques such as modeling, machine learning, data mining, visualization, and statistical analysis. Big data offers significant

potential in predictive analytics, improving outcomes in various areas of healthcare research (Galetsi et al., 2020).

In summary, the digitization of healthcare involves the integration of various technologies that collectively improve the efficiency, accessibility, and quality of healthcare services. These advancements support a wide range of applications, from electronic health records to mobile health, telemedicine, AI, and big data analytics, each contributing to the ongoing transformation of the healthcare sector.

2-4 Challenges of Using Digital Health Applications

Despite the numerous advantages offered by digital health applications, their adoption and implementation face several significant challenges:

- **Data Accessibility:** Access to large volumes of data is crucial for the development of innovative diagnostic, therapeutic, and surveillance tools in digital health. Insufficient data can impede the effectiveness and progress of digital health applications (Vayena, Haeusermann, & Adjekum, 2018).
- **Cultural Resistance:** The integration of digital health technologies often encounters resistance due to a lack of competence among employees. Healthcare professionals must be adept at using these technologies to deliver high-quality, financially viable, and sustainable services. Cultural resistance can arise when there is insufficient training or willingness to adapt to new technological roles (Asthana & Prime, 2023).
- **Dehumanization of Healthcare:** The heavy reliance on high-tech equipment can lead to the dehumanization of healthcare. This dependence may diminish the personal interaction between healthcare providers and patients, potentially impacting the quality of patient care and the human touch essential to effective healthcare delivery.
- **Lack of Standards and Tools:** The absence of standardized tools and methodologies for assessing the performance of digital health solutions poses a challenge. Without proper standards, it is difficult to conduct comparative evaluations of these solutions and determine their effectiveness and relative importance (Bouzana & Hemdouch, 2022).
- **Data Protection and Privacy:** Ensuring data security and privacy is critical to fostering innovation in digital health. However, existing legal provisions often fall short in addressing ethical issues related to data processing and the full spectrum of legitimate data concerns. This gap in legal coverage can undermine trust and hinder the development and implementation of digital health applications (Vayena, Haeusermann, & Adjekum, 2018).

2-5 Measures to Improve and Accelerate Digital Transformation in the Health Sector

To overcome these challenges and ensure a smooth and successful digital transformation in healthcare, several measures should be implemented:

- **Enhance Stakeholder Involvement and Leadership:** It is essential to create cross-directorate technical groups and promote digital health advocates across all levels of the healthcare system. Engaging stakeholders in the transformation process can help drive adoption and address resistance.
- **Utilize Evidence-Based Planning:** Incorporating data and assessments into policy

development and investment decisions is crucial. Evidence-based planning ensures that digital health initiatives are aligned with actual needs and priorities, leading to more effective and targeted solutions (Werner et al., 2023).

- **Develop Knowledge and Training Programs:** Creating educational materials and developing training courses, mentorship programs, conference lectures, and webinars are vital for increasing awareness and knowledge among healthcare stakeholders. This knowledge sharing can help address competence gaps and promote the effective use of digital health technologies (Ziadlou, 2021).
- **Reinforce Governance Frameworks:** Establishing bodies to create and enforce digital health policies and standards is necessary for effective governance. Government-led initiatives within existing structures can provide the necessary oversight and support for digital health implementation.
- **Enhance Health System Design:** Advocating for infrastructure-conscious, user-centric, and versatile systems that adhere to global standards and promote interoperability is crucial. Well-designed systems can improve the integration and functionality of digital health applications.
- **Coordinate and Maintain Financial Efforts:** Developing long-term investment plans that align with national priorities and accurately identifying the true costs of digital health initiatives are important for ensuring sustainable funding. Financial coordination and planning can help secure the resources needed for successful digital transformation (Werner et al., 2023).

Addressing the challenges and implementing these measures can significantly improve and accelerate digital transformation in the health sector, leading to more effective and sustainable healthcare solutions.

