CENTRE INNOVATION E-SANTÉ

جامعة محمد الخامس بالرباط
Université Mohammed V de Rabat

White Paper on e-health in Morocco

Realities, challenges and development levers

English edition

Foreword by Doctor Tedros Adhanom Ghebreyesus
Director-General of the World Health Organization

October 2022

INSTITUT SUPERIEUR DES SCIENCES DE L'INGENIEUR TECHNOLOGIA

Buildfluence Impacting People

IT6

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المملكة المغربية
ROYAUME DU MAROC

“ Achieving universal health coverage is not beyond our reach, nor should it be restricted to developed countries. It has been clearly shown that this goal can be achieved, irrespective of a country’s level of development. ”

Extract from the message addressed by H.M. the King to the participants in World Health Day celebrations, April 8, 2019, Rabat.

“ Africa is on its way to becoming a global digital laboratory. Spurred on by young people’s ingenuity, creativity and audacity, digital technology is changing the face of our Continent. ”

Extract from the speech of H.M. the King at the Extraordinary Summit of Heads of State and Government of the African Union on Continental Free Trade Area, March 21, 2018.

The ambitious health sector reform currently being undertaken in Morocco, guided by His Majesty King Mohamed VI, has its roots in a digital transformation agenda that began at the Ministry of Health and Social Protection in 2008. The reform also positions Morocco as a regional digital hub.

This white paper incorporates the input of national stakeholders and offers a review of digital health components, documents opportunities and challenges, and lays out a way forward for a digital transformation of the health sector.

This complements WHO's Global Strategy on Digital Health 2020-2025, which presents a framework for action to encourage international collaboration and coordination to advance the use and benefits of digital technologies for health. This means an all-hands-on deck approach to working with countries to leverage software, develop evidence-based approaches to planning, and investing in trusted digital applications and services for sustainability and impact.

When used effectively, digital technologies can address persistent challenges and gaps in health system coverage, enhanced accountability and reinforce principles of quality, safety, and universal coverage. A digital health transformation works best when it considers local context and is aligned with national health priorities. Digital health approaches such as telemedicine, decision-support tools, or targeted messaging, can improve access to quality, timely health interventions, even in the most remote environments.

A key challenge is ensuring that new technologies do not exacerbate existing health inequities, and are accessible to the poorest and most vulnerable. To achieve this goal, digital health must be part of national planning, policies, governance, and architecture, supported by long-term financial commitments. Sustainable and dedicated investments are critical to maximize the potential of digital health.

Digital health has the potential to transform health systems. But it is incumbent upon countries to ensure they invest well in governance, capacity building, interoperability, and digital systems aligned with national capabilities and grounded in evidence-based guidance. The design of digital systems should be people-centered, emphasizing usability and accessibility, service quality, patient safety, and consistent outcomes. Continuous education of health professionals in the knowledge and application of digital technologies is also critical.

WHO congratulates Morocco for its ambitious digital transformation agenda and for its leadership in working to enhance the digital transformation of the Eastern Mediterranean Region and the African continent.

Doctor Tedros Adhanom Ghebreyesus
Director-General of the World Health Organization

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How to stimulate an environment conducive to Made-in-Morocco HealthTech emergence?

Foreword

Guided by the High Directives of His Majesty King Mohammed VI, may God assist Him, on healthcare reform and rehabilitation, the Moroccan health system has taken significant strides towards serving citizens and meeting their needs by providing quality health services that are equitably distributed throughout the national territory but are also financially accessible.

Yet, despite the tangible progress made over the past two decades, attested by objective indicators (a child mortality rate reduced by half, a maternal mortality rate divided by three, a life expectancy extended by 9 years, and an exemplary vaccination coverage), our country's healthcare has to face new challenges imposed by the current situation and marked by the imminent generalisation of the basic medical coverage which will intensely put to the test the existing human and material resources, as well as by the health and societal upheavals induced by the Covid-19 pandemic. These have clearly revealed the need for the sector's digital transformation as a realistic alternative in the creation of a resilient healthcare system capable of adapting to future events, and which must therefore be modernised and make use of new technologies to launch a profound overhaul.

Thus, and conscious of the importance of digitisation for this sector, the Ministry of Health and Social Protection has included e-health in its sector-specific strategies as early as 2008. These strategies should lead, inter alia, to the implementation of a national health information system, the dematerialisation of data flows among healthcare stakeholders and a wide-scale and nationwide adoption of novel medical practices, such as telemedicine.

This digital transformation project is in step with Morocco's ambition to become a major digital player on the African continent by implementing the «E-Morocco 2010» strategy, followed by the «Digital Morocco 2013» plan, then the «Digital Morocco 2020», and finally «Horizon 2025». It is within this framework that the Ministry of Digital Transition and Administrative Reform launched the «MoroccoTech» initiative, ambitioning to position Morocco as an international digital hub par excellence and creating a global dynamic that will benefit all Moroccan ecosystems through their digital transformation, including, obviously, the health sector.

Training and national scientific production have also benefited from special attention in the context of digital transformation and digital professions. Thus, the National Plan for Accelerating the Transformation of the Higher Education, Scientific Research and Innovation Ecosystem (PACTE ESRI 2030), drawing its inspiration from the priority choices set by the New Development Model initiated by His Majesty the King, considers digital transformation a key lever of change in providing innovative solutions within the national context, including the promotion of new digital career training. In 2021, Morocco ranked second in Africa in terms of digital transformation-geared scientific production.

The adoption of e-health, a promising sector for the national healthcare system, but also for economy and employment, will allow Morocco to provide personalised and secure healthcare that is also more accessible, strongly preventive and predictive in character, and perfectly in line with the national strategy for healthcare funding. It will also enable Morocco to enhance the way it is internationally perceived, boost its productivity and competitiveness, and significantly reduce the social and spatial inequalities typically affecting disadvantaged populations.

This said, e-health in Morocco cannot be translated into a reality without a favourable environment for its development, capable of federating all the players around an integrated, multi-sector and participatory national strategy that is effectively centred on the patient and that takes into account international experiences, as well as national specificity.

Khalid AIT TALEB
Minister of Health and Social Protection

Abdellatif MIRAOUI
Minister of Higher Education, Scientific Research and Innovation

Ghita MEZZOUR
Minister Delegate in charge of Digital Transition and Administrative Reform

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Acronyms

ACAP	Autorité de Contrôle des Assurances et de la Prévoyance Sociale (*Insurance and Social Security Regulatory Authority*)
ADD	Agence de Développement du Digital (*Digital Development Agency*)
AI	Artificial Intelligence
AMO	Assurance Maladie Obligatoire (*Compulsory Health Insurance*)
ANAM	Agence Nationale de l'Assurance Maladie (*National Health Insurance Agency*)
ANR	Agence Nationale des Registres (*National Registers Agency*)
ANRT	Agence Nationale de Réglementation des Télécommunications (*National Agency for Telecommunications Regulation*)
APEBI	Fédération marocaine des technologies de l'information et de l'offshoring (*Moroccan Federation of Information Technology and Offshoring*)
CAGR	Compound Annual Growth Rate
CCAM	Classification commune des actes médicaux (*Common Classification of Medical Acts*)
CDSS	Clinical Decision Support Systems
CHU	Centre Hospitalier Universitaire (*University Hospital*)
CINE	Carte d'identité nationale électronique (*National electronic identity card*)
CNDP	Commission Nationale de contrôle de la protection des Données à Caractère Personnel (*National Commission for the Control and Protection of Personal Data*)
CNOM	Conseil National de l'Ordre des Médecins (*National Medical Board*)
CNOMD	Conseil National de l'Ordre des Médecins Dentistes (*National Dentists Board*)
CNOPS	Caisse Nationale des Organismes de Prévoyance Sociale (*National Fund for Social Security Organisations*)
CNSS	Caisse Nationale de Sécurité Sociale (*National Social Security Fund*)
DGSSI	Direction Générale de la Sécurité des Systèmes d'Information (*General Directorate of Information System Security*)
DOL	Digital Opinion Leaders
EHR	Electronic Health Record
EIG	Economic Interest Group
EPR	Electronic Patient Record
GAFAM	Google, Apple, Facebook, Amazon and Microsoft
HIMMS	Healthcare Information and Management Systems Society
HIS	Hospital Information System
ICT	Information and Communication Technologies

INDH	Initiative nationale pour le développement humain (*National Initiative for Human Development*)
INPE	Identifiant national des professionnels de santé et des établissements de santé (*National Identifier of Health Professionals and Institutions*)
IoT	Internet of Things
IS	Information System
IT	Information Technologies
LIMS	Laboratory Information Management System
LIS	Laboratory Information Systems
LTC	Long-term condition
MENA	Middle East and North Africa
mHealth	Mobile Health
MoCA	Montreal Cognitive Assessment
MS/MSPS	Ministère de la Santé et de la Protection Sociale (*Ministry of Health and Social Protection*)
NDM	New Development Model
NGAP	Nomenclature générale des actes professionnels (*General Classification of Professional Activities*)
NHIS	National Health Information System
NHS	National Health System
NRP	National Reference Pricing
PACS	Picture archiving & communications system
PESTEL	Political, Economic, Social, Technological, Environmental, and Legal
RAMED	non-contributory basic coverage scheme
SGG	Secrétariat Général du Gouvernement (*General Secretariat of the Government*)
SMR	*Shared Medical Record*
SMT	Société Marocaine de Télémédecine (*Moroccan Society of Telemedicine*)
UM5R	Mohammed V University of Rabat
UM6SS	Mohammed VI University of Health Sciences
UNICEF	United Nations Children's Fund
UNFPA	United Nations Population Fund
USR	Unified Social Register
VNA	Vendor Neutral Archive
WHO	World Health Organisation
WIPO	World Intellectual Property Organisation

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Digital transformation expert
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A graduate of ENSIAS and founder of IT6 Maroc, Hicham El Achgar is a CISA, COBIT, ITIL, ISO 27002 and CEH certified specialist in IS good governance and effective management. He carried out a dozen audit missions and IS master plans in the public sector. He is a national and international lecturer on IS management and founder of the Higher Institute of Engineering Sciences specialised in disruptive technology-based digital transformation (AI, IoT, Big Data...).

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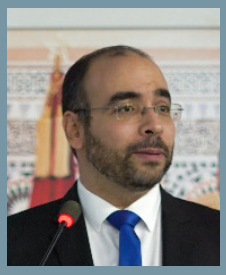
Azeddine Yassine holds an MBA in Strategic Management and Economic Intelligence from the School of Economic Warfare in Paris and a university degree in Information System Management from the University of Aix-Marseille. After accumulating twenty years of experience in France and then with the OCP Group as director of communication strategy, he created Buildfluence in 2014 to provide consultancy and support to decision makers in influence strategy.



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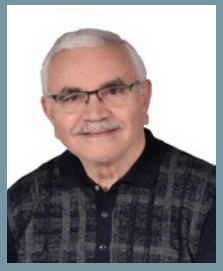
Dr. Chaabo is a medical doctor and expert in medical informatics and e-health. After a professional career at the Rabat University Hospital as head of the Technology Watch Unit, he joined the Sheikh Khalifa Foundation as director of information systems and then as director of medical information. He is also a lecturer in medical informatics at Mohammed VI University of Health Sciences and the University of Aix-Marseille, and the executive director of the Moroccan Society of Telemedicine.



Smail Aachati

Expert in strategy and health systems management

Smail Aachati holds a PhD in legal and economic sciences from the University of Montpellier in France and is a graduate of the National School of Public Administration in Rabat (ENAP). He spearheaded the training division at the Ministry of Health, served as Secretary General of the Rabat University Hospital, and as Dean of the Faculty of Health Sciences and Hospital Management at the UIASS. He is an expert consultant in strategy and health systems management.

Why a white paper on e-health in Morocco?

Philosophy and background

In 2021, the Rabat Mohamed V University launched a reflection process on a project to develop e-health research and innovation, in partnership with the firms IT6 and Buildfluence. To this end, a roundtable that brought together the key players of the national health system was organised, followed by an international call for projects intended to encourage innovative project leaders in this field.It is against this backdrop that the notion of producing a white paper on e-health in Morocco germinated during an informal exchange with an economic operator. We were not mandated by any organisation. Indeed, it was a voluntary initiative led by the University and its partners and driven by a spirit of community service. Our human and financial means were limited, yet we wanted to take up the challenge...

More than a conceptual analysis document, our main desire was to produce a roadmap that would support:

- An extensive understanding of the subject at hand;
- inclusive strategic orientations;
- recommendations;
- fact-based decision support aimed at ensuring pragmatic implementation.

There were many obstacles, issues and paradoxes that interfered and overlapped with our action. There were even moments of uncertainty, but we strongly believed in what is at stake in this document and in the significance of its outcome.

Vision

Our major commitment was:

- to draw up a heuristic and analytical e-health cartography of a decisional nature in Morocco;
- to trace the evolution of e-health in Morocco over the last few years;
- to accommodate a position document in the form of a repository available to all public and private decision makers of this ecosystem;
- to accelerate the development and promotion of this sector with an inclusive and culturally appropriate approach.

Objectives

The objectives of the present work are multiple:

1. to provide relevant and updated information on the situation of e-health in Morocco;
2. to identify the strengths and weaknesses of the national health system with a view to developing e-health;
3. to seize the opportunities and meet the challenges of integrating available solutions;
4. to identify the obstacles and challenges hindering e-health promotion in Morocco;
5. to outline Morocco's regional, continental and international positioning and produce an analytical understanding of the shortcomings in its advance towards e-health;
6. to engage studies and analyses that target good practices;
7. to understand the reality on the ground for all stakeholders (users and professionals) in terms of their e-health needs and level of adaptability to it;
8. to present strategic perspectives that are inclusive of all stakeholders, based on the expectations and issues identified;
9. to put forth recommendations for decision-makers for the future development of e-health; and
10. to develop a roadmap in order to facilitate rapid and effective implementation.

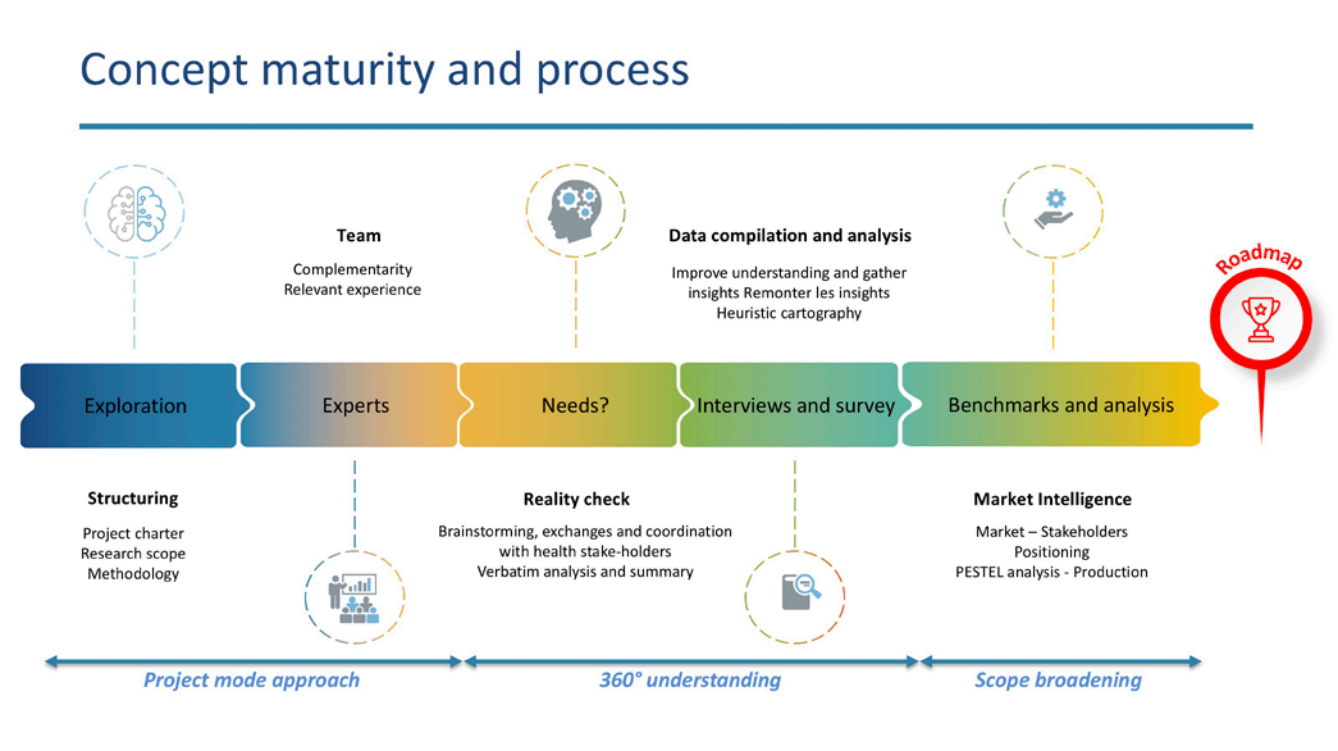
Methodology

The development of this white paper was based on a broad review of e-health conceptual and pragmatic elements, as well as on the factual analysis of every aspect that could be impacted by e-health in Morocco.

The approach adopted was based on sequential work carried out over three complementary components:

1. A project mode approach;
2. A 360° extensive understanding;
3. A broadening of the scope.

This resulted in the development of a pragmatic roadmap that favours easy and effective implementation.



1. A project mode approach

• **Exploration**.The «white paper» trigger idea prompted us to explore the subject's environment (off-line) in order to gauge our research and production capacities. From the offset, we self-imposed a project mode structure and methodology: a concept note, objective laying, team building and organisation, scope of the study, geographical scope, task allocation, planning of meetings, tools and communication.

• **Experts**. The identification and targeting of the human resources in terms of quantity (without settling for an inadequate volumetric aspect) and of quality, achieving a complementarity that is manifest in subject matter expertise: health + digital + analytical spirit + sense of synthesis + strategy.

2. 360 degree and extensive understanding

A process of transversal but profound understanding that evolves crescendo to better identify all key and secondary issues requiring attention:

• **Stocktaking and need assessment:** Thorough knowledge of the current state of affairs through a conceptual diagnosis of the situation using a cross-sectional study based on national health strategies, a review of national reports, and a literature review.

• **Global vision of the stakeholders:** The organisation of technical discussion sessions (roundtable, Annexure 1 and expert seminar, Annexure 2). The goal was to identify expectations and assess needs, understand the vision of public and private stakeholders of the e-health ecosystem and those in education and research**.**

• **Targeted understanding:** Meeting and interviewing (one-on-one meetings) key public and private decision-makers (see list of interviewees) of the Moroccan health sector, using interview guidelines (Annexure 3) developed and sent out in advance. The aim was to gain insight into the true vision of each decision-maker according to his or her position on the national health scene, and to identify a few use cases and good practices related to e-health in Morocco.

• **Two digital surveys:** We sought to broaden the scope to include all e-health stakeholders in Morocco in order to poll opinions by key target. To do this, we carried out two surveys for the stakeholder categories using a participation-based and territorial approach (see Annexure 4):

1. General public;
2. Health professionals.

- Quota sampling was used in both surveys. This enabled us to have the quantitative and qualitative data analysis broken down by territory and respondent profile.
- Three similar themes but different formulations of the questions articulated according to the respondent profile :
  1. general data and socio-professional characteristics;
  2. perception and knowledge of the subject;
  3. attitudes, expectations and perspectives.

3. Broadening the study scope

We then considered broadening the scope of our study to an international level in order to examine key issues, sector opportunities and implementation inherent risks by looking at practical case studies. To this end, we set up an AI and Big Data-based information collection and analysis platform. Our objectives were:

– to consult private and institutional digital platforms specialised in HealthTech analysis and ranking;

– to carry out theme benchmarking through several segments:
  1. Market Intelligence: e-health market growth, trends and prospects around the world,
  2. Morocco's positioning at the regional, continental and international levels,

3. PESTEL analysis to measure the impact (benefits and drawbacks) of e-health at different levels: political, economic, social, technological, environmental and legal;

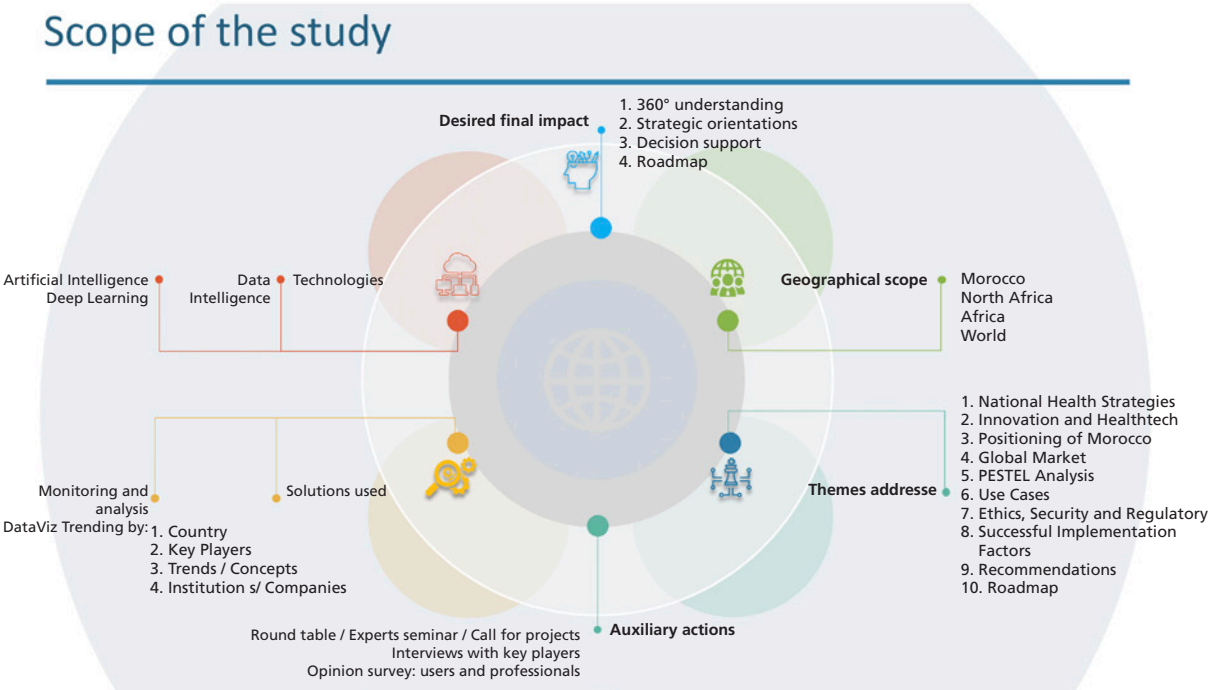
– to build a relevant documentary base allowing the extraction of procedural and efficient good practices;

– to draw inspiration from the good solutions implemented in some countries and which can be adapted to the national context and reinforce the recommendations part.

