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التكنولوجيا الرقمية وتطور جودة خدمات الرعاية ألصحية التجربة الجزائرية: التجربة الجزائرية

Digital technology and the evolution of the quality of healthcare services: the Algerian experience

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الملخص:

تعد التكنولوجيا الرقمية إحدى أولويات تطوير قطاع الصحة ، حيث يمكنها تحسين رعاية المرضى ولديها القدرة على تحسين جودة خدمات الرعاية الصحية بشكل كبير في جميع أنحاء العالم. تهدف هذه الدراسة إلى دراسة مساهمة التكنولوجيا الرقمية في تطوير الجودة و الجهود التي تبذلها **الحكومة الجزائرية لإدخال مفهوم التكنولوجيا الرقمية في نظام الرعاية الصحية الخاص بها. تظهر نتائج الدراسة أن التكنولوجيا الرقمية لديها القدرة على إحداث ثورة في الرعاية الصحية من خلال تحسين الوصول وإدارة البيانات والتشخيص والعلاج ، مما يؤدي في النهاية إلى تحسين جودة خدمات الرعاية الصحية.كما تظهر التجربة الجزائرية الفوائد المحتملة للتكنولوجيا الرقمية في مجال الصحة** ,من الضروري مواجهة التحديات حتى يتمكن الشعب الجزائري من الاستفادة الكاملة من الخدمات الصحية الرقمية. في الختام, من الضروري معالجة قضايا الخصوصية والأمن والوصول العادل حتى يتمكن جميع المرضى من الاستفادة من فوائد **للتكنولوجيا الرقمية.**

الكلمات المفتاحية : التكنولوجيا الرقمية ، خدمات الرعاية الصحية ، الجودة.

Abstract :

Digital technologies are one of the priorities for the development of the healthcare sector, as they can improve patient care and have the potential to significantly improve the quality of healthcare services worldwide. The aim of this paper is to study the contribution of digital technology to quality development and the Algerian government's efforts to introduce the concept of digital technology into its healthcare system. The results of the study show that digital technology has the potential to revolutionize healthcare by, improving access, data management, diagnosis and treatment, ultimately leading to better quality healthcare services. The Algerian experience shows the potential benefits of digital technology in healthcare. Tackling the challenges is essential to reap the full benefits of digital health services for the Algerian population. In conclusion, it’s essential to address issue of confidentiality, security and equitable access so that all patients can benefit from advantages of digital technology.

Key words: digital technology, healthcare services, quality

Introduction

The concept of healthcare has evolved since human beings began to act consciously to preserve their health and treat disease. Increased awareness of health-related issues is leading to higher expectations of healthcare quality and performance among the population (Mariusz D., 2004).

The healthcare space is going through a massive amount of changes and much of that is being fueled by and enabled by transformation and technology.

Obviously, one of the causes of this changes is the pandemic COVID 19, as governments have ordered containment measures and deployed social distancing strategies to combat the virus, human-machine interaction become a major challenge digital space have suddenly become necessity, representing the main means of access to information and services (chantal F, 2020), another is a long term tend toward a focus on health and wellness but a third thing that's contributing to the changes in healthcare space, in many cases is fueling and enabling the first two trends is the fact that technology is being used to drive changes and to drive improvement and better care and decision making for healthcare organizations' which effect directly in quality of services.

For several years now, health technology companies have been engaged in an unprecedented race for technological innovation, a movement supported by the public authorities. Te health crisis has reinforced the need to support this sector.

The health technology represents all the technology created in the field of health in the broad sense. This sector is divided into three (3) branches (Quand le numérique révolutionne la santé, quel avenir pour la HealthTech ?, 2021):

→ **Biotech:** solution combining life sciences A technology for example: information technology;
→ **Medtech:** diagnostic medical services developed on the basis of new technologies;
→ **E-health or digital health:** new tools allowing the health to carry out its digital transformation.

All over the word we are seeing exceptional growth momentums in health technology.