3 -The Reality of the Algerian Experience in Health Institutions

3 -1 Digital Transformation in Health Institutions in Algeria

In Algeria, digital transformation in the healthcare sector represents a pivotal step towards modernizing and enhancing the efficiency of health services. The Algerian government has taken significant measures to promote digitization and improve the overall quality of healthcare through several key initiatives:

- **National Agency for Digitization in Health:** Established by Executive Decree No. 22-251 dated June 30, 2022, this agency is tasked with implementing and overseeing the national strategy for health digitization. The agency focuses on developing digital solutions for medical activities while ensuring the security and confidentiality of health data among professionals, institutions, and users (Executive Decree for Digitization in Algeria, 2022).
- **Key Initiatives in Digital Transformation:**
 - **Digital Hospital Infrastructure:** The development of digital hospitals aims to provide a comprehensive view of patient care in real-time. This includes integrating patient data from various sources such as medical analysis laboratories, imaging facilities, and pharmacies. It also emphasizes the standardization and maintenance of medical equipment to enhance service delivery.
 - **Patient Medical Records:** Each patient is assigned an identifier that links to a

comprehensive medical file. This file contains all necessary personal and medical information, facilitating effective coordination and management of patient care.

- **Telemedicine and Remote Care:** The implementation of telemedicine, tele-radiology, and tele-visual lectures enables remote medical consultations and care, particularly in areas with limited healthcare coverage. This initiative aims to bridge the gap in healthcare accessibility and improve service delivery in underserved regions.
- **Online Medical Training:** The promotion of online medical training platforms, in collaboration with relevant institutions, supports remote education for healthcare professionals. This initiative ensures continuous learning and skill development while encouraging distance education in the medical and paramedical fields.
- **Patient Referral Networks:** The establishment of local, regional, and national networks facilitates the appropriate referral of patients to suitable health facilities. This system aims to streamline patient care, especially in emergency situations, by directing them to the most appropriate institutions for their needs.
- **Health Vigilance Platform:** A dedicated platform for health vigilance has been created to provide reliable information on emerging diseases, epidemics, pandemics, and scientific and epidemiological data. This platform is intended to enhance public health responses and ensure timely and accurate information dissemination.
- **Reporting Unwanted Health Events:** A portal has been developed to enable individuals to report adverse health events or abnormal impacts. This reporting mechanism helps in monitoring and preventing potential health crises, including epidemics and pandemics.
- **Digitization of Medical Archives:** The management and preservation of medical and health archives have been digitized to improve record-keeping and accessibility. This step aims to streamline archival processes and enhance the efficiency of health information management.

These initiatives collectively contribute to the ongoing digital transformation of Algeria's healthcare sector, aiming to improve healthcare delivery, enhance data security, and foster a more efficient and accessible health system.

3 -2 The Electronic Medical File of the Patient within the Public Hospital Institution in Adrar

3-2-1 Steps to Implement and Use the Electronic Medical File

The implementation of the electronic medical file system within the public hospital institution in Adrar involves several key steps, as guided by the instructions of the Guardian Ministry. The process is overseen by a specialized committee responsible for managing and monitoring the system's implementation. The steps are as follows:

1. **Establishing a Local Network:** A local area network (LAN) is set up to connect all relevant departments within the hospital. This network includes nine key areas: medical

surgical emergencies, general surgery, block operations, maternity, childhood, newborn care, laboratory, radiology, and blood injection. The network ensures seamless communication and data sharing across these departments.