Methodology

In broad terms, the environment of this white paper project had a conceptual and complementary analysis scope on the one hand, and a pragmatic and factual one, on the other:

Scope of the study



Healthcare System in Morocco:

Understanding, Studies and Analysis

A. The Moroccan healthcare system: between ambitious reforms and real challenges

In its quest to ensure human development and social justice, Morocco has undertaken several reforms over the past few decades, aimed at improving the population health.

These efforts have made possible in the extension of care based on primary healthcare, through prevention and vaccination programs to fight epidemics or control chronic diseases, as well as on quality hospital infrastructure and university hospitals to provide the country with qualified human resources.

In 2011, in response to growing social demand, the constitutional reform made access to healthcare a fully-fledged right. Since then, significant advances in health policies and services have been observed. Public health indicators over the past 20 years show significant improvement in life expectancy at birth, estimated at 77 years (+9 years), a maternal death ratio divided by 3 and an infant mortality rate divided by 2.

Despite undeniable progress, the national health system contends with several challenges, including an increase in the chronic epidemiological burden, very significant regional disparities, a medical service offer that is below benchmarks in terms of hospital capacity and health professionals, and financing that is half borne by households.

Starting 2018, Morocco began to realize that the goal of universal health coverage is perfectly achievable beyond the country's development level, and that it would be essential to engage in a large scale and in-depth overhaul of the health system, in tandem with the acceleration of basic medical coverage generalisation.

Today, achieving medical coverage for all by 2022, i.e. through the mega project of generalizing social protection announced by HM King Mohammed VI, will be a historic opportunity to engage in a real upgrade of the healthcare system, in a total synergy between the public and private sectors.

In order to reform healthcare governance, improve its quality and efficiency, and reduce still significant health inequalities, this far-reaching reform will involve (i) a continued upgrade and expansion of the healthcare offer in a fair and equitable manner; (ii) a reduction of the significant deficit in human resources, strengthening their capacities and enhancing the value of public health service; (iii) a consecration of the regional dimension in the sector' management by positioning university hospitals as real driving engines of the region; (iv) the convergence of public policies on disease prevention and control; (v) consecrating the private sector as a real partner in this reform process; and (vi) the digital transformation of the sector through the creation of an integrated national health information system (NHIS)*.

B. Place of e-health in sector-specific strategies

The rapid development of new information and communication technologies in Morocco over the last two decades has had a major impact on several economic sectors, affecting the entire value chain of the sectors concerned. However, the situation is particularly different for the health sector which did not sufficiently benefit from the digital revolution to tangibly change, for example, hospital organisation, health professions and patient relationship.

Since 2008, the Ministry of Health's sector specific strategies have focused on the implementation of a computerised and integrated health information system, covering all of its missions and functions (ambulatory care, hospital structures, epidemiological monitoring and control, population health programs, medicine and pharmacy...). Despite the number of projects initiated to this end, the current information system

* Presentation by the Minister of Health on the reform of the healthcare system at the Government Council meeting of April 20, 2021.

remains largely incomplete, heterogeneous, fragmented, compartmentalised and poorly accessible. Following an urbanisation study that exposed the current system's weaknesses, followed by the development of a master plan, the Ministry has pushed back the prospect of an integrated information system to 2030.

Place of e-health in sector-specific strategies

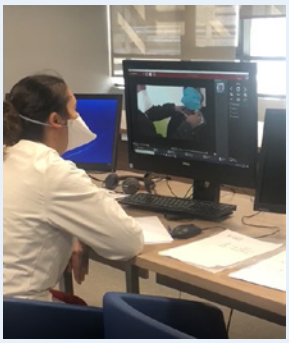
At present, a national program has enabled several regions to initiate projects for hospital information system (HIS) projects in order to catch up with the university hospitals, some of which have reached a level of maturity allowing for optimal care monitoring and information sharing between healthcare operators and managers of these structures. For its part, the Lalla Salma Foundation for the Prevention and Treatment of Cancer (FLSLC) has in this sense initiated a patient-focused integrated information system that is operational for oncology centres.

The first strategic patient-focused e-health measures, such as telemedicine promotion, the development of e-health or the design and implementation of the shared medical record, will feature in the «2025 Healthcare Plan».

The Moroccan Society of Telemedicine (SMT): a vanguard experience

Created in 2018, the SMT seeks to contribute to the development of the practice of telemedicine by deploying this channel in favour of populations living in disadvantaged and isolated areas. After a pilot phase, still ongoing and that covers 35 non-medically serviced health units, the extension phase should reach 123 priority communes by 2025.

- Satellite internet-connected equipment
- Handling of devices by nurses on site
- Tele-consultations provided by a teaching medical staff
- Several specialties covered
- 100% digitised processes
- Online prescription
- Online monitoring
- Integrated computerised patient file
- IS hosted in Morocco
- Free services
- Partners: MS, UM6SS, private laboratories



The telemedicine project, fruit of a partnership between the Ministry of Health and the Moroccan Society of Telemedicine (SMT), after a successful pilot project in 2019, is taking off to eventually cover more than 120 remote and poorly medically serviced localities.

In terms of e-health, a roadmap for the development of strategic projects has been drawn up. It identifies the priority actions affecting the legal, technical and governance frameworks, as well as technologies, systems, and management of change.

Though e-health transformation has not been operated in a tangible way, its importance was further amplified by the health crisis, to the benefit of the public at large and patients, creating an urgent need for institutional support in terms of health, technology, economics and ethics. Most particularly, it has become necessary to improve the patients' quality of life, organise healthcare and prevent inequalities in access to care, which inequalities are aggravated by the digital divide..

C. Covid-19 and the emergence of solutions dictated by the epidemiological situation

Although our national healthcare system was somewhat taken by surprise by the magnitude of the unprecedented Covid-19 pandemic crisis, as with healthcare systems around the world, including those in developed countries, it has shown great resilience and adaptability in the face of the hazards associated with a momentous and complex crisis. For example, according to WHO, Morocco's performance has enabled it to feature among the first 10 countries that successfully met the vaccination target.

www.wiqaytna.ma, launched on June 1, 2020, is a mobile application for Covid-19 virus exposure notification. Jointly developed by the Ministry of Health and the Ministry of Interior, in collaboration with the ADD, the ANRT and private companies' volunteer contributions, its aim was to strengthen the existing contact case management system.

www.liqahcorona.ma is a platform set up by the Ministry of Health and dedicated to electronic exchanges related to the coronavirus vaccine system. It answers the users' questions and allows them to obtain information on vaccination appointments, download their vaccine pass or certificate of exemption from vaccination, or declare an adverse event following vaccination.

www.tbib24.com is an innovative solution that allows the person to quickly locate a doctor and request a video consultation or book an appointment for an office or home consultation, in real time. The platform, fruit of a partnership between the MOH, the CNOM and the CNOMD, was set up at the beginning of the lockdown.

With the pandemic, the Administration's digitisation process accelerated to ensure the continuity of services. Digitisation is expanding to all sectors, including health where healthcare has been severely disrupted. Several public and private mobile platforms and applications have been created to maintain and even improve the relationship between the health system role-players. Information, sensitisation, appointment booking, tele-consultation, and sanitary passport are all services offered by these tools.

Decision-makers, caregivers and citizens are becoming increasingly aware of the value of better connected, reliable and secure health information. However, the adoption of new technologies in the health ecosystem has to contend with a context where the infrastructure is not sufficiently established, a situation further compounded by the lack of a digital culture among the role-players involved.

D. Digital transformation in Morocco: a godsend for e-health development

Digital transformation will enable Morocco to face its socio-economic challenges, but most particularly to improve the quality of public services, economic productivity and competitiveness, and reduce social and spatial inequalities. For the latter, digitisation can open up new perspectives by allowing disadvantaged populations to access information and social benefits, including healthcare services.

Healthcare digitisation opens up new perspectives thanks to the mass and volume of health-related data available. The development of electronic health records to facilitate information sharing and medical monitoring will improve patient care. Telemedicine will make it possible to redraw the health map and will enable a territorial rebalancing in favour of areas with low medical density. Mobile health applications will provide comfort to patients by encouraging their involvement in and commitment to their treatment and health journey.

E. An e-health conducive environment

To develop e-health, it is crucial to create a digitisation-conducive environment. Generally, this involves improving training programs for new digital professions, setting up the necessary infrastructure, adapting regulatory frameworks and, most importantly, fostering a digital culture in the country.

The challenge of a digital transformation in the health sector is also to convince and bring on board currently low digital users, particularly vulnerable populations that are generally most undermined by the digital divide.

Finally, the e-health project's success should be based on a participatory and patient-focused approach, mobilising all the e-health ecosystem players around the core player, the Ministry of Health, in order to take stock of the current status of actions already undertaken, the challenges and issues faced by each of these players, as well as their expectations and perspectives in this regard.

It is from this perspective that, by interviewing the e-health ecosystem's main players and by cross-referencing their views on e-health in Morocco, the present white paper has endeavoured to position itself in relation to issues of a strategic, operational, economic, cultural, technical, regulatory, ethical, security and governance nature.

This exercise, presented in the third part of this book, aims to identify a common culture that could serve as the foundation of a true national e-health strategy.

Breakdown of e-health actors in Morocco

The patient at the heart of the reflection process

Global E-health Market Research

Global E-health Market Research

A. How is the global healthcare market?

1. Segmentation, size and growth: e-health, a market in full expansion

The Covid-19 crisis has empowered digital platforms in directing healthcare. From the beginning of 2020, teleconsultation, remote monitoring and telemedicine solutions have effectively reduced foot traffic in hospitals and ensured great virtual closeness of the patients with their doctors.

E-health is defined as the use of information and communication technologies in the healthcare sector. The e-health market includes mobile health (mHealth), mobile devices, e-health and telemedicine, health information technology (IT) and personalised medicine. It offers various value-added services to patients, enabling them to benefit from early diagnosis of life-threatening pathologies and monitoring the progress of chronic diseases.

Segmentation

The e-health industry is segmented by product and service, component, end user, and region. In terms of product and service, the market is respectively classified into mHealth and eHealth. The eHealth category (service) is classified into electronic health records (EHR), vendor neutral archive (VNA), picture archiving and communications system (PACS), laboratory information systems (LIS), telehealth, prescription solutions, medical applications, clinical decision support systems (CDSS), pharmaceutical information systems, etc.

In 2020, e-health dominated the market in the products and services category and this trend is expected to persist during the projection period due to the triple increase in the prevalence of chronic diseases, demand for telehealth/telemedicine, and number of internet users. mHealth, on the other hand, is expected to witness considerable market growth due to greater demand for remote monitoring services and the rising numbers of smartphone users.[1]

By component, the eHealth market is divided into software, hardware, and services. By end user, it is fragmented into healthcare providers, payers, healthcare consumers and others.

1. https://www.alliedmarketresearch.com/

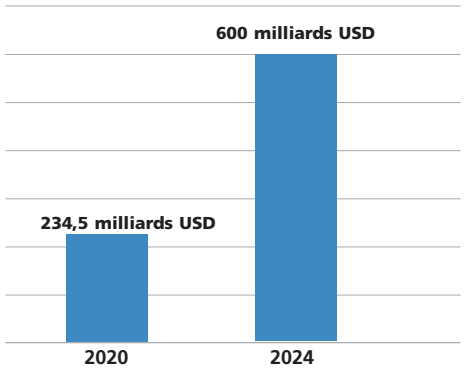
E-health: a very high potential sector

Size and growth: The e-health market is nowadays viewed by banks[2] as a high-potential investment environment. The high demand and adoption of preventive care, as well as the increase in funding for various e-health start-ups continue to drive this market's growth.

Patient data management, telehealth but also fitness and wellness applications, remote consultation or monitoring solutions via smartphones and interconnected health devices are all growth drivers in this field. Thanks to the sector's strong prospects, health technology trends can prove profitable when it comes to long-term investment strategies.

Today, the e-health market value is estimated at USD 234.5 billion[3], with projections around USD 600 billion in 2024, up 160% from 2019.

Size and growth of the e-health market



160% increase compared to 2019

The key driver of this dynamic trend will be **telemedicine**

Source: Frost & Sullivan

Data exchanged in 2020 can to be measured in tens of zettabits. In this growth segment, telemedicine will be a dynamic vector favouring strategic alliances. It will also be the cornerstone of e-health which will experience unprecedented growth and post an annual growth rate between 23 and 36%[4]. This activity will continue to be dynamic, irrespective of market trends.

However, the above-mentioned 160% increase must be nuanced in view of the large disparities existing between Europe, North America, Asia-Pacific, Latin America, and the MENA region. The table below highlights this continental fragmentation by showing which countries have achieved remarkable advances in health technologies:

2. https://www.credit-suisse.com/about-us-news/en/articles/news-and-expertise/long-term-investment-key-trends-in-health-technology-201807.tag*article-topic--sectors.html
3. https://store.frost.com/global-digital-health-outlook-2020.html
4. Idem

REGIONAL REACH				
North America	**Europe**	**Asia-Pacific**	**Latin America**	**MENA**
United States	Germany	Japan	Brasil	South Africa
Canada	Great Britain	China	Mexico	United Arab Emirates
	France	India		Israel
	Italy	Australia		
	Spain	New Zealand		
	Russia	Singapore		

This growth is undeniably linked to each country's innovation index level according to the World Intellectual Property Organisation's Global Innovation Index.

A very striking finding about e-health is the presence of a certain cognitive dichotomy in the reports and studies published as per the geographical scope of the research firms and ranking platforms.

2. Trends and outlook

The Covid-19 pandemic is expected to have a positive impact on the growth of the global e-health market. The pandemic has put a strain on healthcare systems across the globe and has heightened the need for developing healthcare information technology and remote monitoring services.

Thus, healthcare-related technological advancements and growing consumer demand for convenient yet effective treatment, coupled with a higher awareness of new technologies, are expected to not only drive the HealthTech market, but, more importantly, to bring out four salient trends in the sector.

A prospective study[5] for 2019-2023 shows that the e-health sector will not experience a crisis. The e-health market is multidisciplinary.

Therefore, one of the best categorisations[6] of health technology trends breaks them down into four distinct categories:

1. **Telehealth:** Telehealth provides health support and assistance using information and communication technologies (ICT). It essentially encompasses the electronic data exchange between health professionals (experts and practitioners) on the one hand, and patients on the other.

2. **M-Health:** m-health represents cell phone applications related to health and/or wellness. Connected mobile devices are also included in this category.

3. **Health Analytics:** health analytics cover the assimilation of bulk medical data and Big Data-based processing through software and the analytical capabilities of their algorithms.

5. https://store.frost.com/global-digital-health-outlook-2020.html
6. https://www2.deloitte.com/global/en/pages/life-sciences-and-healthcare/articles/global-health-care-sector-outlook.html

4. **Digitised Health Systems:** digitised health systems include elements such as massive data storage and secure, norm-based exchange of digitised patient records.

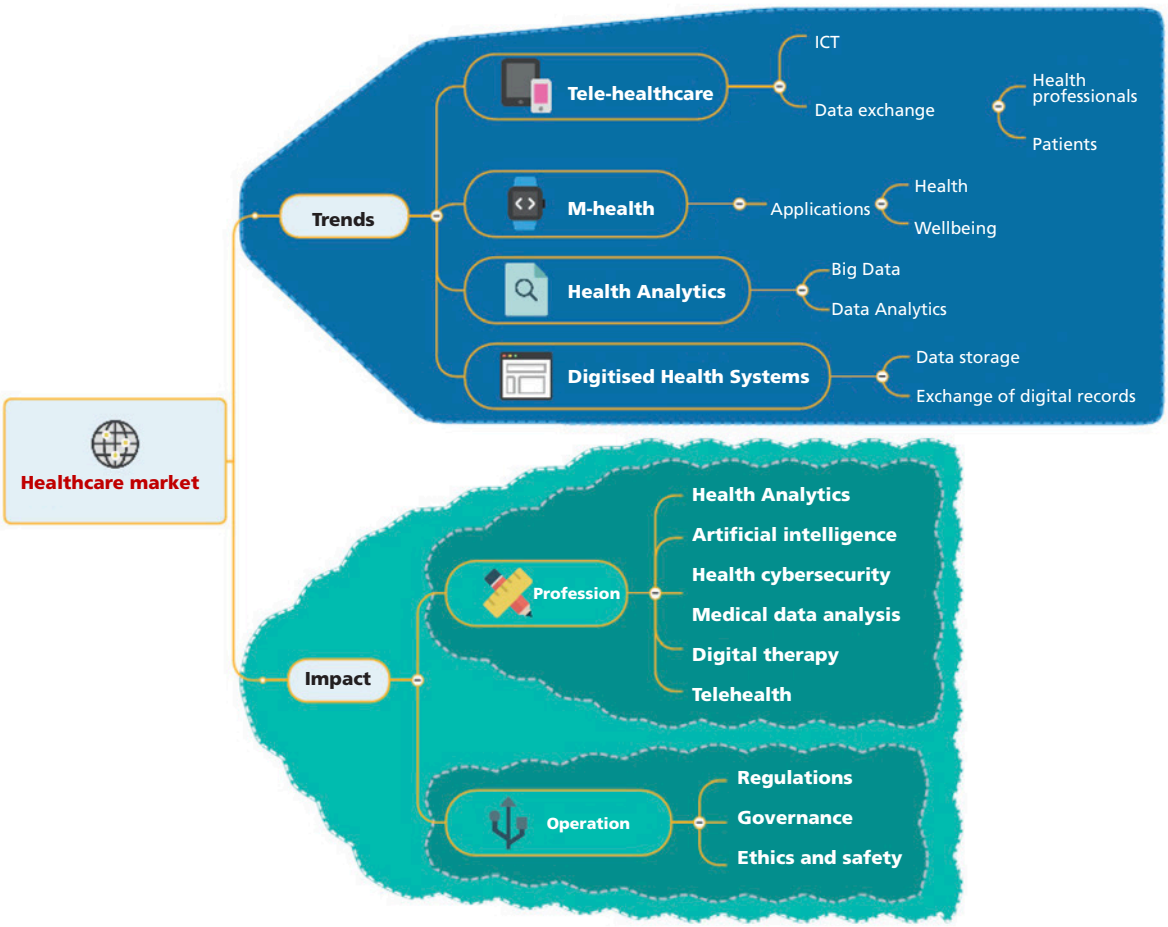
These fast-growing megatrends will strongly stimulate:

a. The development of new healthcare technology lines around the improvement of IT infrastructures (Cloud Computing, Big Data, IoT and AI), promoting and stimulating in all its aspects the growth of the e-health market in terms of:

- Artificial Intelligence;
- Cyber security in healthcare;
- Health data analysis;
- Telemedicine; and
- Telehealth.

b. The industrial exploitation of e-health, largely based on the massive processing of sensitive data, requires the authorities to reinforce suitable and structured foundations for:

- regulation;
- governance;
- ethics and security.



All studies affirm that AI technologies will reach maturity in the healthcare sector in 2030. The benefits of AI and digital platforms are already perceived in the areas of rapid and factual decision making, coordination of care pathways, simplification of exchanges between healthcare professionals, facilitation of administrative management and freeing up of medical time... These processes are based on the automated collection and analysis of large data volumes for beneficial cognitive use.

Global outlook on healthcare

All experts agree that e-health solutions herald a bright future for the creation of new care delivery models, job creation, a broader access to care, improved efficiency and added value for all stakeholders.

North America is expected to maintain its dominance in the e-health market. Besides the prevalence of chronic diseases there, this is owed to the presence of major HealthTech players (Allscripts Healthcare Solutions, Cerner Corporation, Cisco Systems, eClincalWorks, GE Company, Koninklijke Philips NV, Honeywell International Inc, Mckesson Corporation, Siemens Healthcare AG, and Qualcomm technologies, etc.), to the users' adoption of smartphones, and to advances in healthcare.

This said, Asia Pacific is expected to register the highest compound annual growth rate (CAGR) of 28.1% between 2021 and 2030, attributed to a growing geriatric population, demand for remote monitoring services, and the large number of internet users.

Changing habits

E-health has impacted the behaviour of healthcare professionals and patients by steering them towards new care models and supporting technologies:

- 72% of patients prioritize their personal health and wellness needs and goals;
- 60% of physicians favour a shift to prevention and wellness;
- 75% of patients want to partner with providers on care and health goals.

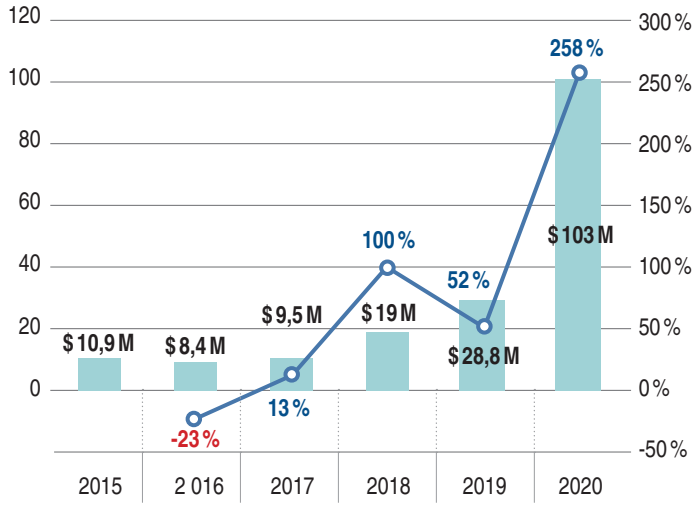
B. What about the African e-health market?

A 2020 High Tech Health study[7] estimates that the health technology sector in Africa is booming, especially after the increased investment in this sector spurred by the Covid-19 pandemic. The African continent has 180 start-ups active in health technologies out of a total of 397. This has triggered an exponential 258% increase in the capital of HealthTech start-ups during the 2019-2020 pandemic.

At the same time, investments continued to climb in 2020. E-health start-ups raised more than USD 103 million. Half of the funding allocated to this sector over the past five years was disbursed in the first half of 2020, reaching a record high since the start of the Covid-19 pandemic.