Digitization makes it possible to detect diseases in advance, reduce their burden, improve care delivery, and facilitate coordination and collaboration between different actors, also it effect directly in quality of the services provided by the healthcare system. (Abderrahmane Z, 2022).

In the sector of health, different forms of digital technology are helping in the diagnoses of different diseases and extending life expectancy, and saving lives.

Problematic:

Digital technologies are one of the development priorities of the health sector worldwide and this market grows by a quarter every year. The Algerian government is also one of those countries

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that wish to introduce digital technology into the health sector, with the aim of developing the quality of health services.

Hence, the problem presented in this work is defined as follows:

How will digital technology contribute to developing the quality of healthcare services?

In order to answer this problem, three basic questions must be addressed in this work:

→ What do we mean by digital technology?
→ How does the medical information system affect the quality of healthcare?
→ Digital technology within the Algerian health system?

The aim of this research is to study the achievements of digital technologies in health care and his impact on quality healthcare services.

To do so, we have divided our work into two (2) parts which will be presented as follows:

I- The digital technology and quality of healthcare services:
II- The Algerian experience in improving the quality by digital technology:

I- The digital technology and quality of healthcare services:

1- Digital technology in health sector:

The digital technology definition can be defined as, every technical instrument, automation system, and electronic equipment that produce, operate, or keep information and data are considered as digital technology definition (digitaltech, 2021).

Digital technology has been described as a facilitator of social inclusion, as it allows for real-time delivery of services that can enable individuals to learn, work, travel, socialize, shop, and interact with society without physical barriers. Digital technologies have also been identified as one of the most important factors that can contribute to reducing existing social gaps and can be used to encourage and support social inclusion and increase people's quality of life (Mirfa M., Vivian V, 2018).

Digital technologies are now an integral part of everyday life, and the world's population has never been more interconnected. Innovation, especially in the digital realm, is happening on an unprecedented scale. However, their application to improve population health remains largely untapped, and there is enormous scope for the use of digital health solutions (WHO, 2020).

Digital health, or digital healthcare, is a broad and multidisciplinary concept that includes concepts from the intersection between technology and healthcare. Digital health applies digital transformation to the healthcare industry, including software, hardware, and services. Digital health under its umbrella includes mobile health (M Health) applications; electronic health records (EHRs), electronic medical records (EMRs), wearable devices, tele-health and telemedicine, as well as personalized medicine (corinne B, 2021).

1- Evolution of healthcare

- **Health care 1.0**

Healthcare 1.0 can be described as a physician-centric model. Healthcare 1.0 refers to the essential encounter between patient and physician. During this interview, the patient visits the clinic and meets the doctor and other members of the care team. Through consultation, testing, and diagnosis, the doctor provides prescriptions for medications and a plan of care to treat the disease, as well as plans for follow-up (Jingshan L., Pascale C, 2021), also,it can be done by telephone (telephone advice), by email (television), or on screen (telemedicine 1.0).. The patient, who often has limited medical information, trusts the doctor's expertise implicitly (Padam k, 2023). This model has been prevalent in health care practice for hundreds of years.

- **Health care 2.0**

Along with major advances in healthcare, life sciences and biotechnology, many new medical equipment and devices have been invented, developed and tested and are increasingly used in healthcare delivery. For example, imaging test equipment monitoring devices and surgical and life support equipment are increasingly used in hospitals and other healthcare settings to aid in diagnosis, treatment and monitoring. We call this evolution Health Care 2.0 (Jingshan L., Pascale C, 2021).

Medicine 2.0 began in 1985 with the first embryos of forums. But it was around the 2000s that internet forums brought medicine 2.0 into global discourse.

With all this development, but still the human beings who interact with each other use digital means as media.

- **Health care 3.0**

For the past decade, along with the development of information systems, medical or electronic health records (EHRs or EHRs) have been implemented to manage patient care in units and departments of healthcare organizations; these health information technologies have had a major impact on clinical and operational processes. Many activities are time-stamped and recorded in the EHR, and many manual processes have been computerized and digitized. In addition, thanks to the computer networks available, remote care and tele-health have become possible, and electronic visits are beginning to replace some face-to-face meetings. The machine is now present within the doctor-patient relationship. We are talking about connected patients and connected doctors. All of these have led to multiple revolutionary changes in healthcare delivery. We categorize this revolution as Health Care 3.0.