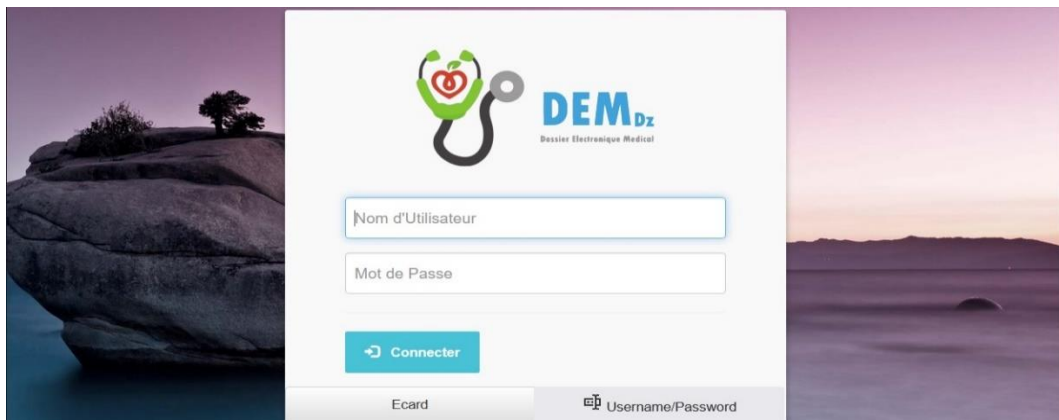
2. **System Installation and Configuration:** The electronic medical file system is installed on a central server, which is responsible for storing all medical information. The system's settings are adjusted from an administrator account, and the hospital is structured within the system by:
 - Assigning room and bed numbers for each department (capacity).
 - Listing all hospital staff according to their departments.
 - Creating individual accounts for each staff member, including doctors and nurses, and identifying departmental heads and medical coordinators.
 - Providing a digital representation of the institution to facilitate system navigation and management.
3. **Training Program Development:** A comprehensive training program is developed for hospital staff to ensure proper use of the electronic medical file system. The training includes:
 - Instruction on how to operate and utilize the system.
 - Clarification of roles and responsibilities for each staff member within the system.
 - Hands-on training to familiarize staff with the new processes and tools.
4. **Equipping Departments and System Access:** Necessary equipment is installed within each department to enable access to the electronic medical file system. Staff members are trained to use the equipment and integrate it into their daily workflows, ensuring that all departments can effectively utilize the system.

These steps collectively ensure the effective implementation of the electronic medical file system, aiming to improve the management of patient information and enhance overall healthcare delivery within the public hospital institution in Adrar.

3-2-2 The Patient's Medical file

The electronic medical file (EMF) represents a digital version of traditional paper records used by healthcare professionals, including doctors and nurses. It is designed to be connected to all healthcare providers and carries comprehensive personal and medical information necessary for diagnosing and managing patients' health conditions. The system facilitates the integration of patient data across various departments, ensuring a cohesive approach to healthcare delivery.