7. https://disrupt-africa.com/

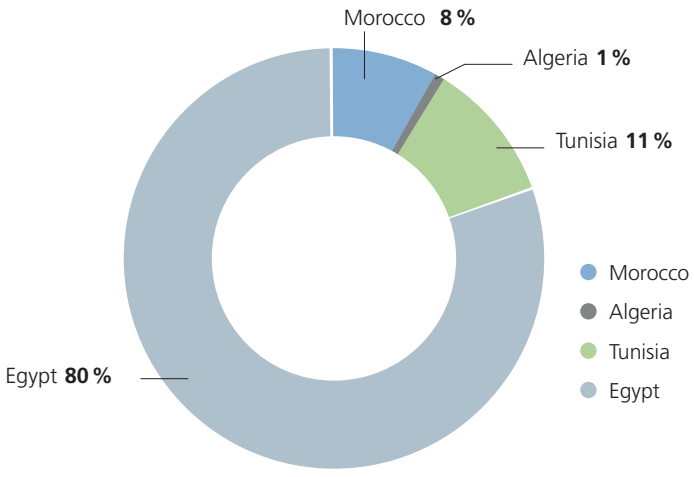
The graph shows the opportunities seized by African start-ups in the health technology sector. This has driven the exponential increase in HealthTech start-up capital to 257.6% during the 2019-2020 Covid-19 pandemic.



1. Morocco's positioning on the regional and continental levels

Regional positioning. Regionally, Egypt remains the major investment hub in tech start-ups[8]: since 2015, 80% of investments in start-ups in the North Africa region were attracted by Egyptian start-ups. In second position comes Tunisia which continues to advance in African rankings thanks to its reform of the Start-up Act[9] legal framework, enacted in 2018. Very attractive levels of support are encouraging foreign investors to take more interest in Tunisian start-ups.

Investment rate in technology start-ups in North Africa



Continental positioning. According to the Global Start-up Ecosystem Research Center[10] which publishes the Global Start-up Ecosystem Index on a continuous, dynamic and interactive basis, Morocco ranks 10th among African countries and 3rd in North Africa, after Tunisia and Egypt.

8. https://thebaobabnetwork.com/
9. https://startup.gov.tn/fr/startup_act/discover
10. https://www.startupblink.com/

International positioning. Specialised platforms and media place Morocco in the 95th position in world rankings (in red on the map). After two consecutive years of significant decline in global rankings, Morocco runs the risk of dropping entirely out of the world's top 100 in 2023. However, given its highly skilled human capital, Morocco can improve its ranking.

The Moroccan e-health ecosystem

The e-health (HealthTech) sector is linked to the digital, start-up, innovation and investment fields in general. One cannot dissociate e-health from the general context of these concepts. It would therefore be wise to look at the studies and analyses that holistically address these aspects.

In Morocco, the health technology environment is very modest, with only a few outstanding experiences stemming from isolated initiatives.

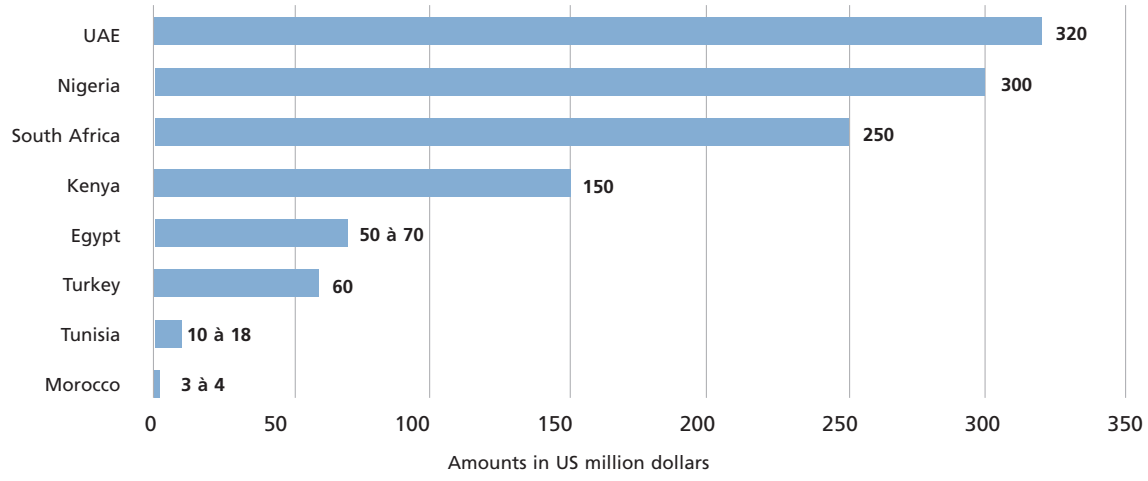
The top 10 African start-ups

The HealthTech sector in Morocco can be subdivided as follows[11]:

- Biotechnology: companies that develop new drugs, bio-diagnostics, cosmetics or new therapies;
- Medtech-Medical Technologies: companies that develop new medical equipment;
- Digital HealthTech: companies that develop services or software in the medical field based on digital technology.

Despite signs of progress buoyed by Covid-19, which prompted the creation of health technology start-ups, HealthTech in Morocco remains underdeveloped, and the overall ecosystem of start-ups generally remains below its potential when compared to a target benchmark:

Funds raised by start-ups



11. Start-up.ma

2. Doing Business & Innovation Index

Human Capital

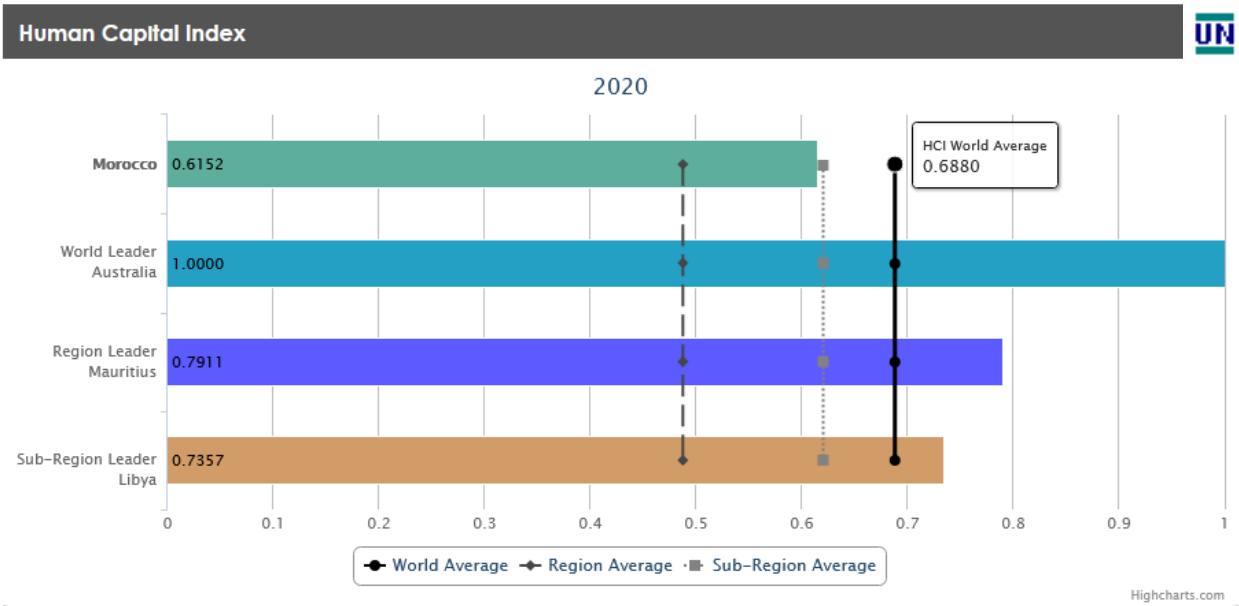
A biennial survey of digital development, conducted in 193 countries by the United Nations Department of Economic and Social Affairs (UNDESA), provides a comparative assessment of UN member states and provides an overview of Morocco's positioning from a regional and global perspective.

The UN-EGDI is based on 3 important dimensions of digital supply, namely:

1. Online service packages;
2. Telecommunications infrastructure;
3. Human capital.

The analysis of this assessment reveals that Morocco does in fact have significant capacities to achieve excellence, particularly in health technologies and in the digital sector as a whole. This potential lies in its human capital which could provide a source of innovativeness in Morocco (UN-EGDI & GII Score).

The Moroccan human capital index for digital[12] in general is above the regional average and closer to the



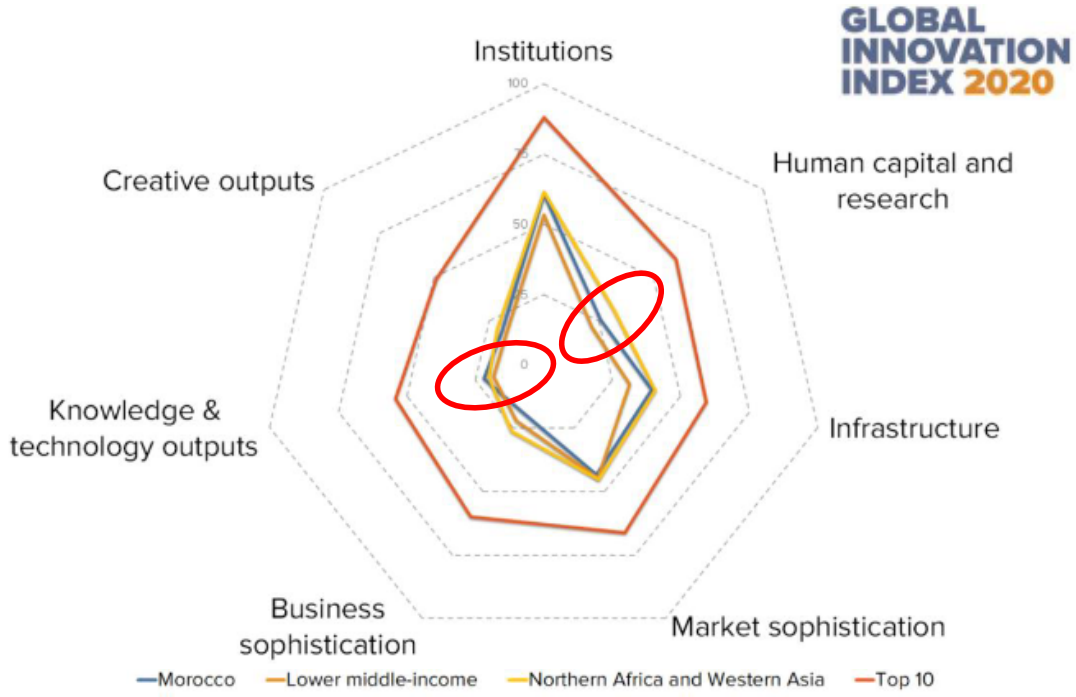
Human Capital Index	2020	2018	2016	2014	2012	2010	2008	2005	2004	2003
Morocco (Value)	0.61520	0.52780	0.47372	0.49010	0.44303	0.57393	0.54368	0.53000	0.50000	0.50000

Innovation

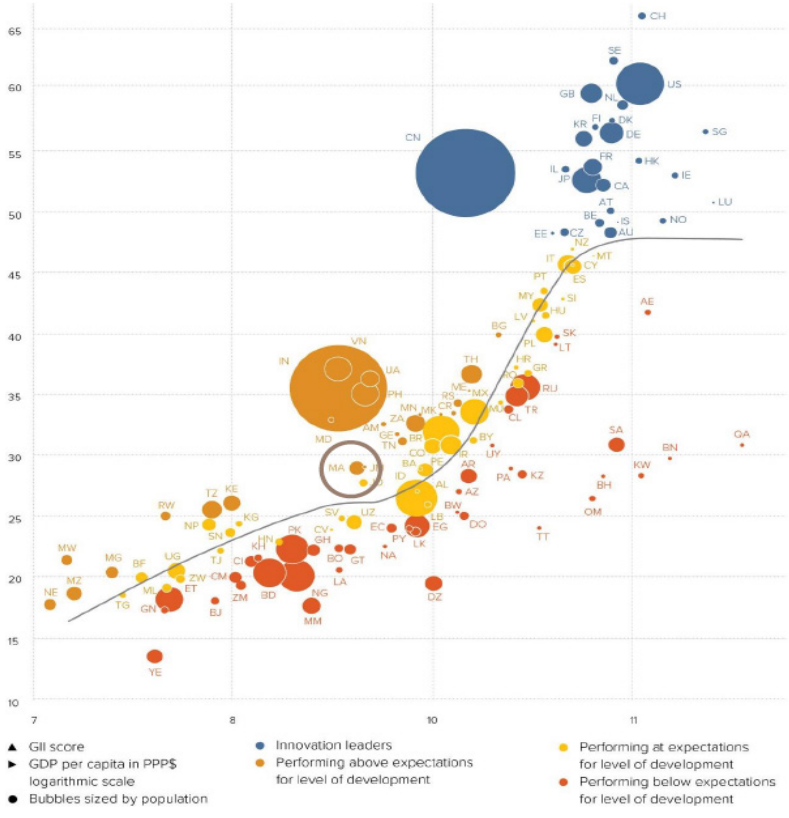
a. Global ranking. Generally, the start-up ecosystem in Morocco is considered an emerging innovation hub. The Global Innovation Index (GII) provides a diagnosis of Morocco's multi-dimensional innovation factors based on 80 indicators, to rank it 75th among 131 economies (a slight decline from 2019), as presented in the World Intellectual Property Organisation's 2020 report.

12. United Nations Division for Public institutions and Digital Government.

Morocco scores highest in knowledge & technology outputs, but its weakest performance, which can be considered an attractiveness let-down, lies in business facilitation (regarding investments in start-ups) compared to other countries in the region.



b.Expectations versus innovation performance (WIPO-GII). The bubble chart below shows the relationship between per capita income level and innovation performance (GII score). The trend line plot gives an indication of the expected innovation performance relative to each country's GDP. Economies above the trend line perform better than expected, and those below the trend line perform below expectations. Morocco's innovation-to-GDP performance is well above expectations for its level of development.



Source: WIPO-GII

3. Conclusion

- Statistics and rankings published by specialised international platforms are largely based on data published by countries and the referencing of national start-ups in these platforms. What is lacking for Moroccan start-ups is ecosystem liveliness.
- In the age of data, it is increasingly obvious that «influence» is now achieved through feeding media spaces (on and off) with the publication of studies and information via credible communication relays (professional platforms, reputable institutional sites, partnerships with industry leaders, etc.) allowing not only more impactful messages but also the promotion of a sensible ranking.
- It was noted from the studies and analyses of renowned organisations (UN and WIPO) that Morocco has an environment conducive to the emergence of made-in-Morocco HealthTech characterised by:
    - o a highly developed human capital that is closer to the world average (UN-EGDI);
    - o a higher knowledge and technology output (WIPO-GII);
    - o a GDP-relative innovation performance that is beyond expectations (WIPO-GII).

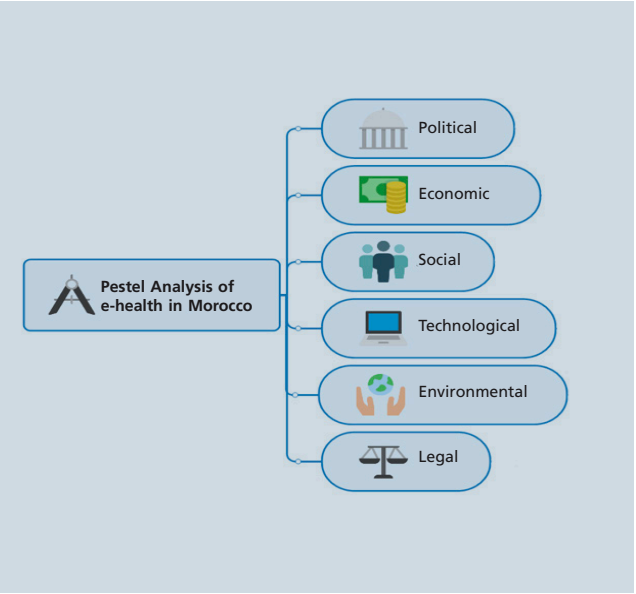
Yet, and despite all this, Moroccan start-ups in all sectors, including HealthTech, are not attractive for investors. This implies a low ranking for Morocco, hence the notoriously inadequate development of e-health in Morocco.

- It is obvious that attracting investors is not an easy task. However, the regulatory aspect and government incentives regarding this aspect have a major role in the eyes of the foreign investor;
- Despite the efforts of some institutional stakeholders, the spirit of entrepreneurship is not well anchored among young Moroccan graduates and even among employees willing to become entrepreneurs. This is owed to a lack of training and awareness;
- Innovation in e-health in Morocco would benefit from more encouragement and from being driven by public authorities.

C. PESTEL analysis of HealthThech in Morocco

The PESTEL method (Political, Economic, Social, Technological, Environmental and Legal) was chosen to analyse the macroeconomic impact of e-health at different levels.

The objective is to take a step back from our environment in order to identify potential opportunities or risks..

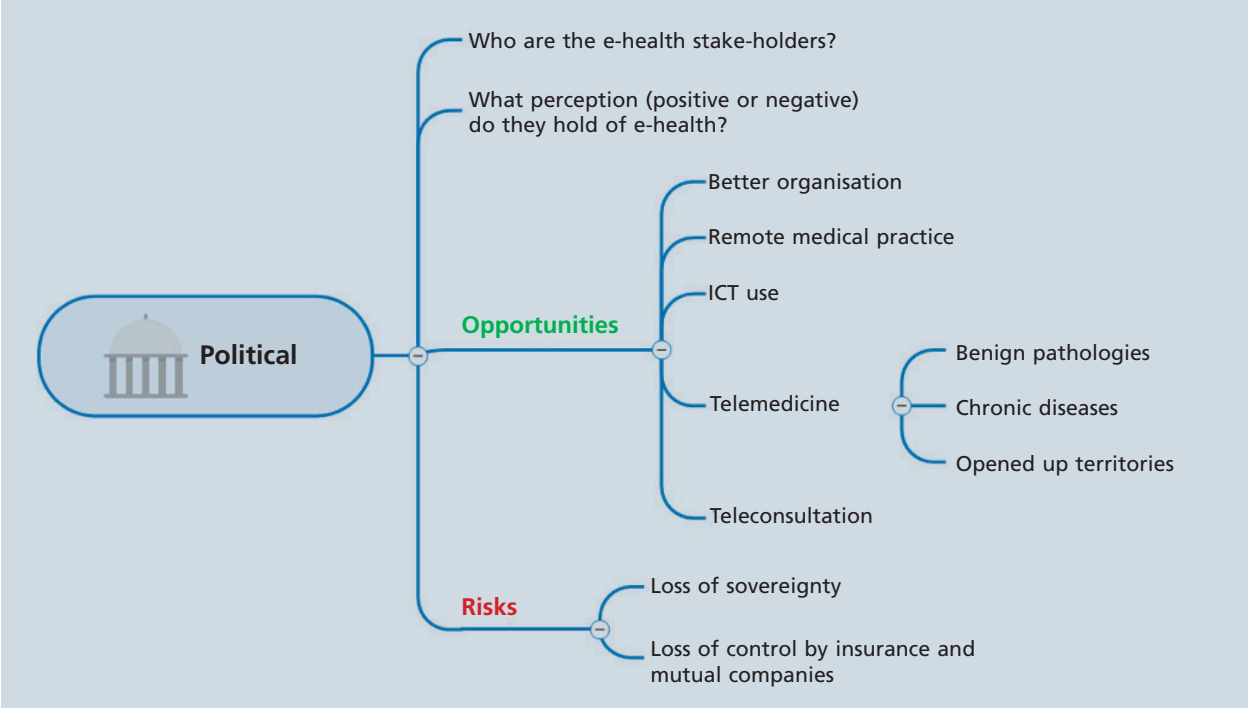


1. Political

The following two important points are noted under the political aspect:

- to identify the stakeholders of the topic under discussion: e-health;
- to measure their perception and expectations from the e-health project.

This is exactly what we have addressed in depth (interviews and surveys) with the stakeholders of Morocco's health ecosystem.



Opportunities

E-health provides vital strategic support in the organisation of medical procedures. It enables a response to the numerous challenges facing the system: the rise of chronic diseases, demographic changes, economic issues and new health and social challenges. Add to this the distinction associated with the image of a nation excelling in this sector.

Among the responses made possible through e-health are:

- Information and communication technologies (ICT):
  - digitisation of medical data,
  - optimised and efficient data exchange,
  - rapid access to the patient's records at any time,
  - coordination among experts, and
  - secure storage of the patient's data history.
- Telemedicine:
  - prevention of chronic diseases and hospitalisation needs,
  - reduction of face-to-face consultation constraints,
  - medical servicing of remote areas.;

- Tele-consultation:
  - patient empowerment,
  - building the patient's capacity for self-management,
  - automation of consultation processes,
  - optimisation of care pathways,
  - cost containment.

Risks

Health digitisation is considered a technological innovation sector that attracts foreign investors, favours the creation of start-ups financed by Business Angels or foreign funders, and sometimes even the storage of data in datacentres and clouds of foreign firms, hence the risk of losing control over the patient's/user's data.

Another risk to be mindful of, and not the least of all, is linked to certain private sector platforms used for the payment of teleconsultation fees, interoperable with insurance companies and mutual insurance companies. These platforms may become, among other things, masters of the financial data circuit.

2. Economic

Opportunities

According to the World Health Organisation (WHO), some 40 million new jobs are expected to be created in the healthcare sector worldwide by 2030. Jobs will be driven by technological and digital innovations in this sector.

Risks

The control of the data circuit by insurance organisations can lead to capital flight in the case of foreign platforms.

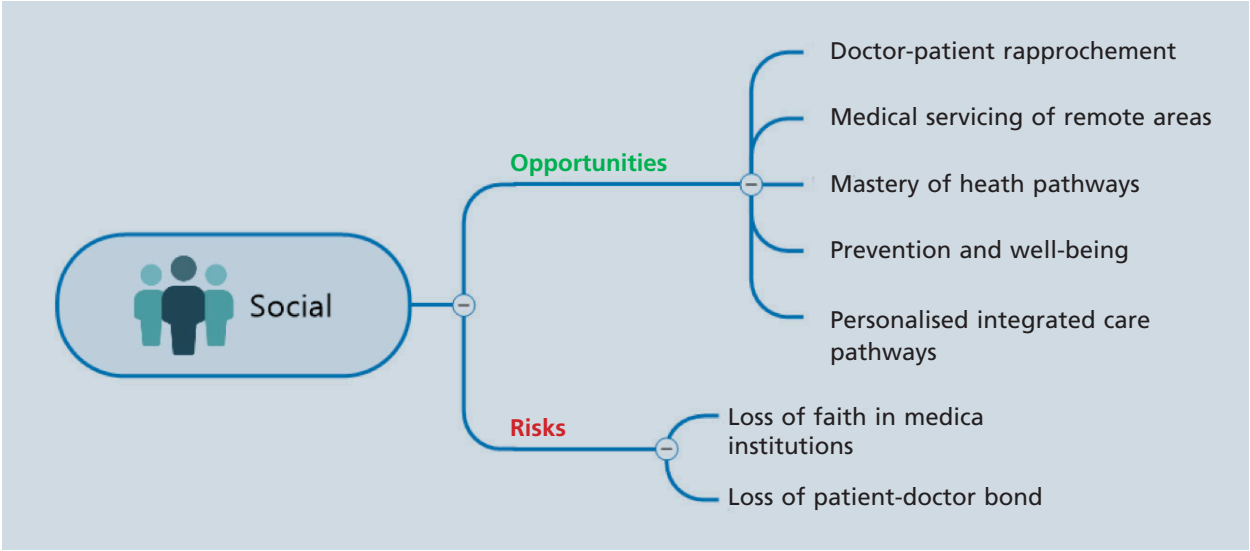
3. Social

Opportunities

- Contrary to popular belief, e-health will bring patients closer to their doctors and will encourage greater penetration in remote areas;
- E-health allows the control of the healthcare system through instantaneous information circuits, access and storage of medical data;
- Thanks to m-Health tools, e-health contributes to well-being and can prevent certain diseases.