- **Health care 4.0**

Health 4.0 is a newly invented concept, coming from industry 4.0, which represents the fourth manufacturing revolution. Ultimately, the concept relies on intelligent machines having access to large amounts of data, allowing them to make decisions without human intervention (Diana K, 2021).

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Healthcare delivery is on the cusp of a fundamental shift towards the new era of smart, connected healthcare, called Health Care 4.0.

Health is one of the most anticipated areas of the 4.0 revolution to achieve excellent results. Today's industry is more computerized than in previous decades, with X-rays and magnetic resonance imaging giving way to CT scans and ultrasounds, as well as electronic medical data (Diana K, 2021).

the healthcare delivery process becomes a cyber-physical system equipped with IoT, RFID (radio frequency identification), wearable devices and all kinds of medical devices, smart sensors, medical robots, etc. , which are integrated with cloud computing, big data analytics, artificial intelligence and decision support techniques to achieve intelligent and interconnected healthcare delivery (Jingshan L., Pascale C, 2021).

As Healthcare 4.0 improves the healthcare experience, it successfully improves the quality, flexibility, productivity, cost-effectiveness and reliability of healthcare services. Health Internet of Things, medical cyber-physical systems, health cloud, health fog, big data analytics, machine learning, block chain and intelligent algorithms are all integrated and used (Diana K, 2021).

2- The information technology system and quality of healthcare

Recently many countries have introduced the information technology system in healthcare system; it has become the most adopted system in this field.

Information technology opens the window to ensure adequate quality healthcare obtained at reasonable costs.

Now, many healthcare organizations use IT system that helps medical professionals and facilitates their work, the healthcare system depends on the use of IT in all countries of the world, such adoption of the electronic registration system, the internet system and others.

The tradition codes of practice in medicine emphasize direct physician-patient communications however, there are many forms of healthcare services in which the traditional approach can be modified with the use of modern communication tools, and the changes in the relation physician-patient bring new challenges to formal and legal regulations for standards of care

The use of electronic communication is associated with some risks, which are related to the security and confidentiality of electronic health, but in general the IT allow for greater quality of healthcare services.

- **Tele-health:**

One of the ore recent developments in the healthcare space is this whole concept of tele-health, ever since the pandemic began in the early 2020s we saw a big massive shift towards more tele-health which is also called tele-medicine , cyber medicine or e-health.

Tele-health means the provision of healthcare services that are connected using telecommuting infrastructure an advanced tele-health system or network enables various forms of medical services and information transfer between institutions and health professionals when direct contact is impossible (Mariusz D., 2004).

One of the main reasons for the emergence of this type of tools is the rapid development in technology, which has helped the emergence of many who cannot obtain health care directly in private centers (Nuha Abdullah N.A., Lin L., Ali A. et al, 2019).

Tele-health is basically the ability to get care from your doctor or have an appointment with your doctor without actually going to see your doctor, so providing video capabilities, health care recording capabilities, the ability to interact and interact with your health care provider via tele-health This is something that has been fueled by the pandemic, but would not have been possible without the technology that enables it.

The first tele medicine applications were developed in the 1950s', which has undergone significant development since that time (Mariusz D., 2004).

Telemedicine allows healthcare providers to evaluate, diagnose and treat patients in remote locations using communications technologies. Advantages of telemedicine include the ability to collect, store, and exchange medical data. Furthermore, telemedicine enables remote patient monitoring, distance education, improved healthcare management and organization, integration of health data systems, and tracking of patient movement (Maksut S.,Timur S., Zhanar B., et al, 2020).

- **Electronic health records :**

This trend is been in the making for longer than the tele-health trend is the whole concept of Electronic health records (HER), this concept was emerged in 1991 as a computer based patient records with the functions of practice management, clinical management, system management and drug management (peter G., Eunice N., Joseph M., et al, 2021).