Figure 2: Initial EMF Interface

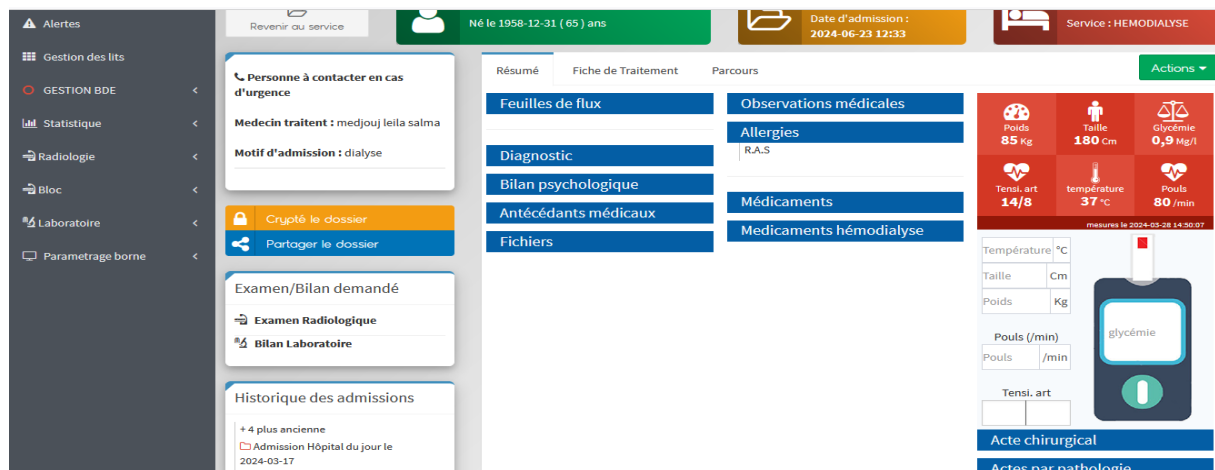


Source: application of institution of Adrar

3-2-3 How the System Works

The patient Upon arrival at the Emergency Department, a patient is first assessed at the triage office and assigned a waiting ticket based on the severity of their condition. The patient then consults with the treating doctor who may prescribe medication or refer them to internal departments for further care. The admission office receives an electronic notification to officially register the patient, thus creating an electronic file (see Figure 3) that includes all treatment details. If the patient requires laboratory tests or radiological examinations, electronic notifications are sent to the respective departments. The results are directly transmitted to the doctor's account, facilitating timely and accurate decision-making. This process is repeated across various departments as needed.

Figure 3: Sample Patient Account



Source: application of institution of Adrar

The patient's information is stored in a central database under the file named "dossier medical," which can be accessed upon subsequent visits. This centralization enables seamless patient

transfers between institutions, eliminating the need for paper records and avoiding redundant procedures. The following figure shows an example of this:

Figure 4: Sample Patient Medical File

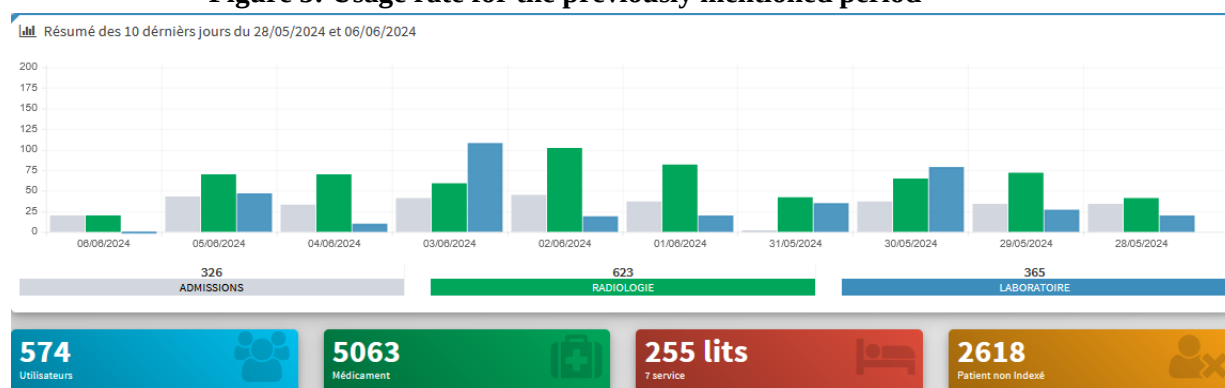
REPUBLIQUE ALGERIENNE DEMOCRATIQUE ET POPULAIRE		
MINISTERE DE LA SANTE		
EPH IBN SINA ADRAR		المؤسسة الحمومية الإستشفائية ابن سينا بآدرار
Dossier Medical		
Administré par: De: Né(e) le:	Delivré le: / Enregistré le: Prescrit par: /	
FORMULE NUMERATION SANGUINE (FNS)		
HEMATOCRITE.....	49 %	Valeurs de référence 40_52 %
HEMOGLOBINE.....	15 g/dL	14_18 g/dL
GLOBULES ROUGES.....	4.5 "	4.5_5.5 T/L "
TAUX DE PLAQUETTES.....	300 "	150 - 450 G/L "
GLOBULES BLANCS.....	6 "	4_10 G/L "
TAUX DE PROTHROMBINE		
TAUX DE PROTHROMBINE.....	78 %	Valeurs de référence >70 %
TCK		
TCK.....	35 "	Valeurs de référence 32_38SECONDS "
UREE SANGUIN		
UREE SANGUIN.....	0.20 g/l	Valeurs de référence 0.15_0.40 g/l
CRP		
CRP.....	0.6 mg/l	Valeurs de référence 0_6 mg/l
RADIOLOGIE		
VITAL		
2024-07-01 08:58:34:température 37.5°C		
2024-07-01 08:58:49:Taille 1.7Cm		
2024-07-01 08:58:57:Poids 70Kg		
2024-07-01 08:59:03:Tensi. art 12		
2024-07-01 08:59:06:Tensi. art 8		