Risks

- On the other hand, and as a result of successive medical scandals (contaminated blood in France, Mediator drug, H1N1 crisis in Morocco, leakage and theft of medical data, etc.), citizens end up losing faith in medical institutions;
- Through the excessive interposing of tools between patient and doctor, the human bonds are at risk of being gradually degraded.



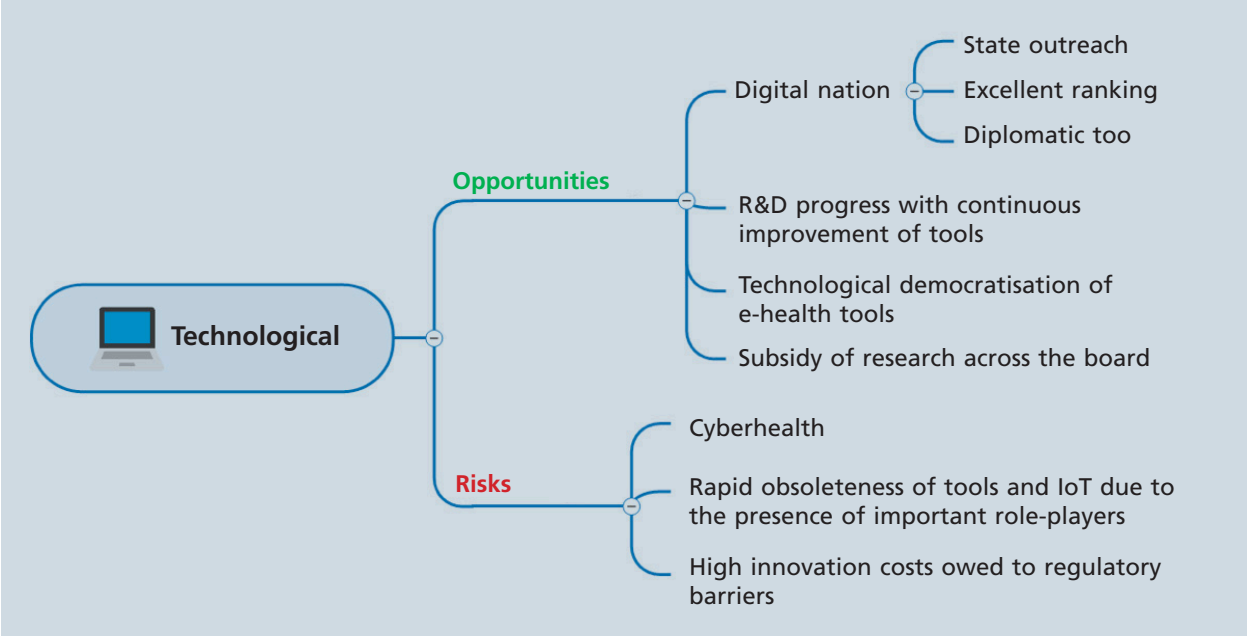
4. Technological

Opportunities

- All the conditions are met for Morocco to rise to the rank of a Digital Nation among developed countries in HealthTech (UN-EGDI & GII Score)). Accordingly, Moroccan know-how is likely to be promoted for export to the African continent and thus position the Kingdom as a real hub in health technologies.
- The structured, well-planned and sector-specific promotion of the digital ecosystem (incubators, catalysts, start-ups, etc.) by supervisory authorities can only result in a good international ranking of Morocco.
- Some small start-ups have become giants in the global technology industry, mainly in digital health. Governments of developed countries are using these start-ups as tools for diplomatic alliances with other developing countries.

Cyber risks

- Medical data are a major financial stake today. This fact has given rise to great enthusiasm on the part of Big Techs and Big Pharma, but also of cyber-pirates who can use this data in ways that divert them from their primary purpose and generate illicit and unethical gains. This situation gives an inkling of the extent to which governments must guarantee the security of their citizens' medical data by demanding traceability of data processing, hosting and use.
- The security of health data is more than ever before threatened by IT risks in all digital sectors. As soon as they are digitised, health data naturally become vulnerable to various types of computer attacks, in particular intrusions into information systems either for data destruction, encryption or theft purposes.



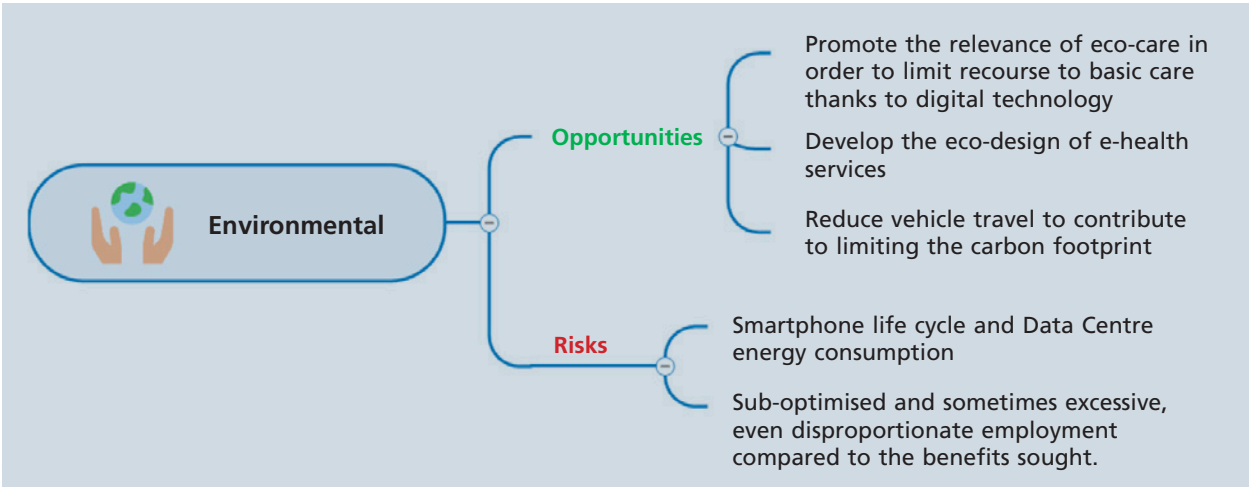
5. Environnemental

Opportunities

- Health technologies limit the use of teleconsultation to basic care: eco-care.
- Several start-ups are innovating by combining design and mindfulness of the environment: eco-concept.
- Teleconsultation results in less travel and less vehicle use: carbon footprint.

Risks

- The life cycle of smartphones and the exorbitant energy consumption of servers and data centres (data processing and storage) indicate a negative impact on the environment.
- Sub-optimal or even disproportionate employment, given the benefits sought by e-health start-ups



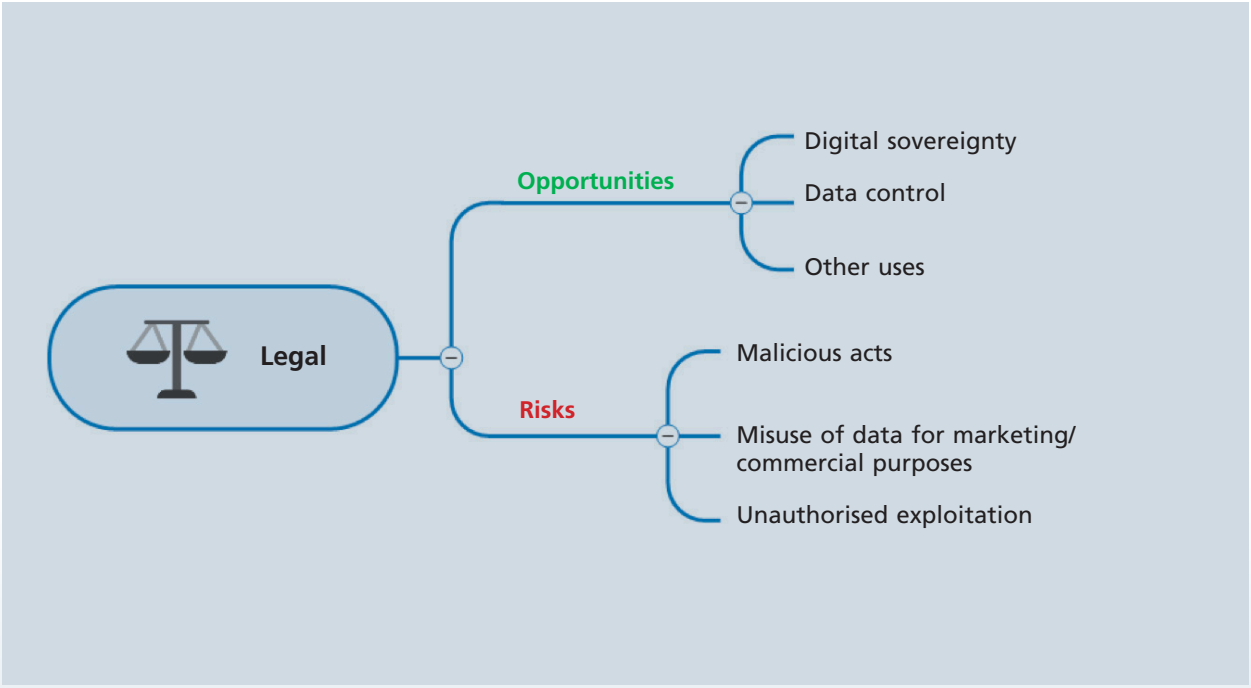
This component remains a determining factor in the promotion of e-health in particular and innovation in general. The regulatory part will speed up the embracing of e-health by health professionals, citizens and investors.

Opportunities

- One of the key challenges of e-health is digital sovereignty, i.e. when the country hosts its own data storage or Health Data Hub.
- The country's storage and hosting (without foreign outsourcing) of its own citizens' health data must be reinforced by technical security and by the protection of data use with rules and regulations.
- The cross-referencing of citizens' medical data goes beyond the prescription of appropriate care to promote new scientific advances.

Risks

- Networks of predation and misappropriation of medical data are proliferating on the Dark web.
- European teleconsultation platforms - which are well established - have been caught red-handed selling patient data files to marketing companies for unauthorised use.



Field interviews and digital surveys

Field interviews and digital surveys

Interviews with e-health ecosystem stakeholders, and online surveys on e-health in Morocco, conducted among healthcare professionals and patients/users, constitute integral and crucial parts of this white paper, intended as a tool of reflection on the reality of e-health in Morocco, but also a factual database with a strategic scope.

A. Interviews with private sector and institutional decision-makers

The interviews were conducted along the lines of an interview guide with a target audience of more than forty senior officials and decision-makers, including institutional representatives, public authorities, regulators, health care providers, insurers and financiers, manufacturers, professional associations, learned societies, international organisations, universities and training and research institutions.

- **General observation**

The current general assessment is that the New Development Model (NDM) and the generalisation of compulsory health insurance (AMO) present true opportunities for the development of e-health in Morocco. This development should be part of a broader framework for overhauling our healthcare system.

As a factor that accelerated this e-health development process, i.e. the digitisation of the medical act, the Covid-19 pandemic has revealed the technological inadequacy of the health sector compared to other sectors, notably the limited sharing of information between the different national data producers, and the deficit noted in the monitoring, reporting, planning, real-time decision-making and access to reliable and global information.

Role-players thus call for the immediate global and integrated digitisation of data generated by the AMO's management and regulatory bodies, as well as by the public and private healthcare providers, in order to build an integrated, solid and efficient national health information system (NHIS).

1. How is e-health perceived by the Moroccan healthcare sector's key players?

- **General perception**

There is a general perception among all the stakeholders interviewed that digital technology will help the health sector in becoming more efficient and more resilient, and in providing better services to the citizen. It will enable continuity of care across time and space, and will facilitate the collection, storage, processing, analysis and use of patient data to better control health and social care provision.

However, they also consider that the digital cannot replace an effective human presence. The role of doctors, nurses and midwives is very important, both to ensure the proper use of technology for health benefits and for the well-being of every patient.

For healthcare providers, while digitisation can improve remote screening and referral, optimize the mobilisation of human resources and ensure economies of scale for the deployment of certain specialties such as medical imaging or medical biology, it will not be able to replace close clinical examination (palpation in particular) or, even less so, manage serious pathologies. On the other hand, several stakeholders remain convinced that the use of IoT and connected medical devices embodies the future in terms of the surveillance and monitoring of chronic pathologies such as hypertension and diabetes.

For professionals and insurers, telemedicine, and particularly teleconsultation, has been most associated with the notion of e-health.

For the former, it is the professional solution most likely to offer global medical coverage given the insufficient number and inequitable territorial distribution of doctors, to overcome the unsafe use of general public telecommunication tools, and even to reduce service costs considering the potential savings that can be made on operating costs. At the same time, teleconsultation allows private practitioners to recover up to 15% of patients in their medical practices.

> ***Conceptually, it would be interesting for this white paper to put forth e-health as a way of bringing hope to people as to the bright side of digitisation, to allay their fears and anxieties about illness through rapid/digitised access to the healthcare system, and to the electronic communication of clear and important information for their health and well-being.***
>
> *Oumayma RAIMI-RODÉ, Program Specialist, UNICEF Morocco*

For the latter, telemedicine remains relevant to the current situation, but the online care offer is still non-reimbursable for the time being, due to the absence of a national reference pricing system. However, they remain open to the acceptance of certain procedures for reimbursement purposes, provided that telemedicine providers can adhere to the traceability of their services.

For the regulator, the Moroccan citizen is inclined towards the adoption of the digital, and there is no shortage of technical solutions and platforms. The determining factors remain the environment, the regulatory framework, the level of maturity, the availability and the support of health professionals.

- **Morocco's position**

Most of the parties consulted believe that Morocco could become a hub linking Europe and Africa in terms of e-health, and also an exporter of technology and expertise.
On a continental scale, Morocco is well advanced in terms of network infrastructure and internet penetration. It is also a recognised trainer and exporter of high-level IT skills. In terms of organisation, it does not lag far behind its northern neighbours who are ahead in investment volume and human readiness, which allows them to operate a faster digital transformation.
What is therefore proposed is to strengthen our digital sovereignty by encouraging Moroccan start-ups and by federating the national IS solution champions while consolidating the achievements of our digitisation strategy.
On the question of the «Moroccan» e-health model, the dominant response is that the model would be rather hybrid: innovative to respond to its own context but open to successful foreign experiences.

As for benchmarks, several countries were cited by the various players as successful cases in e-health. On a continental scale, some countries such as South Africa, Egypt, Botswana or the Seychelles are better placed than Morocco.

> ***The Fez University Hospital is one of Africa's most digitised health centres as it is equipped with innovative technologies at the technical platform level (pharmacy, laboratory, radiology, operating room, etc.), the latest generation full web HIS with the implementation of several interconnected modules covering all administrative, medical or paramedical activities.***
>
> *Pr. Faouzi BELHSEN, Deputy Director, Hassan II CHU, Fez*

Successful international experiences of healthcare digital transformation are mainly found in the following countries: Estonia, Denmark and Sweden. In these Nordic countries, technology solutions were prioritised to meet the identified needs of the local healthcare system. The USA, Canada, France and Israel can be considered to have advanced experiences in HealthTech. Spain and Kenya are examples of community health with integrated IS. Singapore is a global centre for remote medical care. France's model is seen as an example of teleconsultation pricing. The Canadian system (Quebec) is cited as a successful example of interoperability between all players. Spain, France, the Scandinavian countries, but also Thailand, are considered successful models in the implementation of the Universal Health Coverage system and the Shared Medical Record (SMR).

Oman is cited as a Middle Eastern country that has managed to integrate the IS of different strata of healthcare structures. Finally, South Korea's experience stands out for its high level of sensitisation and communication advocating the use of e-health services and avoiding conflicts of interest.

2. What is the current state of e-health in Morocco?

The overall observation reveals the existence of several initiatives carried out in recent years towards the development of e-health, but which, without a global State-led approach, remain isolated. For information technology professionals, several studies were conducted, but few actions were recorded at the strategic and operational levels. These studies consider that the increase in life expectancy, the rise in demand and spending on wellness, the rapid digitisation development, especially with the advent of Covid-19, the encouragement of telemedicine, or the adoption of INPE (National Health Professional Identifier) present opportunities for the deployment of HealthTech. On the other hand, poor connectivity in rural areas, poor IS integration, lack of interoperability and exploitable data sources, poor management of public hospitals, lack of training for health professionals, the absence of a unique patient identifier, and cybercrime are real threats to this development.

As far as the health information system is concerned, it remains poorly understood on the ground, with very little computerisation and difficulties in collecting and using data, scattered over several applications and information systems that are often redundant, resulting in a visibility that is often skewed in relation to reality, and in impacted planning.

Add to this the fact that outside of university hospitals, the public sector is lagging behind in terms of HIS and the corresponding technological infrastructure, and the absence of a long-term strategy for the implementation of remote medical practices in health centres.

Another observation is the lack of a national offer of proven software solutions that meet standards, forcing users to procure them from abroad with the additional effort of

adapting them to the local context, or even extensive overhauls of foreign solutions requiring heavy and costly investments.

However, there are some encouraging initiatives such as the launch of several experiments in local telemedicine, particularly those carried out by the SMT and the INDH, or the m-Health initiative of appointment booking for pregnant women in need of follow-up consultations.

The same goes for the UN agencies interviewed. Because of their proximity to the Ministry of Health in the implementation of their country programs, they affirm that the «e-health» accelerating factor has been identified as a priority for Morocco in the Global Action Plan launched in 2019. They note that the Ministry of Health has neither the organisation nor the adequate resources and needs more advice and support in e-health related actions. They point out the existence of several applications within the MSPS, each processing data related to a specific program without any interoperability between them, and the overload and multiplicity of data as well as the difficulty of extracting reliable dashboards in real time. In addition, due to a lack of digital literacy, practitioners still prefer to use paper for collecting and processing patient data. Among the obstacles to healthcare digitisation, they finally note the high illiteracy rate, particularly among the rural and female population, and failure to take into account gender specificities.

Integrated introduction of digitisation into patient circuits, from appointment taking to discharge

The situation differs for private health providers. Interviews with the heads of some foundations and large groups have shown that HISs have been set up, respect interoperability norms and standards and are integrated with all third-party systems (laboratories, medical imaging, etc.), that digital technology has been introduced in an integrated manner into patient circuits, from appointment taking to discharge, and that medical information is systematically coded, using in particular the new CCAM nomenclature for medico-economic studies and precise activity description. However, this does not apply to all private hospitals where the e-health adherence rate, according to their representatives, does not exceed 30%. Problems related to obsolete national reference systems (procedures, drugs, medical devices), material exchanges imposed to date by health insurers, and the lack of encouragement from telecommunication operators have been cited as major blocks to the rapid development of e-health.

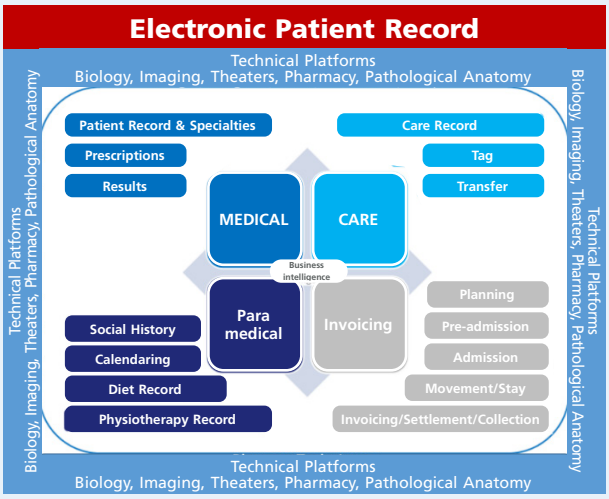
The Moroccan healthcare system must deal with numerous changes (demographics, medical density, and incidence of chronic diseases) in a context of insufficient specialised resources, particularly human ones. The contribution of digital technology and artificial intelligence can help in the short term in reducing inequalities in access to quality care, increasing healthcare pathway coordination, and promoting a paradigm shift that will make it enable a gradual move towards 5P medicine (personalised, preventive, predictive, participatory, and proof-based medicine).

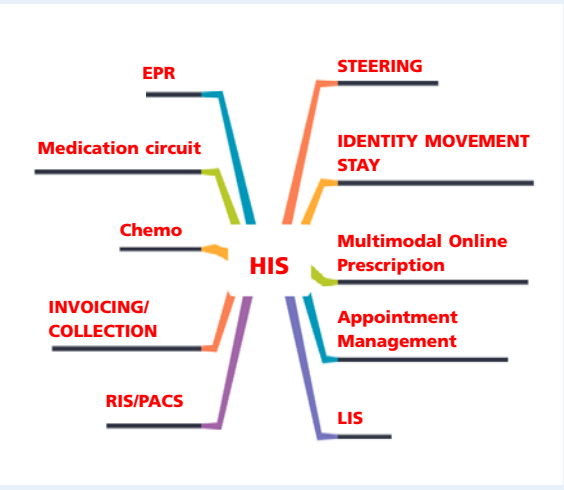
Cheikh Khalifa International University Hospital: 4.0 Generation Hospital

CKH entered the digitisation era by deploying a patient-focused Hospital Information System that is evolving towards the logic of sharing, integration and openness to partners.

This solution is built around an electronic patient record around which the hospital's functional bricks revolve. The electronic patient record is put together by collecting information on a need basis during the various stages of the patient's care process, from reception to the follow-up of the patient's care pathway, including the management of the medication circuit and relations with payment agencies.