There are many terms used in EHR, such as computer-based patient records (CPR), computerized medical records (CMR), patient-portable medical records (PMR), electronic patient records (EPR), electronic medical records (EMR), and personal health records (PHR) and digital medical record (DMR) (Nuha Abdullah N.A., Lin L., Ali A. et al, 2019).

There any many systems like epic (Founded in a basement in 1979, Epic develops software to help people get well, help people stay well, and help future generations be healthier (EPIC)) and Cerner (Cerner EHR is a suite of medical software solutions (Lisa H., Collin C, 2021)) that provide HER capabilities that allow hospitals and other healthcare organization to capture information about patients, what kind of care they're receiving who their doctors are, belling insurance, all the stuff related to patients and all the record and the health care records that go behind that and other healthcare records. In general, The process of using HER is carried out by converting paper data into electronic data containing patient details and care details, in addition to doctor's notes, medications, and necessary tests (Nuha Abdullah N.A., Lin L., Ali A. et al, 2019).

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HER is implemented in hospitals with a view of improving the quality of healthcare services.

They provide a significant chance to enhance health surveillance and appraise service delivery which effect the clinical decisions and develop the quality of care services.

HER impacts healthcare quality through medical document management, practice management and communications, by reducing unnecessary test recorders, healthcare personnel time and work done in documentation or other work related to patients' health (peter G., Eunice N., Joseph M., et al, 2021).

- **Artificial intelligence**

another digital technology that is completely transforming healthcare is the whole use of artificial intelligence and machine learning to advance healthcare and so we mentioned EHR and tele-health already and what both of those movements are doing they're providing more centralized and standard data for how health care providers capture information about their patients and about the care they're receiving on the back end though you have all this data that's being collected and as you throw in artificial intelligence and or machine learning you start to look for trends in the data and you start to looks for ways that we can make better decisions around the types of health care, the type of prescriptive solutions that we might provide to our patients all that's being enabled by this really cool technology called artificial intelligence.

In general, artificial intelligence (AI) refers to intelligent applications that help diagnose diseases, make treatment recommendations, as well as manage data, improve online consultations, accelerate drug development (NAH, 2020, p. 6).

Artificial intelligence captures information on dozens, hundreds or even millions of patients cared for by a given healthcare system and looks for trends and patterns, so it looks for commonalities and cause-and-effect relationships in the available data, giving doctors and other healthcare providers better visibility and understanding of how to provide better healthcare and make better decisions for their patients, something no human could do. So it's a way of harnessing the massive amounts of patient data captured in some of these systems, as we've mentioned, Cerner and other systems used in this sense, as well as the information captured in telemedicine, as we mentioned above. health, as we've already mentioned, all this data can now be used to make better decisions and recommendations to humans, i.e. doctors or healthcare providers, who can then provide these prescriptive solutions to their patients.

II- **The Algerian experience in improving the quality by digital technology**:

The health sector is of great importance, especially with the increase in epidemics and diseases around the world.

Algeria has an average health system that can be improved, one of the main ways to improve the quality and safety of care is through digitalization (Abderrahmane Z, 2022), and so to confront current challenges, the use of digital technology has become an imperative to respond to citizens requirements at the level of services and health care.

This can help healthcare professionals to manage patients conditions more effectively by given them access to real time information about their health condition, enabling them to provide timely treatment and avoid costly hospitalization (Abderrahmane Z, 2022).

The Algerian government seeks to improve the health sector and provide distinguished and quality health services through several components.

1- Digital technology tools used in Algerian healthcare sector

A group of Algerian talents launched a digital health platform for doctors and citizens to join, to ensure an easier healthcare experience, under the name of "Docta", it's aim is to organize medical appointments and manage patients medical information and files in one platform, in addition to improve doctor-patient relationship and that by facilitating the communication between the two of them (Ammar Z, 2023).

"Ducat" is not the only digital platform that was launched in Algeria there is a lot of other examples such as: "RDV Toubib", "Santé DOM"…This new idea comes within the framework of the need for digital solutions that keep pace with reality and develop a healthcare experience in the country and provide high quality health services.