Source: application of institution of Adrar

3-2-4 Evolution of Usage and Advantages

Here is a summary of the use of the electronic medical file for the period from 28/05/2024 to 06/06/2024, as illustrated in the figure below:

Figure 5: Usage rate for the previously mentioned period



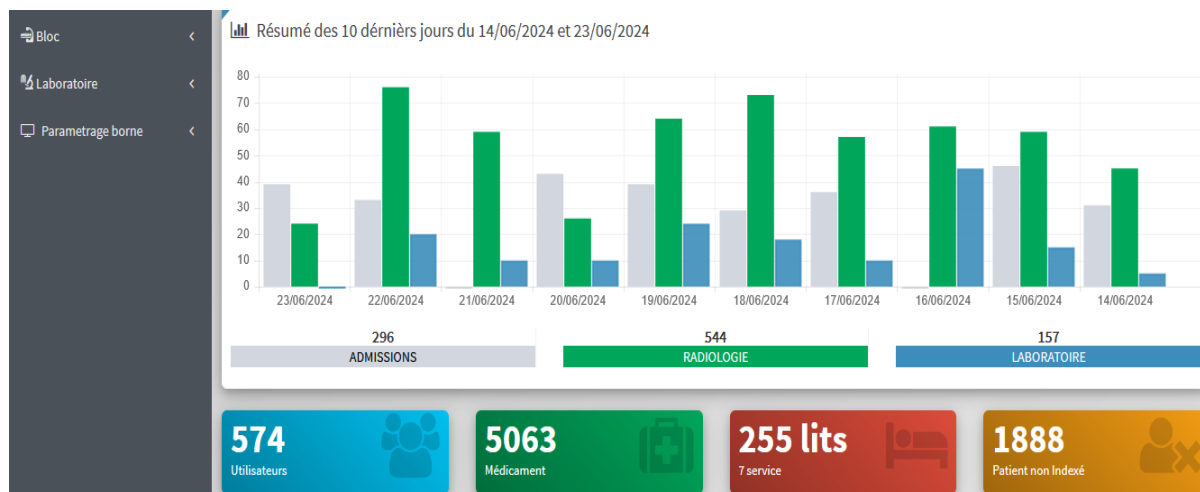
Source: application of institution of Adrar

During this period, the utilization of the electronic medical file was initially low, attributed to difficulties in system adoption and inflexibility. Notably, the radiology department showed higher usage rates compared to other departments, which experienced fluctuating usage.

The reality of digital transformation in health institutions, the public hospital institution with Adrar as a model

The following figure summarizes the use of the electronic medical file for the period from 14/06/2024 to 23/06/2024.

Figure 6: Usage rate for the previously mentioned period



Source: application of institution of Adrar

An increase in usage was observed during this period following targeted training for doctors and nurses on the essential functions of the electronic medical file. Enhanced training focused on gradual skill development and strict adherence to digital processes, even in urgent situations, contributed to this improvement.