- ***Improving the quality of patient care and care pathways***
- ***Paperless objective for all hospital departments***
- ***Promoting communication among healthcare professionals***
- ***Improving productivity and optimizing costs***
- ***Reducing the average appointment time***
- ***Maintaining indicators and dashboards to inform decision-making***





As regards training and research role-players, it was noted that for private universities the e-health axis is considered as priority in training and applied research among students and doctoral researchers. E-health, medical informatics, telemedicine, health-applied big data and artificial intelligence, virtual and augmented reality, entrepreneurship and innovation in health-tech, etc., are all introduced into the curricula of major pre-service and continuing education programs.

Additionally, promising projects were noted at the level of some public university hospitals (cf. call for projects, Annexure 5) requiring further encouragement.

3. What are Morocco's e-health challenges?

• Positive challenges and impacts

Overall, all the interviewees described the positive and multidimensional challenges facing e-health:

1. In terms of health, the sector's digital transformation would allow for a better understanding of the epidemiological transition, the aging of the population - thanks to improved monitoring and control of chronic diseases of which the prevalence continues to rise, the promotion of patient therapeutic education via information platforms and self-care interventions;

2. at the professional level, the improvement of care quality and safety, the patient's experience and participation, and the personalisation of care generated through e-health would contribute to strengthening confidence in the services provided by the health sector;

3. at the territorial level, e-health would make it possible to overcome difficulties linked to a shrinking medical and paramedical population and to reduce inequalities in terms of access to care, to the benefit of remote populations, particularly through remote therapeutic monitoring;

4. in terms of economic stakes, health care organisations should build their economic capacity in order to guarantee the sustainability of their services. With remote monitoring, preventive medicine could significantly contribute to the preservation of the citizens' health and consequently minimize the impact on the finances of health insurance management organisations. Moreover, the development of e-health could constitute a new growth opportunity for national companies;

> ***Digitisation in health is not a luxury but a real necessity in the sense that it has been proven that health facilities that opted for an HIS have significantly reduced mortality and morbidity.***
>
> *Pr. Mhamed HARIF, Director of TTA CHU, Tangier*

5. finally, in terms of rationalizing resources and lowering informational discrepancies between professionals and patients, e-health, through the critical role of Hospital Information Systems and Health Information Systems, or telemedicine, AI, BD and IoT, would contribute to a better rationalisation of medical resources (human and material), to informing size infrastructures decisions and to anticipating health product supply needs.

• Key success factors

To achieve success in healthcare digital transformation, we have identified several prerequisites and key factors that we summarised according to the desired four types of maturity:

– Technological maturity through the broad development of health information systems that ensure comprehensiveness, reliability and real-time access to data, with the re-engineering of health «business» processes as a key step. Priority should be given to healthcare institutions that do not have an information system allowing patient identification, service traceability, activity management and care coordination at all levels of the territory. The interoperability of information systems and the unique identifier of insured persons and

healthcare providers were equally considered important, along with the importance of strengthening telemedicine and developing e-health platforms. Finally, it is recommended that any IS project should integrate the various stakeholders from as early as the design phase, thus facilitating its adoption and minimizing the risks associated with interoperability.

E-health is not a matter of technology, but above all of the way in which innovations steer healthcare organisation towards greater efficiency, for the benefit of patients and healthcare professionals alike."

Franck Laureyns, Founding Director of Healthcare 360

– Societal and cultural maturity by supporting the cultural transformation of citizens who are not yet accustomed to using transparent and rigorous processes supported by new technologies, on the one hand, and of practitioners who still see the HIS as a burden in the absence of incentives, on the other. Therefore, the empowerment of health care personnel is of paramount importance for the proper conduct of remote care, both technically, for the optimal use of technological platforms, and relationally, in terms of knowing how to communicate with a patient via these interfaces.

Telemedicine lies first and foremost in the patient's consent and the physician's commitment.

Dr. Mohammadin Boubekri, President of CNOM

– Legal and institutional maturity through a legal framework that encourages technological initiatives, builds confidence in digital solutions and between doctor and patient, and facilitates access to information, particularly institutional information. Insurers have particularly raised the prerequisites of the completeness of care producer repositories, the convergence of support care baskets towards a solidarity basket, the reform of the public hospital and the full adherence of players. Professionals, for their part, emphasize the crucial prerequisite of pricing (National Reference Pricing -TNR) for e-health procedures, which will make it possible to organize this practice and promote its use among doctors and patients.

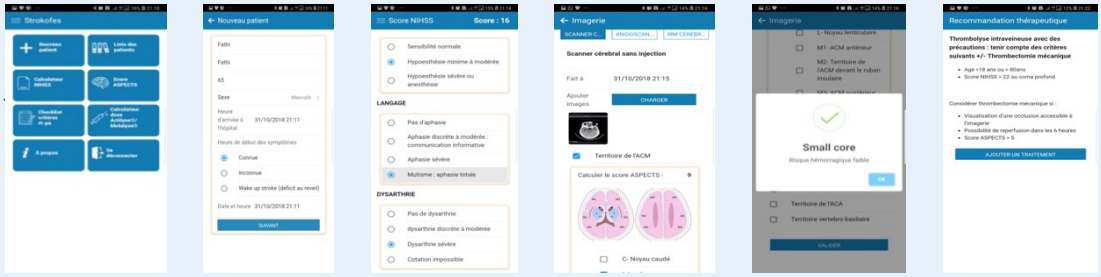
– Economic maturity, through the expansion of public investment in e-health to allow specialised operators to enter the market; the involvement of the private digital industry in developing a national local software offer, including those dedicated to medical coverage; the development of research and innovation know-how in order to be less and less dependent on foreign turnkey solutions (costly and not sustainable); and the cost control of digital solutions, particularly those of management, maintenance and sustainability.

The strategic priorities of Morocco's e-health plan will have to be decided on based on their high-impact contributions to the Moroccan health system's «ills». All health systems in the world are making hospitals their priority in terms of digitisation, and patients will be key players in the organisation of tomorrow's healthcare. Finally, the existing literature testifies to the crucial necessity of training healthcare professionals in digitisation.

Applications to improve patient management

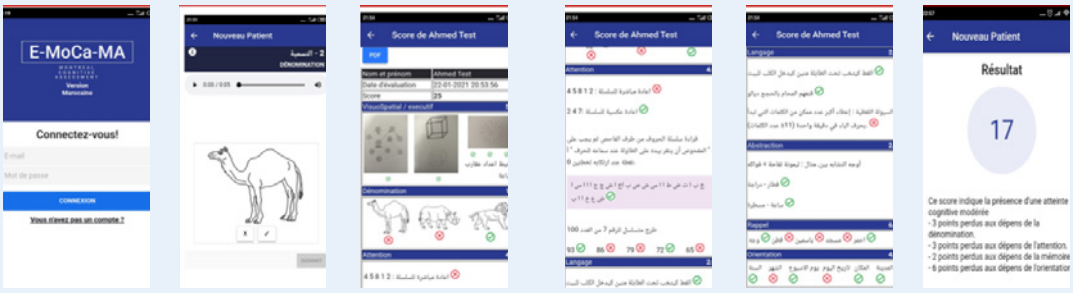
- **Thrombolysis application**

  This is a smartphone application that helps with thrombolysis decisions for all practitioners. The user has to capture the clinical and radiological data of the patient. The system proposes a therapeutic approach to the user and provides the possibility of asking an expert opinion in a secure way. The application proposes a score and dose calculator to be used depending on the patient's weight and thrombolytic molecule used.



- **Scoring application for evaluation of patients with cognitive disorders**

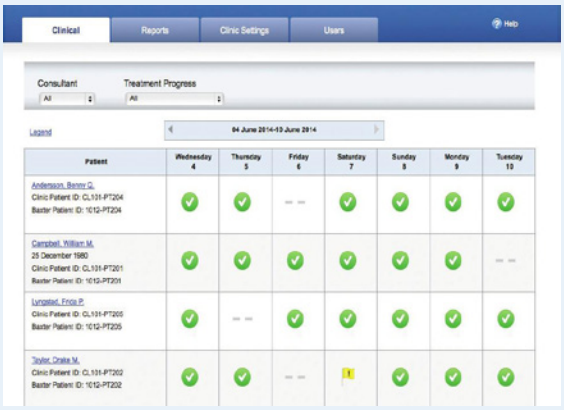
  This application can be used on a tablet or smartphone and makes it possible to perform the MoCA cognitive assessment test, translate, adapt and validate it in Arabic dialect. It helps the user with the scoring of the patient, storing patient data, performing several tests throughout the patient's evolution, and comparing test results.



- **Remote monitoring of peritoneal dialysis patients in the Fez-Meknes and North-East regions of Morocco**

  The Nephrology Department of the Hassan II University Hospital in Fez currently treats about 50 patients with chronic end-stage renal failure by peritoneal dialysis. In collaboration with a specialised multinational company, two-thirds of the patients have benefited from new equipment allowing automated peritoneal dialysis and a telemedicine system without the need for an internet connection. This has reduced the need for patients to travel to the hospital as monitoring and

treatment adjustments can be made remotely on the equipment. The patient is informed of the changes via a dialogue screen and gives his consent by simply pressing a button. A monitoring station has been installed in the nephrology department of the university hospital to follow-up on all patients.



4. What are the e-health risks and what type of regulations for Morocco?

• Risks and security

According to all the interviewees, the protection of personal data remains an issue of utmost importance as to health digitisation, thus necessitating collaborative and close partnership with the CNDP. Among the risks highlighted are the exchange of confidential patient data and their storage via non-secure phone messaging applications; the hosting of health data outside Morocco; the non-consensual exploitation of Big Data by digital giants (GAFAM); the illegal marketing of platform-hosted data; quality defects or fraudulent alterations of connected objects (IoT) that can jeopardize patients' health; the unjustified circulation of personal medical data between several stakeholders that could arise in parallel with the generalisation of health coverage; incomplete, unreliable or erroneous information that may alter data quality; or the digital divide, particularly the one related to gender or the rural world.

To minimise the risks associated with e-health, foster digital confidence and accompany the sector's digitisation, stakeholders concur that it is necessary to establish solid mechanisms for the security of information and data generated by health activities, starting with the compliance of all healthcare providers with Law 09-08 on the protection of personal data and the implementation of Law 05-20 on cyber security. Also mentioned as important factors are the national sovereignty of digital solutions, networks and hosting to ensure information system security and sustainability, the security of patient/doctor exchanges, and the security related to the use of connected objects.

For AMO management organisations, expected to become the main aggregators of health information flowing from the generalisation of medical coverage, it is necessary to provide information security systems such as data encryption, management of access rights and authorisations, and management of electronic signatures and stamps.

The CINE number is proposed as the only reliable and universal identifier for patient and professional authentication. The shared medical record, with an identifier and a code, would allow each stakeholder to use data according to his authorisations as per his profile/status.

For technology operators, a balanced approach is emerging. They propose a step-by-step risk assessment throughout the patient's care pathway, drawing a distinction between what requires protection and what can be shared in open data to feed an open, alive IS with up-to-date data, and to anonymise the Shared Medical Record to secure data and turn it into a tool for scientific exploitation. The Ministry of Health and Social Protection must therefore work with the relevant partners, in particular the CNDP and the DGSSI, to identify confidentiality levels and set a clear framework for sensitive data and how to manage them, while leaving the door open to the introduction of new technologies.

• Regulation and governance

To ensure e-health development while limiting risks and improving security, issues related to regulation and governance were vigorously raised by most of the role-players interviewed. Three, more or less disruptive, approaches have emerged:

- A clean-break approach that calls for the implementation of an e-health specific legislative and regulatory framework, with a customised regulatory system (specifications, regulations, supervision of role-players, patient protection, etc.). It also proposes the establishment of a regulator in the form of a National e-health Agency, NeHA. An independent, autonomous, transparent body with the skills, authority and means to regulate the e-health ecosystem. This agency would be responsible for (i) federating, coordinating and regulating the entire ecosystem; (ii) proposing a clear normative and regulatory framework; (iii) certifying the solutions marketed in Morocco; (iv) certifying the so-called «digital» hospitals, as per the example of the French «Hôpital numérique» program; (v) meeting the requirements of generalised medical coverage by considering the mandatory nature of health information systems within institutions as a guarantee of transparency and competitiveness; (vi) aggregating and opening up certain data for anonymous use as part of a national open data initiative.

An evolving intermediate approach that proposes head of government level leadership, with a strong involvement of relevant structures

- An intermediary evolving approach that advocates a head of government level steering with a strong involvement of the relevant structures for a common and integrated vision. It is proposed that governance be articulated around 4 pivotal departments: (1) Health/ANAM for the referential aspects, coordinated care pathways and the involvement of care providers; (2) the Interior/ANR (RNP and RSU) to accompany the transformation of RAMED into an insurance scheme (AMO); (3) Economy and Finance to monitor the financing of infrastructure and prepare the transition of AMO and mutual insurance organisations; (4) Digital Transition/ADD for the design and deployment of a national health information platform and for the emergence of a national software development offer. Add to this the CNDP support for patient data protection, and of the ACAPS to ensure coherence between the schemes and the SGG about the legal framework of intended reforms. The creation of an EIG is also recommended to manage the platform, authorisations, connections, updates and specifications, billing, etc.

Interoperability in e-health

#ADD
Agence de Développement du Digital

Interoperability is a national project of great importance for the provision of e-government services in Morocco. Indeed, the interoperability platform represents a basic foundation for inter-administration information sharing and reorganizing administrative procedures to further simplify administrative processes and ensure the continuity of e-government services.

Therefore, the Digital Development Agency has set up an interoperability platform allowing the totally secure exchange of data among administrations. Moreover, the health system digitisation is a major project around the world. With the rise of digital technology, the healthcare system is undergoing a profound mutation that requires all players to rethink their operating modes and propose new forms of care that allow data exchange between various stakeholders (healthcare centres, regulators, social security and insurance organisations, etc.).

In fact, in e-health, the ability to exchange data is fundamental since it is a condition for the proper coordination of care and patient follow-up.

Thus, the interoperability of the healthcare ecosystem players enables:

- *Better care coordination: with access to data, clinicians can more easily access a patient's vital health information, resulting in fewer repeat tests, preventing inadvertent therapeutic interactions and reducing communication errors.*
- *Higher performance: when data can be exchanged easily, it can also be correlated and analysed. Interoperability allows organisations to study data trends and make improvements based on real statistics.*
- *Better experiences: interoperability improves the patient's experience and modernizes the internal workings of the healthcare ecosystem.*

In the Moroccan context, the interoperability platform will enable interactions between the different information systems of the organisations involved in a patient's journey. This will facilitate the digitisation of the patient's treatment processes by allowing the exchange of:

- *Patient identification;*
- *management and monitoring of the patient's records;*
- *management of the patient's transfer from one care entity to another;*
- *management and follow-up of test results, radiology/imaging, etc.;*
- *dematerialisation of the reimbursement process;*
- *Automatic tracking for insurance companies and social security organisations of the insured persons' visits to healthcare providers.*

- A continuity-based approach that favours the establishment of a framework made up of experts in various disciplines to discuss appropriate regulation and assess the current status of DATA governance, while capitalizing on the current national framework of information systems security (DGSSI, law 05-20…) and on the respect of medical and patient data confidentiality (CNOM, code of ethics, CNDP, framework law 09-08, Penal Code…). On the other hand, no interest is perceived in a regulatory entity, a role that can be played by the ANAM, public managers of health insurance or even the ADD, as was suggested in some interviews. For the latter, it would be possible to coordinate the actions of HealthTech role-players, provide the interface and instil a culture of respect for patient DataHealth by allocating the necessary means and resources. It could set up standards to label health IT solutions, at the request of the sector, and propose initiatives in governance and standards in the development of e-health public services, interoperability and integration.

In addition, it is advisable to consult, upstream of each regulation/regulatory project, both health and digital technology professionals, to ensure that the role of regulation is to accompany and not to sanction innovation in the health field.

5. What are the perspectives and main expectations of each party?

• Prospects and innovative projects

In light of this observation, it is clear that e-health development is very much present in the minds and strategies of the ecosystem players who are profoundly aware of the challenges that this sector holds. However, it is now time for action, and this is what we have raised with the various interviewees by taking stock of the innovative projects underway and their prospects.

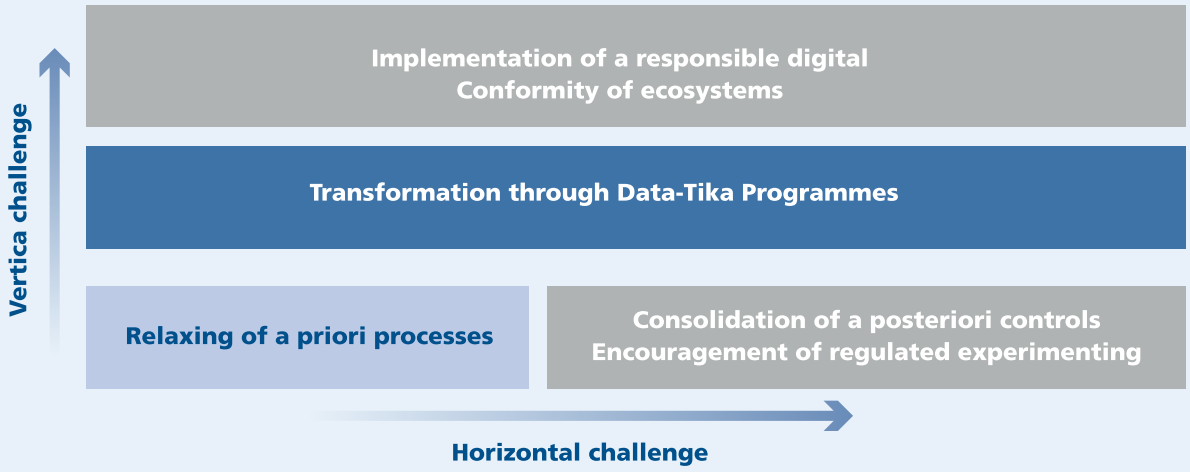
For public authorities and regulatory bodies, we note the project launched by the Department of Health to create the HIS in the Kingdom's 12 health regions, taking into consideration the prerequisite of interoperability with the existing HIS of university hospitals, as well as the ambulatory IS. The aspect of interoperability is also topical within the ADD where experiments are being conducted between healthcare providers and managing organisations. The ANAM, in partnership with the MHSP, the CNOM, the CNSS and the CNOPS, is experimenting with a pilot project in the Fez-Meknes region for the medical expense control of AMO. This consists in introducing «the coordinated care pathway» for patients with long term illnesses, based essentially on «the shared electronic medical record». In order to accompany the ecosystem players and understand their expectations and vision of development, the CNDP is deploying its DataTika programme and creating a «Health Group» within its organisational chart.

DATA TIKA : For a responsible digital

Because the protection of personal data is not an end in itself, but an essential means to build a Responsible and Developed Digital, the CNDP has been deploying the DATA-TIKA programmes since 2020 (الثقة في المعطيات).

The CNDP's two objectives are to reinforce the compliance of ecosystems and to understand the partners' data-related problems and issues before proposing regulatory elements.

Today, the CNDP has two operational issues and they invariably apply to e-health. For the e-health ecosystem, the CNDP is committed to dealing with some experiments while ensuring compliance by all stakeholders.



Thus, on August 26, 2021, the CNDP signed an agreement with the Ministry of Health to join the DATA TIKA program. In terms of personal data protection, this program provides for the consolidation of the Ministry's ecosystem and biomedical research, as well as capacity building around telemedicine, genomic information, medical information protection mechanisms, as well as the simplification of compliance processes (Clinical Investigation Centres, bioequivalence centres, research sites ....).

On November 23, 2021, another DATA TIKA membership agreement was signed with the CNOM.

All players in the medical and e-health sectors will be approached in order to strengthen the climate of digital confidence in these strategic sectors.

AKDITAL operates a digital shift in position and creates the electronic health record

Akdital is one of the largest private health groups in Morocco. To develop its EHR platform, scheduled for launch in 2022, the group has involved its medical staff in all departments by targeting their needs.

To ensure traceability, legibility and historisation of all patient information at all times, it is has been upgrading its IT equipment with All-in-one PCs, tablets for care professionals, PDAs, patient wristbands with QR code, label generators with QR code, barcode & QR readers...

On the healthcare producers' side, mention must be made of the implementation in the Cheikh Khalifa Foundation hospitals of a complete end-to-end HIS with the elimination of the paper circuit and the obtaining of the quality HIMMS Certification, as well as the progressive transition to personalised medicine via the use of AI and BD. To overhaul its information system and create a 100% Moroccan HIS, the Sheikh Zaid Foundation mobilised a development team of about 30 persons. The Akdital Group followed the same approach for the development of a proprietary, low-cost and completely autonomous software. For its part, the Oncorad Group upgraded its two remote pathology diagnosis platforms, DataPathology and TecRad, a remote radiology examination platform. In the public sector, the new Tangier University Hospital was designed as a digital health facility.

TECRAD GLOBAL: a cooperative tele-radiology platform

Created in 2018, TECRAD GLOBAL has become the first Moroccan cooperative and international tele-radiology network. It brings together radiologists of different nationalities organised by specialty, including an emergency specialty, and delivering diagnoses to a dozen institutions.

Practiced outside the hospital, tele-radiology guarantees care continuity and the relevance of the diagnosis thanks to the sharing of information among health professionals. Suitable for emergency situations, it also resolves the situations of extended waiting experienced in «medical deserts» for a report to be drawn up.

To guarantee accountability in service, a governance and ethics committee oversees the service's quality approach and ethics. The data is transferred in encrypted form and anonymously and is hosted on a secure server installed on the company's premises.

For managing organisations, the major challenge is ability to digitise exchanges and to identify in a unique and secure way each role-player in the medical coverage ecosystem. The CNOPS has therefore designed a platform for digitised exchanges and interoperability associating all existing information systems. CNSS, as the main manager of the AMO and aggregator of medical information, wants to position itself as a versatile health player in terms of the processing, sharing and multidisciplinary operation of HealthData. It also intends to encourage its partners who are committed to digitisation, as well as the use of connected objects and IoT in the context of personalised medicine. Representing digital technology players, the APEBI has engaged discussions to promote and organize the HealthTech ecosystem. To do so, it wishes to map operators and the solutions proposed by Moroccan start-ups, and contribute to interoperability development, digitised healthcare pathways and player maturity in general.

With regard to UN agencies, we note in particular the efforts of the UNFPA to improve the care extended to pregnant women through the promotion of the «self-care» approach. The target population is invited to actively participate in the process through mobile applications set up within the framework of the digitisation of health centres. Programs to digitise the monitoring of women victims of violence have also been implemented. UN-Women is poring over a digital solution for the prevention of violence against women.