Other example of Algerian healthcare digital technology is the CHIFA card, which gives holder social security status, the use of electronic tools allows health organizations and professionals to consult the authorized data of the CHIFA cad, to issue and sin electronic invoices and send any other document or data to social security organizations it allows the reading and insertion of each act and service by insured and their beneficiaries (Monia C., SamiaL., 2019) .

2- The Algerian government initiative in digital health

The Algerian government seeks to improve the health sector and provide distinguished and quality health services through several component, so, Algeria as implemented digital technology in its health system (Abderrahmane Z, 2022), where the Algerian ministry of health has developed an electronic health information system (SISDZ), which consist six (6) systems (Ammar Z, 2023):

- Humans resources information system (RH Santé): is a complete web platform for human resources management dedicated to the public health sect, approved in 2014;
- The information system related to the notifiable diseases (MDO): this platform contain all the information and data about the patient personal information and the one's related to the disease;
- Maintenance information system (CMMS): collect data and information related to the maintenance and monitoring of medical devices and paramedical equipment;
- Information system associated with electronic vaccination record (DEAC) : this digital platform provide access to vaccination data and all information including the type and data of vaccination;
- The application linked to health activities (8080 SISDZ): is one of the most important applications of the health information system because it collect all daily, monthly, half-

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yearly and annual medical and obstetric activities whether for the patient or users in the healthcare sector;

- Information system related to scorpion poisoning (EVEN.SCO).

The health information system is considered a an important step toward modernizing the health sector and improving health services through the digital technology and making optimal use of them to ensure the provision of health services of the highest quality to citizens.

Through the efforts made and the SISDZ, the Algerian authorities seek to bridge the digital gap in health facilities by investing in advanced information and communication technology in order to provide the necessary and effective health services to citizens through hospital institutions that you need regardless of their location or time.

Several initiatives have fostered interest in the benefit of tele-health and e-health in Algeria within the scientific and medical communities. Finally, the Algerian society for telemedicine and e-health (SATeS) as created, with the mission of contributing to the promotion an development of competencies in the field of tele-health and digital health in Algeria within a national legal and regulatory framework, the SATeS approach focus on promoting the adoption of tele-health system as a means of achieving the required efficiencies in the use of health infrastructure and human resources capacities, all of that has one goal that is the improvement of the quality of healthcare services (Mahmod T., Adel T., Dari A., et al, 2021)

Conclusion

The healthcare industry faces many challenges including increasingly high costs for healthcare services, professionals and equipment; shortage of skilled health care professionals; High demand for high-quality healthcare services. These challenges push healthcare providers towards considering the inclusion and use of new healthcare models based on innovative and digital technology as a solution to these problems (Jameela A., Nader M., Eman A, 2020).

The classic health care model is based mostly on the delivery of medical services through hospital and outpatient systems. The quality of health service depends on many factors such as the qualification of medical staff, hospital facilities, and the availability of modern equipment (Maksut S.,Timur S., Zhanar B., et al, 2020).

For all these reasons, we found that all countries of the world encourage development and innovation in digital technologies, specifically in the health field.

Algeria is one of these countries that have incorporated digital technology into its health system. We can see this in many government initiatives in this context, just like the SISDZ developed by the Ministry of Health. All this is done in one goal, which is to find solutions to problems in healthcare institutions as well as to increase Quality of services.

In fact, the application of medical digital technologies can provide better access and flexibility of healthcare to the general public. It includes the availability of open information about health, treatment, complications and biomedical research on the Internet. On the other hand,

diagnostic and medical counseling services have become more accessible and available even in low-income countries. (Maksut S.,Timur S., Zhanar B., et al, 2020).

The digital technology has an impact positive in increasing the quality of healthcare and this by the different tools that are used in different healthcare organization. Despite these developments in achieving high-quality maids, we always find that there are some shortcomings in this field of digital technology.