3-2-5 Benefits Provided by the Electronic Medical File

The electronic medical file system offers several advantages, including:

- **Time Efficiency:** By reducing the time spent on processing and filling out forms, the system optimizes the use of human resources.
- **Centralized Information:** All patient information is consolidated in one place, facilitating quicker and more accurate diagnosis.
- **Improved Care Coordination:** The system integrates and organizes patient health information, allowing immediate access by all healthcare providers involved in the patient's care.
- **Reduction in Redundant Tests:** Transfers between departments do not necessitate repeated tests or procedures, as previous results are accessible within the electronic file.
- **Accuracy in Prescriptions:** Electronic prescriptions streamline the process, eliminating the need for handwritten orders.
- **Enhanced Control and Accountability:** The system facilitates better monitoring and assignment of responsibilities, providing insights into individual and departmental performance.

These enhancements contribute to a more efficient, accurate, and coordinated healthcare delivery system at the public hospital institution in Adrar.

Conclusion

The digital transformation of health institutions has become both crucial and inevitable, propelled by the rapid advancement of digital technologies and their integration into various facets of life, including healthcare. As societies place increasing importance on enhancing healthcare services, harnessing digital applications has become vital for improving the quality of patient care. Digital transformation facilitates innovative solutions that enhance accessibility to care, improve coordination among healthcare professionals, and advance diagnostic and treatment technologies. By enabling seamless data integration between patients and clinicians, these digital tools support preventive measures, early diagnosis, and optimal care delivery. The adoption of digital health applications, exemplified by the electronic medical file system in Algerian health institutions, highlights the significant benefits of this transformation. Such systems overcome temporal and spatial barriers to healthcare delivery, eliminate the need for physical documentation, and create national databases that help track health trends and manage disease outbreaks. In summary, transitioning to digital health systems not only streamlines healthcare operations but also fosters a more informed and responsive healthcare environment, ultimately enhancing outcomes for both patients and healthcare professionals.

Bibliography:

- Aaouice, Ch. A. Z. (2023). The impact of transformation techniques on the performance of the audit process in Egypt. *Scientific Journal of Financial and Commercial Studies and Research*, 04(02), 252–285.
- Amina, H. (2022). Prospects of digital transformation in Algeria. *Economic Studies*, 16(02), 110–129.
- Asthana, S., & Prime, S. (2023). The role of digital transformation in addressing health inequalities in coastal communities: barriers and enablers. *Frontiers in Health Services*, 3.
- Belkaissi, M. (2024). *digital transformation* (01 ed.). Dar Al-Nabigha for Publishing and Distribution.
- Bouzana, A., & Hemdouch, W. (2022). The shift towards using emerging digital health applications as a mechanism to face corona virus (covid-19): presenting the experiment of the two states of China and South Korea. *Journal of the Research Unit in Human Resources Development*, 17(01), 171–197.
- Chaouchi., K., & Khelouf, Z. (2023). Digital transformation in Algeria. *Journal of Accounting, Auditing and Finance*, 5(01), 17–30.
- Chehata, N. A. A. I. (2022). Digital transformation and achieving institutional excellence in mental health institutions. *Future Journal of Social Sciences*, 10(4), 43–106.
- Emmanouel, F. A., Maria-Effrosyni, F. E., Ioannis, T. A., P Ioannis, K., & A Charalampos, T. (2024). Digital Transformation in the Health Sector in Greece. *International Journal of Multidisciplinary Research and Growth Evaluation*, 5(2), 506–509.
- Executive Decree for Digitization in Algeria., Pub. L. No. 22–251, 13 (2022).
- Galetsis, P., Katsaliaki, K., & Kumar, S. (2020). Big data analytics in health sector: Theoretical framework, techniques and prospects. *International Journal of Information Management*, 50, 206–216.