> ***Digitisation can contribute to improving women's health, the quality of healthcare services, conditions of access to healthcare, accountability, women's empowerment and cost reduction.***
>
> *Louis Mora, UNFPA Morocco*

In terms of training and research, we noted the desire of the CNOM to incorporate the training of doctors on e-health as part of their continuing education. The UM5R's newly created Centre for Innovation in e-health (CIeS), in partnership with the Institut Supérieur des Sciences de l'Ingénieur (ISSI), is launching an Executive Masters in e-health. Several applied research projects have been identified at the UM5R, propelled by the Covid-19 context: mobile applications for appointments or doctor-patient exchanges, remote monitoring for retirement homes, tele-diagnosis in neuroscience, intelligent pregnancy monitoring, teleconsultation and tele-expertise in medicine and dentistry, and virtual and augmented reality simulation of dent-maxillofacial pathology treatments.

The CNOPS/CMAM White Paper

The purpose of this white paper is to mobilize the health and medical coverage ecosystem role-players around a strategic and operational vision to accelerate the digital transition of health coverage schemes in an open, integrated, standardised and secure environment.

The central point of this reflection is the implementation of a platform for dematerialised exchanges and interoperability that can federate all existing IS.

- **Expectations and recommendations**

In parallel with the large-scale project to generalize the AMO, flows between managing organisations and healthcare providers are expected to be digitised, the SMR and the National Patient and Provider Identifier will be implemented, e-health procedures will be reimbursable through the revision of the NGAP or the adoption of the CCAM, telemedicine regulations will be extended to other aspects of this practice, in particular tele-surgery, and preventive medical procedures will be encouraged.

In terms of human resources, action is needed to secure more IT engineering skills alongside practitioners and also to strengthen e-health integration into curricula early in the academic journey of medical sciences' students.

Since the Moroccan experience is still at the budding phase, it is recommended that the e-health strategy be gradually integrated into the overall health sector strategy.

To enable the emergence of e-health start-ups, it is necessary to technically and financially support HealthTech initiatives, facilitate the registration and patent process for Moroccan products, pursue the simplification and digitisation of procedures and promote research activities and innovation.

From a security point of view, the most prominent issues are reinforcing legislation to better adapt it to health data security, encouraging role-players, in particular healthcare providers, to improve data processing and exchange compliance, and finding a sovereign solution to the storage of users' health data.

The interviews conducted gave rise to rich and diverse recommendations. We have selected the most recurrent and relevant ones for inclusion in this white paper.

With the Moroccan experience still in its infancy, it is recommended that the e-health strategy be gradually integrated into the overall health sector strategy, taking into account the complexity and characteristics of the latter. The ANRT believes that this experience should be particularly consolidated in its technology mechanisms-related aspects (mobile, web-enablement, Health Technology...) and the offer-focused system (organisations and care professionals).

UN organisations represented in Morocco suggest starting with a diagnosis of and reflection on e-health priorities such as: (i) chronic disease monitoring; (ii) remote consultations to poorly serviced and isolated areas; (iii) the digitisation of health records; and (iv) the virtual sharing of expertise for the pooling of practices and experiences in e-health. In addition, they advocate the implementation of hybrid e-health systems to achieve the reconciliation between technology use and the human element in order to humanise services and design simple, ergonomic and user-friendly applications that can be used by all categories, including illiterate populations.

Regarding the issue of shared health records, the ADD proposes to draw inspiration from law 55-19 on the simplification of administrative procedures and formalities which enabled the creation of a single service portal dedicated to citizens. Mutatis mutandis, the patient health records can be computerised and benefit from an interoperability platform so that the information can be shared through the use of a primary key (single identifier for insured persons and providers), between the different players involved in the patient's care. Recent technologies such as Blockchain can be used to create secure digital vaults. The interest lies in the fact that each role-player preserves its current system and need not disrupt its architecture, while sharing medical data as needed and with the consent of the patient who remains the master of his data.

For insurers, the national identity card reference number could be used to meet the requirement of a health identifier.

They also recommend imposing standards and labels on IS solutions for private healthcare professionals, subject to obtaining the licence to practice.

For healthcare organisations and professionals, the main recommendations are as follows:

- Grant incentives to institutions that opt for e-health (e.g. better reimbursement rates);
- Implement the health data host status, enabling healthcare institutions that do not have the necessary budgets or skills to host their solutions and data in a national sovereign cloud;
- Internalize solutions, promote the «made in Morocco» product in e-health and save on investments;
- Prepare the human element for e-health emergence through sensitisation and training to share clear, honest and effective information to prevent and reduce disease chronicity and healthcare costs;

- Adopt large-scale telemedicine and offer its services at conventional rates and without additional cost for the patient;
- Create a community of e-health start-ups to pool efforts and engage in advocacy for them (a recommendation also shared by digital technology companies).

Finally, the University and the Industry (pharmaceutical, digital, technological) join forces and propose the laying of bridges between them in order to promote research in health sciences and ensure that their resources, made of pools of experts, researchers and students, join ranks around an e-health project.

B. Digital surveys

The objective of these surveys was to shed light on the different levels of perception, use, attitude and projection before the rapid evolution of digitisation in the healthcare world. Expectations, opportunities, concerns, security, confidentiality, ethics, efficiency, governance and other aspects are all revealed in this exercise.

1. Healthcare professionals

The questionnaire dedicated to health professionals was completed by 359 persons of different ages, 72% of whom operate in the public sector and 28% in the private sector, grouping together several professional profiles and categories: doctors, nurses, health technicians and engineers, pharmacists, dental surgeons, health system managers and administrators, and health science teachers and researchers. 51% were concentrated in the two regions of Rabat-Salé-Kénitra and Casablanca-Settat..

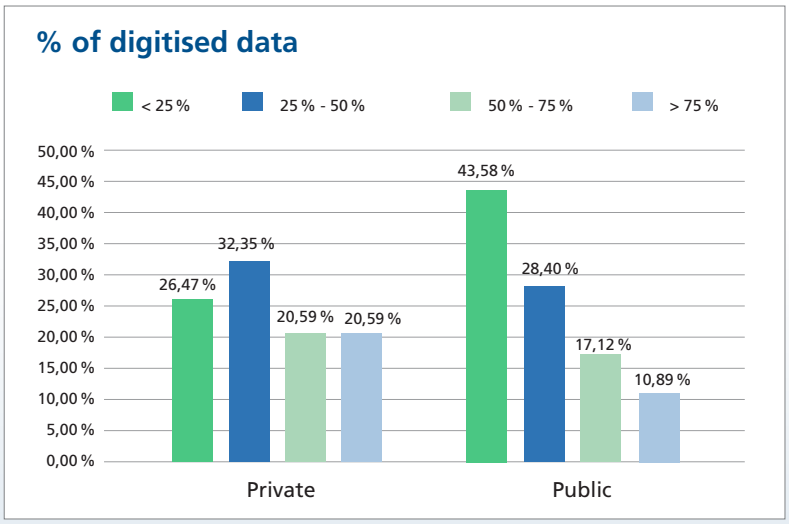
Perceptions and uses

Unsurprisingly, nearly 94% of the study participants believe that healthcare digitisation would have a positive impact on the practice of their profession. It is safe to deduce that these participants already benefit from digital solutions in their current practice, or that they generally perceive the benefit of these solutions.

The questionnaire respondents were asked to evaluate the digitisation level of professional data within their organisations.

The first finding is the strong disparity existing between the private and public sectors in terms of digitisation. In the public sector, nearly half the organisations continue to process data in the traditional way, at a rate of 75%, while organisations with a digitisation rate over 75% represent only 11% of the total number of organisations surveyed.

Private organisations seem to be more committed to digitisation: organisations that are 75% digitised represent nearly 21% of the total, twice as many as their public counterparts. It should also be noted that nearly 42% of private organisations have successfully digitised at least 50% of their data processing.



In its 2005 resolution WHA58.28 on eHealth, the World Health Assembly had urged Member States «to consider drawing up a long-term strategic plan for developing and implementing eHealth services in the various areas of the health sector [...], to develop the infrastructure for information and communication technologies for health as deemed appropriate to promote equitable, affordable and universal access to their benefits."

On the subject of e-health practice among participants, they are almost equally distributed, with a slight predominance of professionals who have already practiced e-health (53.5% versus 46.5%).

The age of the healthcare professional does not seem to have a significant impact on e-health practice. Indeed, the same overall trend is confirmed for all age groups studied, with a peak noted among users aged between 25 and 35 (57%), probably due to this generation's natural affinity for new technologies.

If we address the use of mobile health devices (m-Health), a lower use compared to e-health is observed in general. This practice concerns slightly less than half of the professionals surveyed (43%). Here again, age does not seem to play a significant role in the use of m-Health, although lower rates were observed among professionals over 35 years old.

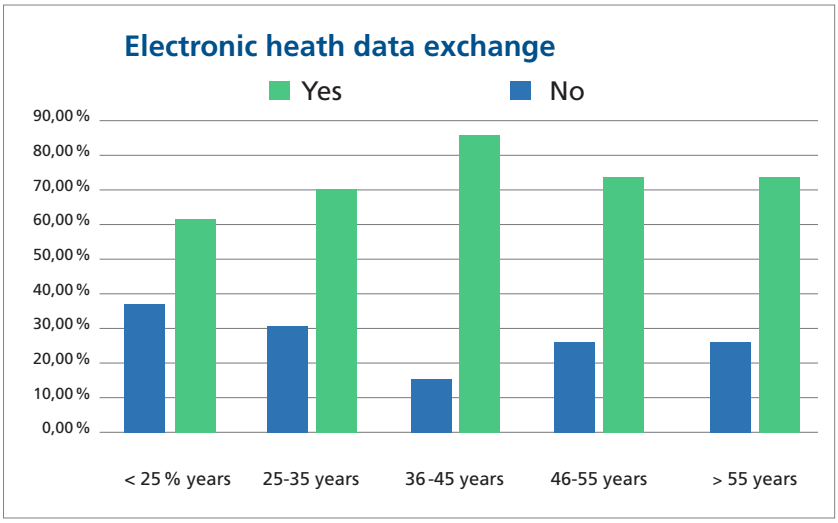
With the rise of the Internet of Things (IoT) and the emergence of fifth generation mobile networks (5G), connected healthcare devices and mobile applications represent a strong potential for innovation, but their development requires a secure framework so that their users can enjoy them with confidence.

By way of illustration, the Digital Health Trends 2021[1] report highlights the progression of health application themes. Today, there is a considerable number of health-dedicated applications (350,000 in 2021) on the main stores. In 2020, more than 90,000 health-related mobile applications were published, an average of 250 applications per day.

Consumer mobile apps are the most widely available and used e-health tools in the world today.

The study also looked at the electronic exchange of health data with a third party. It found that electronic exchanges hold the majority now, with over 75% of exchanges being paperless.

Again, age does not seem to be a determining factor, although a peak is observed among users aged 36 to 45.



1. https://www.iqvia.com/insights/the-iqvia-institute/reports/digital-health-trends-2021

For record purposes, French legislation, for example, distinguishes between the exchange and the sharing of health data.

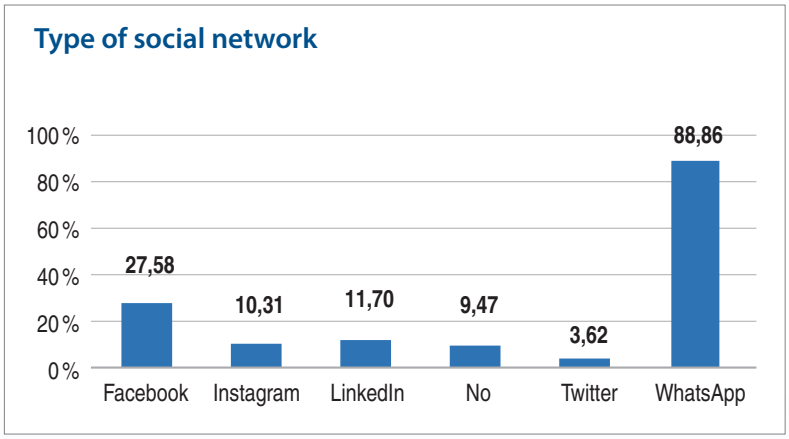
Accordingly, the exchange of documents containing health data consists of a data flow aimed at communicating health-related information to a clearly identified recipient, for example sending an e-mail by secure health-dedicated messaging, sending a fax or making a telephone call.

Sharing, on the other hand, aims to make health data useful for care coordination and continuity available to several professionals who have a right to know it, in the interest of the person being cared for, for example access to data in the electronic patient record.

About the use of social networks in the context of their professional activity, 94% of professionals declared in the feedback received that they use social networks. This very encouraging rate contrasts with the rate of health information systems' use which does not exceed 9.6% on average.

This finding tends to prove that professionals have no particular difficulty using digital tools, and that the low rate of information systems use is due to their inaccessibility or lack within organisations.

Social networks allow health professionals to learn about current events and to engage in exchanges with their peers and patients. They also allow them to share messages of general interest (during the Covid-19 pandemic, for example) and to contribute to the dissemination of quality information. Some professionals can become digital opinion leaders (DOLs) within their specialty thanks to their online content contributions. This trend was particularly observed in our country during Covid-19.



Furthermore, the study of the types of social networks used shows massive recourse to instant messaging solutions, especially WhatsApp, adopted by almost 89% of professionals in their practice.

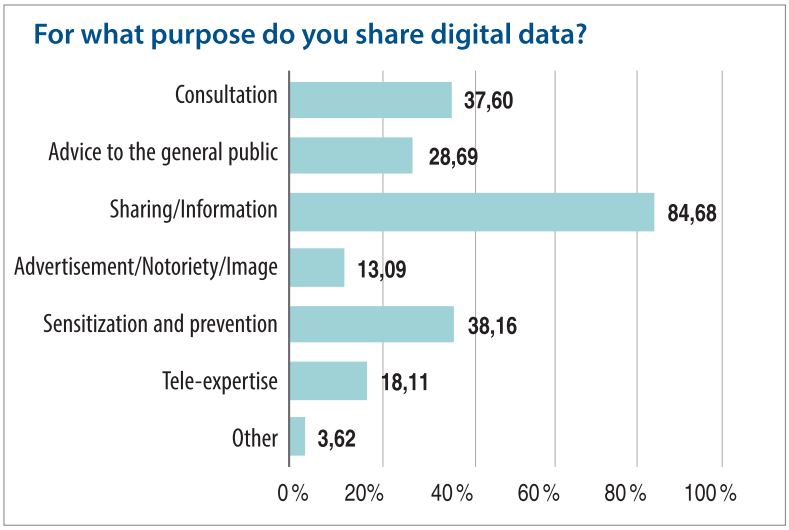
LinkedIn, intended for professional purposes, come only third in rank among the social networks used for professional purposes.

These results reveal the need to make these solutions' users, particularly in the case of instant messaging, aware of the legal and regulatory aspects governing health data publishing and transfer, particularly abroad where the servers of these services are hosted.

In France, Twitter is used by individual professionals but also by scientific societies, medical congresses and institutions to inform and generate discussions through hashtags. On Twitter, nearly 14,000 hashtags related to medical congresses were listed worldwide in June 2020. Its use in Morocco remains rather timid, a finding correlated with the professionals surveyed and who use it very rarely (3.6%).

If we look at the reasons behind electronic data interchange use, it turns out that information sharing is the most important reason (85% of use cases).

E-health uses are found among 38% of professionals, while tele-expertise, an integral part of telemedicine in Morocco, is practiced by 18% of the professionals surveyed.



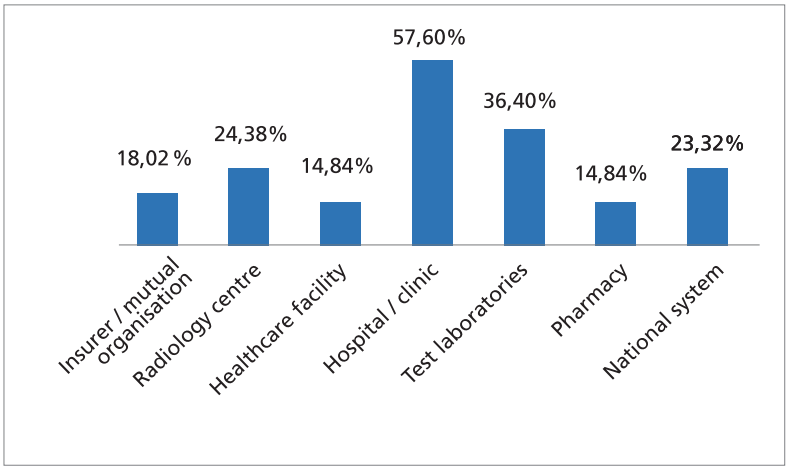
It is interesting to note that as purposes image or notoriety are sought by only 13% of the professionals despite a more consistent use of social networks. The latter seem to be more appreciated for interaction with other users, which could raise ethical and regulatory concerns about the data published and transmitted through these tools. Indeed, health professionals must respect the ethics governing their profession and that prohibit them from promoting products or services.

Confidence in new technologies

The electronic health record (EHR), a modern advance from the old paper health record, has proven to be a central component of information systems and a tool for improving care quality and the healthcare professionals' performance by providing them with rapid access to structured information.

The majority of professionals surveyed, nearly 92%, believe that the adoption of the EHR would significantly reduce their workload, allowing them to focus more on care and management issues.

This result reaffirms the need to expand the use of EHRs within medical-hospital structures, and even to generalize their use on a national scale in order to have a single patient register used by all authorised care providers.



Similarly, the role of EHRs in reducing hospital mortality has been proven. For example, one person dies of sepsis every 5 seconds worldwide. It is still one of the most important mortality causes. This represents 30,000 deaths each year in France where the mortality rate for patients with sepsis is 27% and can reach 50% with the most serious form, septic shock. Digitised and HIMSS 7 certified hospitals have observed a 13 point decrease in sepsis-related mortality (from 45% to 32%).

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In terms of electronic health data exchange, the majority of healthcare professionals surveyed exchange information with hospitals and private clinics (58%), followed by medical testing laboratories (37%). Historically, these are the sectors that engaged in early digitisation, with the implementation of hospital information systems (HIS) and laboratory information and management systems (LIMS).

It is interesting to note that electronic exchanges with health insurance and mutual insurance organisations remain low (only 18% of professionals), which limits the possibilities of remote claim lodging, as is the case in some European countries. In its 2022 action plan, CNSS banks heavily on its digital transformation and digitisation to meet the challenges of generalising compulsory health insurance. As for the CNOPS, it published in 2020 a white paper on the digital transformation of medical coverage in which it recommended the implementation of a platform for digitised exchanges and interoperability.

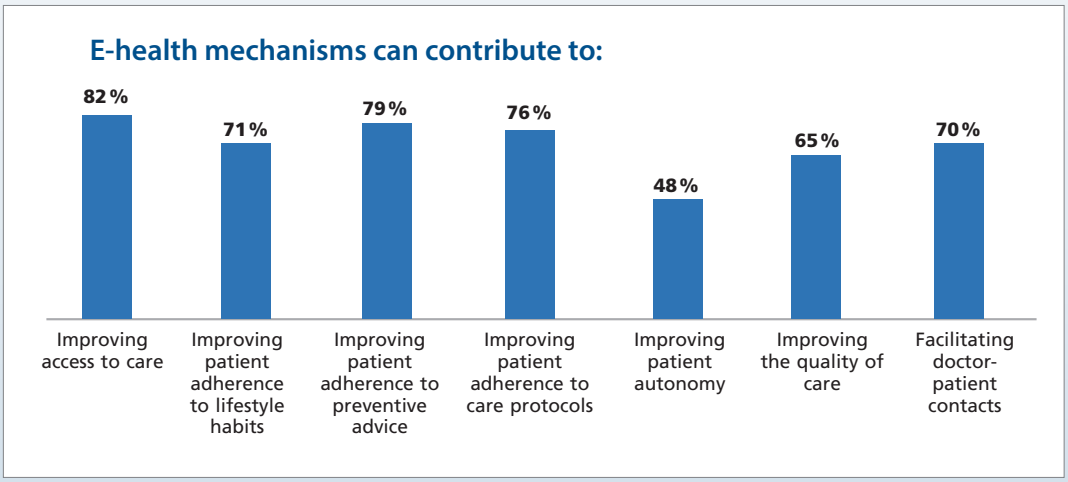
Similarly, dematerialised exchanges with the national health system remain relatively low (23% of the professionals surveyed). This finding is confirmed by the current difficulties in obtaining comprehensive and updated health information in real time on a national scale, particularly with regard to epidemiology.

Patient involvement

Magie De Block, Belgium's former Minister of Health, said «Mobile health can be an instrument for patients to become the co-pilot of their own health. Thanks to remote monitoring, patients feel better supported and more involved. Intermediate app-based consultations help prevent relapses. Patients who use an app are often more involved in their own treatment process.»

Patient empowerment

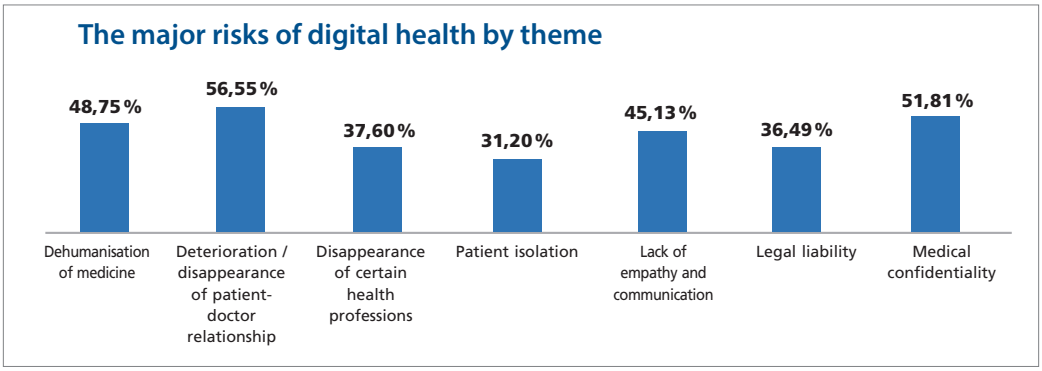
In 2016, Marisol Touraine, France's former Health Minister, said, «At the individual level, e-health is an empowerment factor that provides instruments to access freedom and autonomy, while at the collective level the digital is a factor of networking, transparency and emancipation.»



Generally, healthcare professionals concur on the potential contribution of mobile health devices to improving the quality of patient care at all levels: accessibility to care, patient adherence to medical recommendations and therapeutic processes, quality of care and doctor-patient relationship.