Bibliography

Abderrahmane Z. (2022, 06 28). *Algérie : L'apport du numérique dans l'amélioration de la qualité et de la sécurité des soins.* Consulté le 08 12, 2023, sur linkedin: https://www.linkedin.com/pulse/alg%C3%A9rie-lapport-du-num%C3%A9rique-dans-lam%C3%A9lioration-de-la-zahi

Ammar Z. (2023). algerian experience in digitizing the health sector. *المجلة الدولية للبحوث القانونية و السياسية, 07* (01), 150-172.

chantal F. (2020). le role des technologies numériques e collaboration à distance durant la crise. *l'impact de la crise sur le management* , 59-71.

corinne B. (2021, 03). *digital health (digital healthcare)*. Consulté le 08 29, 2023, sur techtarge: https://www.techtarget.com/searchhealthit/definition/digital-health-digital-healthcare

Diana K. (2021, 08 14). *What is Health 4.0?* Consulté le 08 28, 2023, sur healthcare: https://healthcare-digital.com/digital-healthcare/what-health-40

digitaltech. (2021, 12 08). *What Is Digital Technology? And Its Advantages*. Consulté le 08 26, 2023, sur digitaltech business: https://www.digitaltechbusiness.com/what-is-digital-technology/

EPIC. (s.d.). Consulté le 08 17, 2023, sur epic with the patient in the heart : https://www.epic.com/about

Jameela A., Nader M., Eman A. (2020). Health 4.0: On the Way to Realizing the Healthcare of the Future. *IEEE Access.* , 211189-211210.

Jingshan L., Pascale C. (2021). Health Care 4.0: A vision for smart and connected health care. *ISE TRANSACTIONS ON HEALTHCARE SYSTEMS ENGINEERING , 11* (03), 171–18.

Lisa H., Collin C. (2021, 07 13). *What Is Cerner EMR? A Guide to the Vendor's Solutions*. Consulté le 08 16, 2023, sur software advice: https://www.softwareadvice.com/resources/what-is-cerner-emr/

Mahmod T., Adel T., Dari A., et al. (2021). middle east and north african health informatics association (MENAHIA): health informaticsresponse to COVID19 crisis. *information on IMIA regional groups* , 328-334.

Maksut S.,Timur S., Zhanar B., et al. (2020). The Recent Progress and Applications of Digital Technologies in Healthcare: A Review. *International Journal of Telemedicine and Applications* , 1-18.

Mariusz D. (2004). The Impact of Information Technology on Quality of Healthcare Services. *Computational Science - ICCS 2004* , 1118–1125.

Mirfa M., Vivian V. (2018). Digital technologies for social inclusion of individuals with disabilities. *Health and Technology* , 377–390.

Monia C., SamiaL. (2019). régime de lasécurité sociale en Algérie. *revue des sciences juridique et politique , 10* (02), 1768-1789.

NAH. (2020). *soins de santé numérique en afrique du nord* . informa market.

Nuha Abdullah N.A., Lin L., Ali A. et al. (2019). Improving the Quality of Healthcare by Using Information Technology System in the Hospitals of Yemen. *Journal of Business and Management , 7* (2), 728-754.

Padam k. (2023, 07 09). *The Evolution of Healthcare: Transitioning from 1.0 to 4.0*. Consulté le 08 26, 2023, sur linkedin: https://www.linkedin.com/pulse/evolution-healthcare-transitioning-from-10-40-padam-kafle

peter G., Eunice N., Joseph M., et al. (2021). enhancing healthcare quality in hospitals through electonic health records: a systematic review. *journal of health informatics in developing countries , 15* (02), 1-25.

Quand le numérique révolutionne la santé, quel avenir pour la HealthTech ? (2021, 12 23). Consulté le 08 03, 2023, sur caisse des depots groupe: https://www.caissedesdepots.fr/blog/article/le-numerique-revolutionne-la-sante-quel-avenir-pour-la-healthtech

WHO. (2020). *Digital health* . Consulté le 08 29, 2023, sur WHO: https://www.who.int/health-topics/digital-health#tab=tab_1