- Hassen, M. abd elraheman. (2021). Digital transformation as a planning indicator for achieving administrative reform in social care institutions. *Journal of the Faculty of Social Work for Social Studies and Research, Fayoum University*, 22(22 bit 06), 643–705.
- Iyamu, I., Xu, A. X. T., Gómez-Ramírez, O., Ablona, A., Chang, H. J., Mckee, G., & Gilbert, M. (2021). Defining digital public health and the role of digitization, digitalization, and digital transformation: Scoping review. In *JMIR Public Health and Surveillance* (Vol. 7, Issue 11).
- Kaihlanen, A.-M., Laukka, E., Nadav, J., Närvänen, J., Saukkonen, P., Koivisto, J., & Heponiemi, T. (2023). The effects of digitalisation on health and social care work: a qualitative descriptive study of the perceptions of professionals and managers. *BMC Health Services Research*, 23(1), 714.
- Kamel, H. S. (2023). Electronic health records and the challenges of digital transformation in healthcare. *Scientific Journal of Libraries, Documents and Information*, 5(15), 133–162.
- Kecheti, N. A. E. (2021). Governance of Digital Transformation. *Middle East Journal of Humanities and Cultural Studies*, 01(05), 415–424.
- Konopik, J., & Blunck, D. (2023). Development of an Evidence-Based Conceptual Model of the Health Care Sector Under Digital Transformation: Integrative Review. *Journal of Medical Internet Research*, 25, 1-14.
- Mahmoud Ahmed Abdel Wahab, S., & Saad, M. (2022). Digital Transformation Acceleration in Health Sector during COVID-19: Drivers and Consequences. *Journal of Business and Management Sciences*, 10(4), 164–179.
- Marchant, G. E. (2019). Personalized Medicine and the Law. *Arizona Attorney*, 44(12).
- Mehemoud, H. R. R. (2022). Measuring the impact of implementing digital transformation on the balanced performance of institutions operating in the sector. *Scientific Journal of Accounting Studies*, 03, 433–495.
- Merkeç, A. S., & Aoude, S. S. (2023). The impact of applying digital transformation technologies on improving the information environment. *Scientific Journal of Financial and Administrative Studies and Research*, 15(1–47).
- Rabehi, F. (2022). The impact of digital leadership in the success of digital transformation projects in the organization. In *Journal of Organization and Work* (Vol. 11, Issue 3, pp. 97–116).
- Ricciardi, W., Pita Barros, P., Bourek, A., Brouwer, W., Kelsey, T., Lehtonen, L., Anastasy, C., Barros, P., Barry, M., Bourek, A., Brouwer, W., De Maeseneer, J., Kringos, D., Lehtonen, L., McKee, M., Murauskiene, L., Nuti, S., Ricciardi, W., Siciliani, L., & Wild, C. (2019). How to govern the digital transformation of health services. *European Journal of Public Health*, 29(Supplement_3), 7–12.
- Said, L. Ben, & REdif, M. (2022). The inevitability of digital transformation in Algeria and its prospects in light of the repercussions of the Corona crisis. *Journal Du Forum Pour Les Études et La Recherche Économiques*, 06(01), 332–342.
- Sascha Kraus , Francesco Schiavone , Anna Pluzhnikova, A. C. I. (2022). Digital Transformation in Healthcare. *Digital Transformation in Healthcare*.
- Schwertner, K. (2017). Digital transformation of business. *Trakia Journal of Science*, 15(Suppl.1), 388–393.

- Tebeje, T. H., & Klein, J. (2021). Applications of e-Health to Support Person-Centered Health Care at the Time of COVID-19 Pandemic. *Telemedicine and E-Health*, 27(2), 150–158.
- Vayena Effya, Haeusermann Tobiasb, Adjekum Afuaa, B. A. (2018). Digital health: meeting the ethical and policy challenges. *Swiss Medical Weekly*, 148(34).
- Werner, L., Puta, C., Chilalika, T., Walker Hyde, S., Cooper, H., Goertz, H., Rivera Hildebrand, M., Bernadotte, C., & Kapnick, V. (2023). How digital transformation can accelerate data use in health systems. *Frontiers in Public Health*, 11.
- Ziadlou, D. (2021). Strategies during digital transformation to make progress in achievement of sustainable development by 2030. *Leadership in Health Services*, 34(4), 375–391.