It should be noted, however, that more than half of the professionals surveyed believe that mobile health does not improve patient autonomy. Yet, one of the promises of e-health development is precisely to boost patient autonomy.

Risks



The healthcare professionals surveyed were asked to assess the potential risks associated with AI and BD in the healthcare field. More than half of the professionals believe that the use of these technologies may compromise medical confidentiality and negatively impact the doctor-patient relationship. A large proportion of respondents also believe that these technologies can lead to the dehumanisation of the medical profession, particularly by reducing communication with the patient.

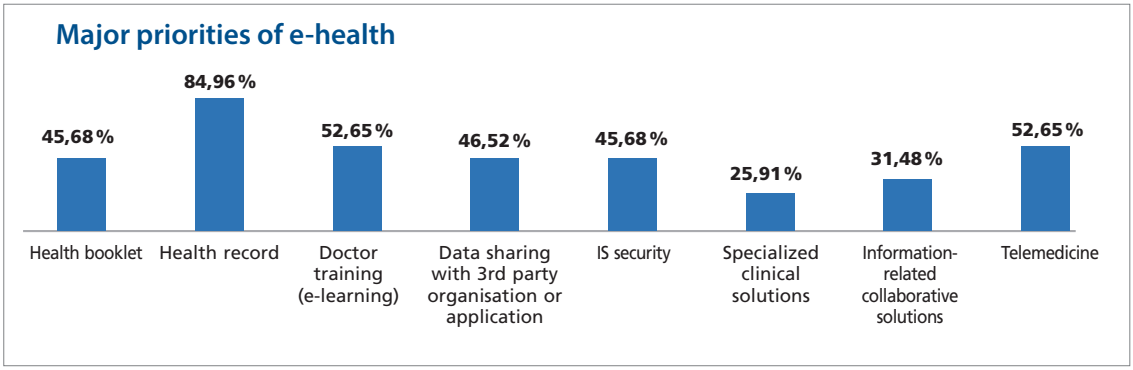
If we look at the profiles of healthcare professionals, we will note that the perception of the risks linked to artificial intelligence and Big Data remains practically the same. However, the risks inherent to the doctor/patient relationship or lack of communication and empathy seem to be more felt by nurses.

Interestingly enough, opinions diverge in France between the general population and healthcare professionals. According to the latest Odoxa[2] barometer on «new uses in healthcare», 61% of the general population believe that digital healthcare will improve the quality of the relationship between patients and caregivers, compared to 37% who believe that «the use of technology will dehumanise this relationship by making things more mechanical». The French also count on these technologies (73%) to «free up time» for caregivers to discuss patients among themselves.

Among healthcare professionals, only 54% of hospital directors believe for example that the use of digital technology will improve the quality of the patient-caregiver relationship. 42% even believe that technological development will cause the deterioration of this relationship.

2 https://esante.gouv.fr/sites/default/files/media_entity/documents/barometre_sante_360-numerique_et_nouveaux_usages_en_sante-_22_mars_2018.pdf

Implementation priorities and stakeholders



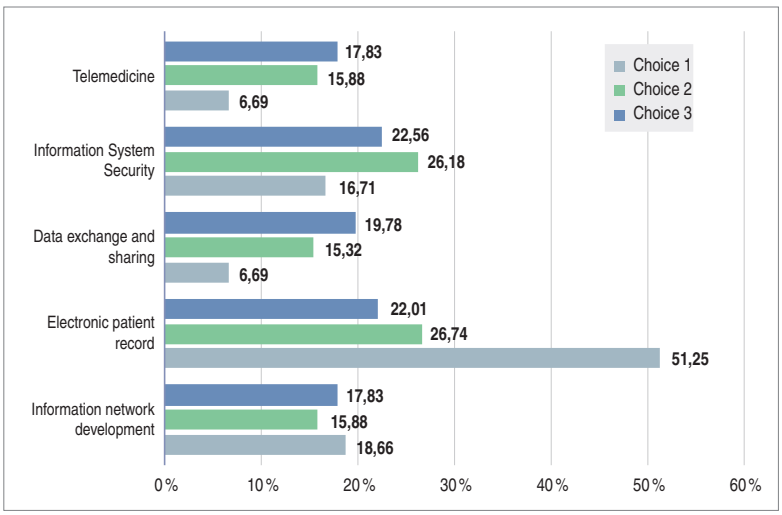
Healthcare professionals were asked to give their opinion about e-health priorities. Most professionals (85%) feel that the digitisation of health records is a priority, which is consistent with other opinions expressed in the questionnaire. Indeed, it is unrealistic to talk about e-health without having a source from where to collect health information, embodied in this case by the electronic patient record.

It is interesting to note that in second place, over 50% of healthcare professionals prioritize telemedicine as well as e-learning. Now authorised and regulated in Morocco, telemedicine is thus naturally emerging as an innovative way of practicing medicine, particularly for the benefit of isolated populations or those necessitating expertise that is not available locally.

Professionals (46% of those surveyed) also view with interest the security aspect of the information system. In fact, in addition to the risk of hindering their business and the resulting financial losses, cyber-attacks can undermine the confidentiality of data entrusted to the professional, with serious repercussions in terms of reputation, image and credibility, without mentioning the possible legal consequences.

In this regard, the Moroccan General Directorate of Information Systems Security, operating under the National Defence Administration, has issued its national directive on the security of information systems, describing the organisational and technical security measures that must be applied by public administrations and bodies, as well as critical infrastructures, namely the health sector.

In terms of the order of priority to be taken into account to successfully implement an appropriate digital solution, healthcare professionals agree that the implementation of an electronic patient record is the first step, followed by information system security.

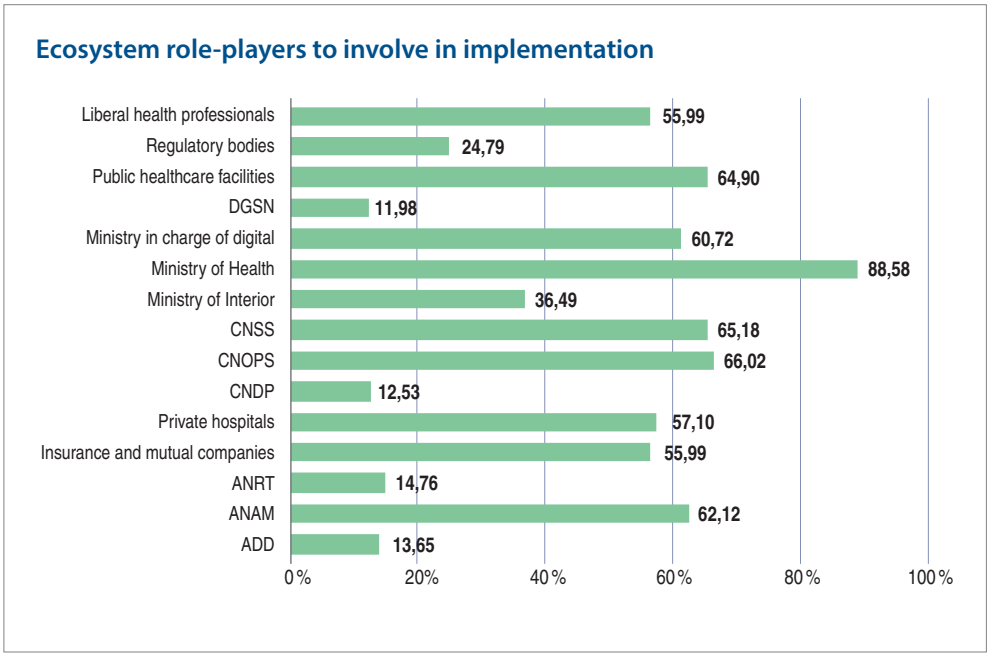


Other aspects, such as the development of the computer network as an infrastructure prerequisite, or the sharing of digital data, ranked last for the majority of users.

Health professionals were asked to give their opinion on the players likely to boost and implement health digitisation in Morocco. The majority (89%) believe that the Ministry of Health is the first stakeholder to be involved, followed (66%) by organisations managing the compulsory health insurance (CNSS and CNOPS) and the National Health Insurance Agency (62%).

On the other hand, professionals believe that the involvement of professional bodies, the National Agency for Telecommunications Regulation and the Digital Development Agency would only be relevant to the extent of 25%, 15% and 14%, respectively.

The role of the National Commission for the Supervision of Personal Data Protection seems relevant to only 13% of the professionals surveyed, despite the regulatory and privacy aspects that e- health gives rise to.



2. Patients/users

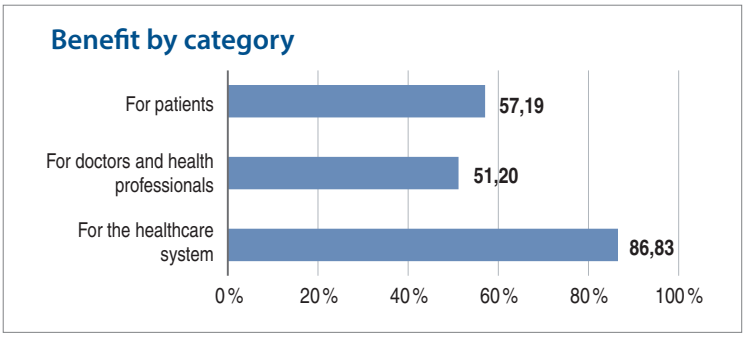
The patient/user questionnaire was completed by a sample of 371 adults, 41.5% of whom were women. All age groups are represented, with 67% of respondents over 35 years of age. 97% of respondents are from urban areas and 96% have a higher education degree. These last two characteristics, which can be explained by the nature of the questionnaire (digital and in French) and its mode of distribution (social networks), mean that this survey cannot claim to be representative of the total population. However, some very significant results and trends can be deduced from it.

Perceptions

The majority of respondents (90%) believe that healthcare digitisation, and in particular the introduction of IT into healthcare structures, is beneficial.

According to a 2020 Survey conducted by the ANRT on the use of new information and communication technologies[3], 90.4% of households are now equipped with a smartphone, while 84.5% are regularly connected to the internet. With the Covid-19 pandemic in mind, Moroccans' enthusiasm for new technologies increased by 64.2% in 2020 compared to the previous year in terms of hardware acquisition (PC and tablet), which demonstrates a clear appetite for ICTs among our fellow citizens and their positive view of computing.

Users consider that the digitisation of healthcare structures is mostly beneficial to the healthcare system (87%), while for professionals and users its contribution is considered less so.



This can be explained by the relatively recent development of digital services for patients, in particular telemedicine (which still contends with a number of obstacles such as the reimbursement of services or the remote prescription of medicine), or the dematerialisation of exchanges with healthcare facilities (quotations, appointments) or health insurance management bodies (electronic claims, digitised medical records, etc.).

A sensitisation effort should be made among end users to counter the perception that health digitisation is the result of some bureaucratic practice, but rather that it is a facility made available to users.

> ***Decision-makers, caregivers and citizens are increasingly aware of the value of better connected, reliable and secure health information. To this end, and taking into account the rapid development of digital technologies, it is essential to put in place the necessary measures and means to support and raise awareness among the various health ecosystem players within the framework of this sector's transformation process***
>
> *M. Sidi Mohammed Drissi Melyani, ADD Director General*[4]

3 ANRT (2020), annual ICT market survey. National Agency for Telecommunication Regulation, consulted on 24 January 2022 on https://www.anrt.ma/sites/default/files/publications/enquete-tic-2020-sysnthse-fr.pdf

4 MAP (June 23, 2021), Digital Health: interview with the DG of the Digital Development Agency, MAPBUSINESS. Consulted on January 24, 2022 on https://www.mapbusiness.ma/a-la-une/sante-digitale-interview-avec-le-dg-de-ladd

Similar to the positive view of the anticipated benefits of e-health, the majority of users (82%) hold a positive opinion of e-health.

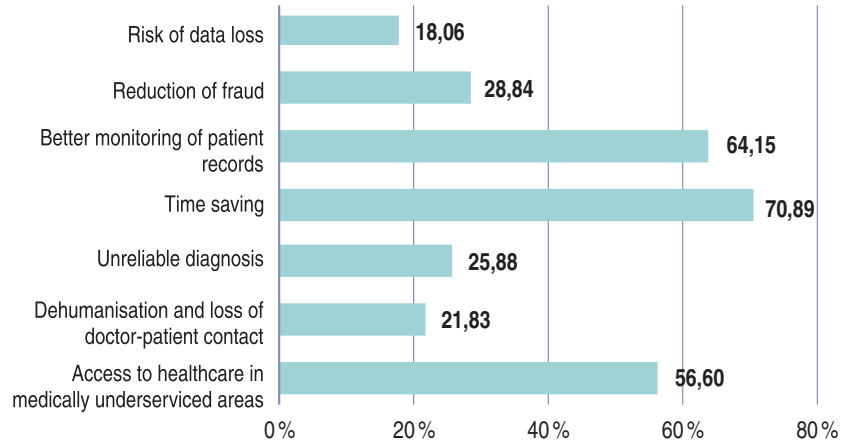
The view of e-health remains favourable for both genders, with a slight predominance of men (84% versus 78%). However, the age of the healthcare professional does not seem to have a significant impact on this opinion. Indeed, the same overall trend is confirmed for all age groups studied, with peaks for men aged 46 to 55 (92%) and women aged 36 to 45 (87.5%), probably as a result of the frequent contact of these categories with the health system, and of the predominantly higher level of education of the sample, making them more sensitive to the importance of new technology use in health.

Asked about the digitisation of the medical act, users naturally focused on the practical aspects that can be directly observed and felt.

Thus, the majority of survey participants believe that digitisation saves a significant amount of time in providing the expected service (71%), improves follow-up through the use of electronic patient records (64%) and makes it possible to access care in medically isolated areas through telemedicine (56%).

Despite the relative novelty of telemedicine regulation in Morocco, the already deep awareness of its advantages is a serious asset in its promotion and gradual generalisation given its acceptability to users.

Opinions on medical act digitisation

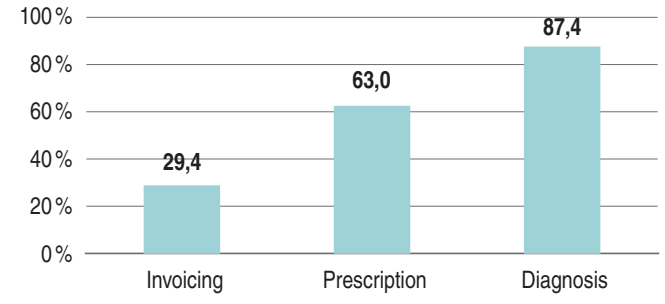


Uses

Most users (71%) have already exchanged health data electronically. A look at the nature of exchanged data reveals that it is mainly diagnostic data (87%) and prescriptions (63%). Although encouraging, this finding should alert legislators to the need to raise public awareness of the exchange of sensitive health data via consumer tools (instant messaging, social networks, SMS).

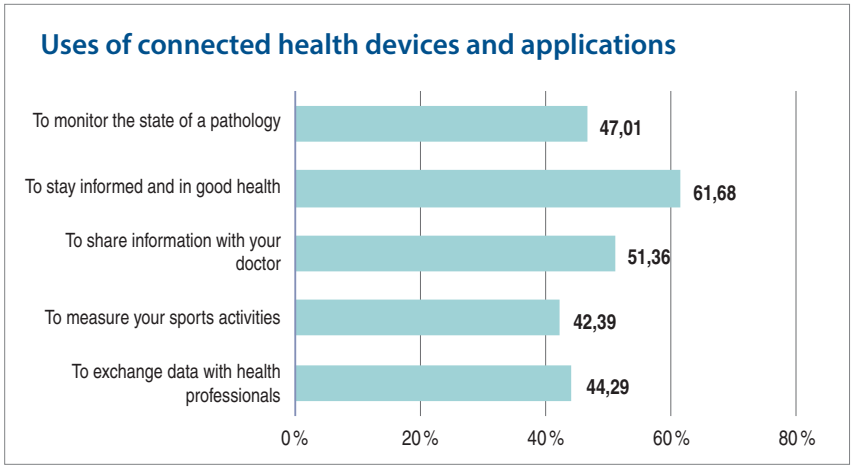
In this respect, the CNDP has since 2020 made the protection of medical data a priority. To this end, it organised several meetings with the Ministry of Health, regulatory authorities, social security and pension organisations and professional bodies, in order to raise awareness of the risks related to health data exchange and the need to comply with relevant regulations and good practices.

Digitised exchange of health-related data



With regard to the actual use of health applications and IoT, users favour solutions that allow them to stay healthy (62%) and share information with their caregiver (51%). To a lesser extent, their use for monitoring pathologies, managing sports performance and for exchanges with health professionals are also envisaged by several users. We must not forget that 20 billion connected objects are currently in circulation worldwide, which figure is expected to climb to 56 billion by 2025. Today, 60% of hospitals worldwide are already using IoT to increase productivity and improve patient care.

According to a 2017[5] international survey, 67% of IT professionals responded that their companies had already implemented an IoT solution or had IoT system plans. 21% of respondents said their companies planned to deploy IoT solutions within 12 months, with 11% stating that IoT implementation in their companies would be completed within a year.



On the other hand, it must be pointed out that IoT now carries a higher risk of cybercrime, resulting in an explosion of cyber-attacks against healthcare facilities which, in view of this, must arm themselves and implement appropriate security solutions.

Confidence in new technologies

Questioned about their preferences between traditional or telemedicine consultations, just over half (55%) the users indicated that they preferred the traditional mode.

This response is evidently expected since the practice of telemedicine is mostly justified by particular circumstances (quarantine, unavailability of expertise close-by, patient inability to move, etc.) and does not claim to be a complete substitute for conventional consultations. However, the high rate of the remote consultation option (45%) can be explained by the pandemic context but also by the appreciation of the difficulties of accessing health care services (inadequate reception and orientation services, long waits for an appointment or consultation...).

5. 451 Research (2017). 2017 Trends in Information Security - 451 Research - Analysing the Business of Enterprise IT Innovation, consulted on January 24, 2022 on https://451research.com/2017-trends-in-information-security.

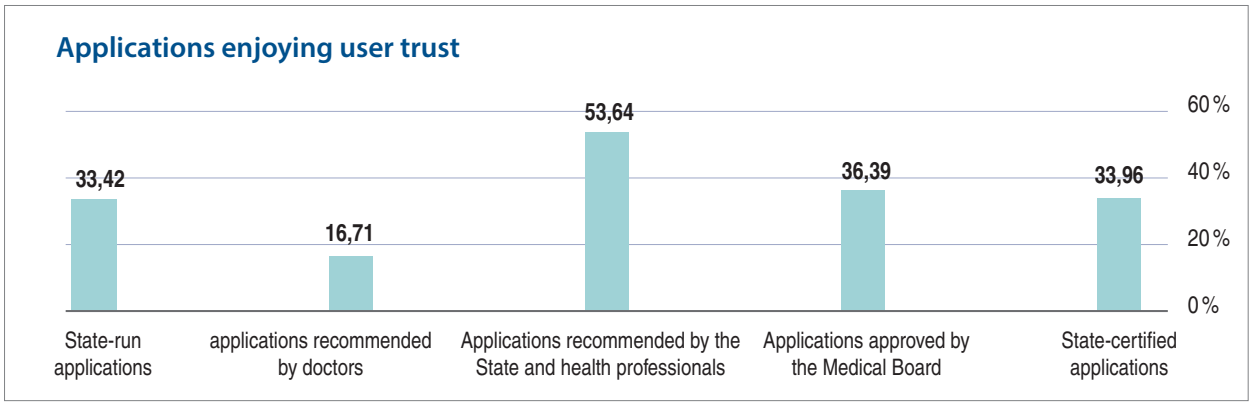
According to a study[6] published on PubMed, patients with chronic pathologies are more inclined to accept telemedicine as a way of simplifying their repeated medical consultations. Other patients, on the other hand, seem to prefer the conventional primary consultation, probably because of the climate of trust and proximity that this mode induces for the patient.

Nearly 84% of respondents hold a favourable opinion of the storage of their health data by professionals.

A similar result was observed in France where the survey conducted by France Assos Santé[7] revealed that 70% of French people were spontaneously interested in the possibility of an online centralisation tool of their medical data, and even 85% in the case of the SMR and its functionalities.

Obviously, centralisation enables a guaranteed access to the information required for care management and coordination, particularly with the increasing incidence of serious and multi-systemic pathologies that require follow-up within care networks that involve several healthcare professionals.

Needless to say, the issue of data sovereignty, security and lawful usages remains as relevant as ever and requires a balance between flexibility of use and security.



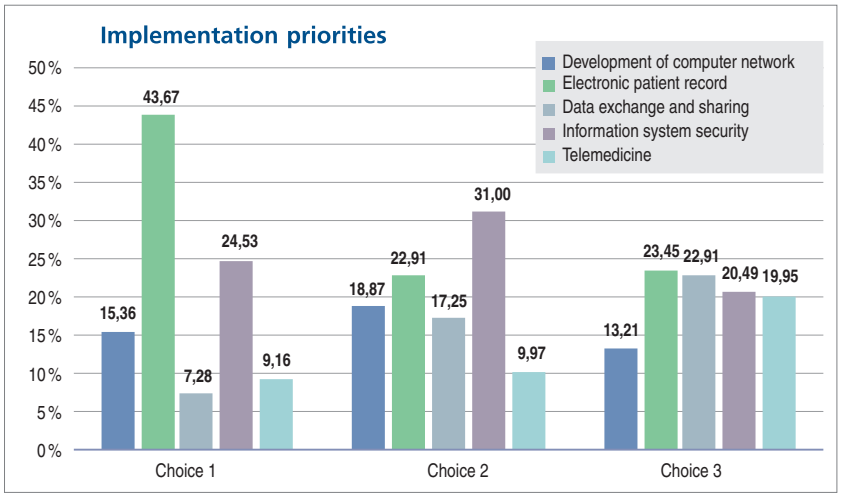
On the subject of trusted applications, the survey respondents indicated that they were more likely to use solutions recommended by the State and health professionals (54%). It is interesting to note that the degree of trust given to the latter is greater than that given to solutions recommended by the State alone (34%), or by health professionals alone (17%).

Implementation priorities

In terms of priorities, users are unanimous about the fact that the electronic patient record and information system security are the two key prerequisites for the implementation of an appropriate digital solution.

6. Sim R, Lee SWH. Patient Preference and Satisfaction with the Use of Telemedicine for Glycaemic Control in Patients with Type 2 Diabetes: A Review. Patient Prefer Adherence. 2021 Feb 10; 15:283-298. doi: 10.2147/PPA.S271449. PMID: 33603347; PMCID: PMC7882448.

7. https://www.france-assos-sante.org/communique_presse/le-dmp-attendu-par-les-usagers/



This security awareness must be underscored as it will allow for a better acceptance of regulations governing e-health practices in Morocco.

C. What conclusions can be drawn from the interviews and two surveys?

1. What are the main findings of the institutional and private decision-makers' interviews?

The interviews, conducted with about forty senior managers and decision-makers, emphasised the importance and relevance of a rapid digital transformation of the Moroccan health sector, thus accompanying the generalisation of AMO and the implementation of the NMD. These two major projects depend heavily on the availability of reliable data and indicators for an efficient management and rationalisation of planned investments, and for which digitisation is no longer an option but a real necessity dictated by the current context. The stakeholders also recommend drawing on the successful experience of several countries while keeping in mind the specificities of Morocco and taking advantage of its strengths and many assets, especially in the new information technologies field. This does come across as a paradoxical situation considering the poor national offer of home-grown software solutions and IT services dedicated to the health sector..

All stakeholders also concur on the value-added of digitisation in healthcare. Digitisation would enable a better understanding of the epidemiological transition, strengthen preventive medical actions, combat disparities in access to care and rationalise household and State health expenditures. This digital transformation should be primarily based on the digitisation of data flows generated by care processes at all levels, including care and social welfare. Indeed, stakeholders deplore the fact that the data produced at each stage of the patient's journey is often unusable since it remains confined to its production site instead of being used for other purposes and made available to national information systems that interface and communicate, which limits its usefulness in terms of effective evaluation or decision-making. Role-players also advocate the use of new tools, including telemedicine which today represents the only viable response to a limited and geographically heterogeneous medical offer.

The interviews also revealed the disparity between the public sector, marked by the preservation of traditional information circuits and a profusion of not so communicative applications, and the private sector which bows to the imperative of profitability and financial viability and which has substantial resources, a better seated digital culture. The private sector is also investing massively in new technologies but its potential for digitisation remains limited due to an obsolete regulatory and normative framework.

This observation brings to the fore the need to develop a long-term strategic vision for the development and implementation of e-health on a national scale. Failing this, the technological gap between public and private sectors may further deepen and foster a negative perception of the public service as outdated by professionals and users who are more eager than ever for digital solutions to simplify their daily lives.

Only a global and integrated healthcare digitisation policy, spearheaded by an ad hoc body in the form of a national e-health agency or by existing structures, would manage to bridge this gap, described by the stakeholders as a real digital divide.

A pragmatic approach, targeting fore and foremost the aspects strongly impacted by digitisation.

To promote this digital transition, four key components were identified during the interviews: 1. technological choices, of course; 2. support for changes in operating methods and procedures undertaken by organisations, professionals and users; 3. updating the legal and regulatory mechanisms to create a framework for new practices; and 4. economic aspects, including the promotion of investment in the sector and the emergence of a home-grown offer in terms of solutions or expertise.

Stakeholders recommend a smooth, non-disruptive transition to digitisation, gradually integrating it into the overall healthcare sector strategy. It is strongly recommended to take a pragmatic approach, initially targeting aspects likely to be most impacted by digitisation such as chronic pathologies management, telemedicine for medically underserviced areas, the EHR to ensure care continuity, and the creation of a national health identifier.

2. What lessons to draw from the poll surveys?

Key findings of the survey of health professionals

The survey of a representative sample of Moroccan health professionals showed that they positively perceive e-health and its potentially positive impact on the practice of their profession. As with the senior managers and decision-makers interviewed, professionals also lamented the technological disparity between the public and private sectors.

Another important fact is that Moroccan healthcare professionals are not necessarily aware of the legislation and best practices governing digital technology, as evidenced by the widespread use of standard instant messaging for medical data exchange, in violation of the law that dictates the exclusive use of approved professional platforms and prior authorisation. However, they are very mistrustful of the introduction of new technologies, fearing a dehumanisation of their relationship with patients and a disclosure of information protected by medical confidentiality.

Concurring with decision-makers, professionals consider sensitisation necessary, particularly through professional bodies, and call for proposing labelled, reliable, acceptable and accessible alternatives that would encourage them to comply with the regulatory and security framework, failing which they will fall back on the available and widely used solutions. It would also be relevant to integrate basic training in medical informatics and IT security into all educational programs for healthcare professionals, following in the steps of certain initiatives of national private universities for medical and nursing students.

Most health professionals share the opinion of decision-makers on the need to adopt a shared medical record (SMR) on a national scale, this being for them the only way to guarantee the quality and continuity of care and inter-institutional management. In a country where public-private partnerships in the health sector are still at the burgeoning stage, and where there is a profusion of heterogeneous software solutions that are not very communicative or inter-faceable, the SMR remains the only credible short-term alternative to successfully share

information without disrupting the existing system, while preserving current technological investments and achievements. In addition to the technological challenges it will give rise to, the adoption of the SMR nationally will require a genuine reform of the current legislation to make it mandatory and enable it to acquire its credentials.

The introduction of a national SMR, described by professionals as a priority digitisation project, would also constitute a partial response to a problem highlighted by most professionals who deplore the obligation to preserve the physical exchange of data with health insurance management bodies, an issue frequently raised by decision-makers. In the same vein, since dematerialised exchanges with the national information system are insignificant, according to health professionals, a structured SMR would finally make it possible to provide detailed information on the national epidemiology situation and provide an accurate assessment of our fellow citizens' health, thus enabling a relevant evaluation of health policies and better targeted investments.

A national digital transformation model cannot be successful without the support of all the departments involved.

A national digital transformation model cannot be successful without the support of all the departments involved.

Finally, these surveys also revealed a degree of ignorance about the national ICT and digital role-players (ADD, ANRT, CNDP, DGSSI, etc.), thus raising expectations from their supervisory ministries and health insurance managing bodies. However, a national digital transformation model cannot be successful without the support of all the departments concerned, and the idea of an autonomous and federating central body, in the form of a national e-health agency, seems most appropriate to reduce the number of interactions required with healthcare professionals who, conversely, are still keen on engaging in this digital transition but who are largely unaware of the technical and regulatory prerequisites.

Key findings of the users and general public survey

The manner in which the digital survey was conducted certainly favoured a selection bias since it targeted a primarily urban, educated and French-speaking population with access to online forms. It is therefore not possible to confer on these results a general scope or substitute them for a national survey. However, by correlating the results obtained with national trends confirmed by observatories (e.g. the annual surveys carried out by the ANRT), we can safely estimate that the sample, although not quantitatively representative, enabled us to identify the main issues related to e-health from the point of view of users and their expectations.

The general trend in terms of appetite for new technologies is also confirmed for the healthcare sector, and almost all users believe that healthcare digitisation, starting with the priority of a secure SMR, is beneficial. It is also interesting to note the use of digital solutions by fellow citizens in the context of preventive medicine as well, as evidenced by the craze for consumer connected devices (connected watches and bracelets, heart monitors...).

Nevertheless, users believe that this digitisation is not directly beneficial to them and that it rather serves the interests of the health system and its professionals. There is therefore a fair amount of mistrust and apprehension about these tools, an aspect that was also raised with healthcare professionals and which today requires close communication and greater sensitisation to reassure users and secure their support. Failing this, digital services may be shunned as happened with telemedicine which only really took off nationally with the advent of the Covid-19 pandemic and which half of the users still do not see as useful.

Similar to professionals, users often use conventional deferred and instant messaging tools to exchange their own or their relatives' health-related data. Although such practices confirm the importance of digital transformation in the health sector in the citizens' eyes, they also reveal tangible shortcomings in the so-called digital education (criminal risk, disclosure of data governed by medical confidentiality, loss of data, etc.) and of tested and proven alternatives (state-approved medical data exchange platform, SMR, etc.).

Barring a practical response to these two issues, it would be unrealistic to expect users to drop these informal but well-established technologies that facilitate their health-related procedures. To take up the recommendations of decision-makers, it would be interesting to link the financial aspects to which users are traditionally sensitive (reimbursements, preferential rates, deductions, etc.) with the exclusive use of approved tools to obtain better support from users and professionals. To judge from the findings, this vision is further reinforced by the confidence placed in the solutions managed or recommended by the State. Thus, the creation of a national digital health agency is once again justified to evaluate and approve solutions for the benefit of users.

Summary of the recommendations from the surveys

- ***Capitalize on the natural interest of citizens in new technologies to benefit the health sector.***
- ***Develop a national multi-sector e-health strategy that emphasises public-private complementarity and circumvents digital divides.***
- ***Promote a gradual transformation that is integrated into the Government's overall strategy and more specifically that of the health authority.***
- ***Ensure wide communication and sensitisation among health professionals and users on e-health challenges and expectations.***
- ***Create a national body specifically dedicated to e-health, with the authority, legitimacy, means and autonomy necessary to accomplish its mission.***
- ***Establish an interoperable national SMR as soon as possible and make it compulsory by law.***
- ***Update the reference systems as well as the legal and regulatory texts to support the transition towards digital technology.***
- ***Propose certified national technical solutions, available free of charge or for a fee, along with financial incentives.***
- ***Encourage human and material investment in e-health.***
- ***Encourage the emergence of national experts in the field to support the digital transformation process.***

What operational declinations for e-health in Morocco? *

Prioritised technological and AI solutions will have to be integrated by the new care organisations to achieve a high level of efficiency. They must, as a priority, contribute to resolving the major dysfunctions of the Moroccan system:

- ***the compartmentalisation of primary and secondary care;***
- ***the scarcity of medical time, especially specialised one;***
- ***the low prevention rates;***
- ***a constrained financing model; and significant geographical and social inequalities in access to certain health services.***
- ***d'importantes inégalités géographiques et sociales d'accès à certains services de santé.***

Based on the priority targets set, a mapping of integrated technological solutions is proposed. The evidence of these solutions' efficiency is strong and meets the Moroccan health system's challenges.

- *E-sorting (at home and in emergency wards)*
- *Online appointment booking (teleconsultation)*
- *E-admission*
- *Patient and equipment geo-localisation*
- *E-capacity*

Health facility

Morocco Digital – Health

Patient/user

- *Remote monitoring*
- *Chabots*
- *AI Health Assistant*
- *Health Manager*
- *Healthcheck*

Healthcare professionals

- *E-health training (E-learning, digital simulation virtual reality)*
- *AI and health*
- *Telemedicine*

Some high-impact technological solutions for the healthcare system

a. 1. E-sorting solution

Target 1: Inside healthcare facilities

Remote patient sorting solutions allow for significant efficiency gains in the context of emergency care.

Thanks to an intelligent chatbot, the user enters his symptoms and is directed to the most appropriate care structure (coherent guidance within or outside the emergency structure). If additional information is required, the algorithm triggers a teleconsultation with a primary care physician.

In addition, an e-sorting solution in emergency waiting rooms can be extremely useful in time-saving, especially for the reception and orientation nurse. On average, this in situ e-sorting solution saves 7 minutes per patient during reception by the emergency ward nurse.

International reference examples: Babylon applications, e-Consult (RU)

2. Patient and equipment geolocation solutions

Real-time patient geolocation solutions (RTLS) within institutions are a channel of efficiency, particularly in managing intra-hospital movements. By using terminal systems, tags and Bluetooth Low Energy, the solution allows the optimization of patient flows (e.g. operating room pathway) and contact tracing.
In addition, real-time geolocation solutions for biomedical equipment allow establishments to generate substantial savings on their investments.

International reference example: SimforHealth solution (FR).

b. Virtual reality in training professionals

Target 2: Patients/Users

Training healthcare professionals using digital simulator solutions is revolutionizing primary and ongoing medical training. The time saving possibilities for professionals who can access this type of digital environment from their office are a leap forward in the harmonisation of medical practices. Indeed, these solutions allow the implementation of both procedural and clinical reasoning training.

International reference example: SimforHealth solution (FR).

c. 1. Remote monitoring solutions

Target 3: Patients/Users

Distance medical monitoring solutions allow the physician to remotely interpret the data necessary for a patient's medical follow-up, data collected either automatically, or by the patient or a professional. Remote monitoring is mainly aimed at patients suffering from chronic diseases (monitoring of vitals, monitoring of the correct implementation of care plans and prescriptions, monitoring of side effects, etc.).

The remote monitoring of patients contributes to their proper care at home, reduces the incidence of acute decompensations of a pathology requiring emergency room recourse, and allows better use of medical time.

International reference example: Sêmeia (FR)..

2. Healthcheck applications

Healthcheck applications allow users to identify their risk factors and receive personalised advice to stay healthy. By answering questions about their lifestyle and family history, they generate a health report.

Thanks to these Healthcheck applications, the user takes a first-hand part in his health and contributes to the preventive management of his health capital.

International reference example: Digital-First Integrated Care (RU).

***** Realised with the help of our partner Healthcare 360.

Conclusion and recommendations

Conclusion and recommendations

Although our country's health system has significantly progressed over the last two decades, it will need a profound overhaul to accompany the generalisation of basic medical coverage stemming from the Royal Will and that translates the profound concern His Majesty holds for the Kingdom's entire population, aiming, in particular, at combating social inequity in access to quality care.

Brining this complex and multi-sector project of national scope to fruition, coupled with the recommendations of the New Development Model, remains contingent upon the global digitisation of the healthcare sector in order to benefit from technological advances, on the one hand, and accompany the recent societal mutations induced by the epidemiological context of the Covid-19 pandemic, on the other hand.

However, the reality of the health sector digitisation remains to date in sharp contrast with the digital boom in Morocco, a country that has tangible assets such as high telecom density and widespread access to broadband Internet, myriad digital professions training institutions, a strong appetite among young people for new technologies, and user enthusiasm for online services. The health sector currently is afflicted with a real digital divide, with few e-services offered to patients and professionals, compartmentalised data between institutions, an obsolete normative framework, limited financing capacities, glaring technological disparity between the public and the private sectors, and an information system that falls short of professionals' and users' expectations.

Morocco aspires to become a major player in the digital world continentally and to assert its position as a digital nation. Therefore, e-health represents a real opportunity to overhaul the current health system and its digital transition by proceeding to an in-depth upgrade of the healthcare offer, governance, health professions and patient relationship, all in perfect synergy between the public and private sectors.

This transition must be holistic because it impacts several areas: governance, safety, ethics, technology, regulation, training, attractiveness, etc.

Based on the results of the studies carried out during the preparation of this white paper, as well as the observations shared by the various managers and professionals interviewed, it is clear that the current state of play not only requires the urgent digitisation of the health sector, but dictates that an original Moroccan model of digital transformation be proposed to create an environment that is conducive to the development of e-health in our country.

It is thus recommended to:

Administration and attractiveness

- Establish an integrated national e-health policy. In this respect, the e-health development roadmap, produced by the Ministry of Health and Social Protection, can level the ground for the implementation of a multi-sectoral, participatory and patient-focused strategy, involving all the role-players of the e-health ecosystem.
- Stimulate national and foreign investments in new technologies by insisting on an «enlightened leadership of e-health in Morocco», based on attractive administrative simplifications.
- Stimulate Moroccan e-health start-ups and make them aware of the need to adopt a growth and international visibility approach by getting referenced on specialised platforms, creating partnerships with well-known players and participating in international events.

Technology

- Deploy a comprehensive, interfaced and interoperable national health information system.
- Implement a national shared medical record (SMR) and dictate its mandatory capturing by all healthcare providers.
- Encourage the development of national technological solutions to reduce dependence on foreign products and ensure the viability of specialised local companies, while proposing a label for solutions that meet national standards.
- Adopt telemedicine on a larger scale, particularly teleconsultation and tele-expertise, as a priority for populations in critical health conditions.
- Facilitate inter-system and inter-player interoperability by ensuring the implementation and promotion of shared medical data repositories, and by providing the regulatory foundations for these operations and protecting their content.

Security

- Formulate a «national e-health policy and strategy» for a coordinated adoption of e-health in Morocco to facilitate the use and protection of medical data within an enforceable legal framework.

Ethics and regulation

- Update current legislation to support the changes brought about by e-health.
- Define policies for the management, confidentiality and security of patient health data.
- Formulate and ensure compliance with e-health IT norms, in accordance with international standards for medical data exchange and storage.

Governance

- Create a national agency dedicated to digital health, with the means and prerogatives necessary to accomplish its mission and to serve as a hub for all departments involved in e-health.

Training and awareness

- Promote the development of national e-health skills.
- Train professionals in the sector and sensitise the general public about e-health benefits and challenges, and encourage them to adopt it while ensuring proper management of the process of change.

List of interviewees

INSTITUTIONS AND REGULATORS

Digital Development Agency (ADD),
Mr. Mohammed DRISS MELYANI, Director General

National Health Insurance Agency (ANAM),
Dr. Khalid LAHLOU, Director General

National Telecommunications Regulatory Agency (ANRT),
Mr. Hassan TALIB, Head of Division

National Commission for the Control of Personal Data Protection (CNDP),
Mr. Omar SERGHOUCHNI, President

National Initiative for Human Development (INDH), Ministry of Interior,
Mr. Mohammed DARDOURI, Wali, in charge of INDH national coordination

Ministry of Health and Social Protection, Directorate of Planning and Financial Resources
Mr. Abdelouahab BELMADANI, Director

Ministry of Health and Social Protection, Directorate of Population,
Dr. Abdelhakim YAHYANE, Director

Ministry of Health and Social Protection, Directorate of Human Resources,
Mr. Adil ZNIBER BACH, Director

Ministry of Health and Social Protection, Directorate of Epidemiology and Disease Control,
Mr. Ahmed RGUIG, Head of the Epidemiological Surveillance

HEALTHCARE PROVIDERS (UNIVERSITY HOSPITALS, FOUNDATIONS AND PRIVATE GROUPS)

Hassan II University Hospital, Fez, **Pr. Faouzi BELHSEN, Deputy Director**

Tangier-Tetouan-Al Hoceima University Hospital**, Pr. M'hamed HARIF, Director**

Sheikh Khalifa Ibn Zaid Foundation in Morocco (FCKM), **Pr. Chakib NEJJARI, Managing Director**

Cheikh Zaid Foundation (SZF), **Mr Samir JAMAL, Managing Director**

Lalla Salma Foundation for the Prevention and Treatment of Cancer
Pr. Maria BENNANI, Deputy Director

Mohammed VI International University Hospital and Sheikh Khalifa Ibn Zaid International University Hospital, **Mr. Mouad EL HALOUI, General Manager**

Akdital Holding, **Dr. Rochdi TALIB, Founder and CEO**

Rabat Karmed Medical Group, **Pr. Karim TAZI MOUKHA, CEO**

Oncorad Group, **Pr. Redouane SEMLALI, CEO**

Tazi Group, **Dr. El Hassane TAZI, CEO**

SOCIAL PROTECTION MANAGING ORGANISATIONS

National Social Security Fund (CNSS), **Mr. Hassan BOUBRIK, Director General**

National Fund of Social Welfare Organisations (CNOPS),
Mr. Abdelaziz ADNANE, Director General

INDUSTRIALISTS AND SOLUTION OPERATORS

Zenith Pharma Group, **Dr. Mohammed EL BOUHMADI, CEO**

Sanofi Maroc, **Mr. Taha AIT HANINE, Director of Public Affairs and Market Access**

DataPathology, **Dr. Hicham EL ATTAR, Co-founder**

Enovacom, Orange Group, **Mr. Christophe THIBAULT, Head of International Sales**

Healthcare 360, **Mr. Franck LAUREYNS, Director, Founder**

Orange Maroc, **Mr. Omar CHAHID, Sales Manager**

Sivsa Soluciones Informatics, **Mr. Manuel ALONSO FERNANDEZ, President and CEO**

TecRad Global, **Dr. Alae MRANI, Co-founder and Medical Director**

REGULATORY BODIES, PROFESSIONAL ASSOCIATIONS AND LEARNED SOCIETIES

National Medical Board (CNOM),
Dr. Mohammadin BOUBEKRI, President, Dr. Najib AMGHAR, Secretary General

National Association of Private Hospitals (ANCP), **Pr. Redouane SEMLALI, President**

Moroccan Federation of the Pharmaceutical and Innovation Industries (FMIIP),
Dr. Mohammed EL BOUHMADI, President

Moroccan Federation of Information Technology and Offshoring (APEBI),
Mr. Amine ZAROUK, President

Moroccan Society of Endocrinology, Diabetics and Nutrition (SMEDIAN),
Dr. Hamdoun LHASSANI, President

Moroccan Nephrology Society (SMN), **Pr. Amal BOIURQUIA, President**

Moroccan Telemedicine Society (SMT), **Dr. Saad CHAACHO, Executive Director**

INSTITUTIONS AND REGULATORS

Rabat Mohammed V University (UM5R), **Pr. Mohammed RHACHI, President**

Mohammed VI University of Health Sciences (UM6SS), **Pr. Chakib NEJJARI, President**

Rabat Faculty of Medicine and Pharmacy (FMPR), **Pr. Mohamed ADNAOUI, Dean**

Rabat Faculty of Dentistry (FMDR), **Pr. Nawal BOUYAHYAOUI, Dean**

Faculty of Health Sciences (UM6SS), C**asablanca, Pr. Saïd OULBACHA, Dean**

National School of Public Health (ENSP), **Dr. Hassan CHRIFI, Director**

National School of Computer Science and System Analysis (ENSIAS), **Pr. Ilham BERRADA, Director**

Higher Institute of Nursing and Health Techniques in Rabat (ISPITS), **Mr. Mohamed Larbi BOUAAZZAOUI, Director**

Innovation Centre, UM6SS, **Ms. Jalila BENHAMMOU, Director**

Rabat Innovation City, UM5, **Pr. Bouchaib BOUNABAT, Director**

University Entrepreneurship Centre, UM5, **Pr. Karima GHAZOUANI, Director**

INTERNATIONAL ORGANISATIONS

UN-Women, **Mrs. Leila RHIOUI, Representative in Morocco**

UNICEF, **Ms. Oumayma RAIMI, Morocco Program Specialist**

UNFPA, **Mr. Louis MORA, Resident Representative in Morocco**

World Health Organisation, **Dr. Maryam BIGDELI, Representative in Morocco**

Joint United Nations Programme on HIV/AIDS (UNAIDS), **Dr. Kamal ALAMI, Director Morocco**

The project team would like to thank,
Mr Mohamed Bahadi, Dr. Nazih El Kouarty, Mrs Maria Loudiyi, Mr Youness Rabaa, Mr Naoufal Rahali and Mr Mohammed Rhalloussi,
for their contribution to the achievement of the interviews


Partners

The project team would like to thank its partners and sponsors for their contribution to the realisation of this White Paper

Partners

Institutions and regulators

Healthcare providers

Management organisations

International organisations

Associations

Training, Research and Innovation

Industrialists and solution operators

Sponsors

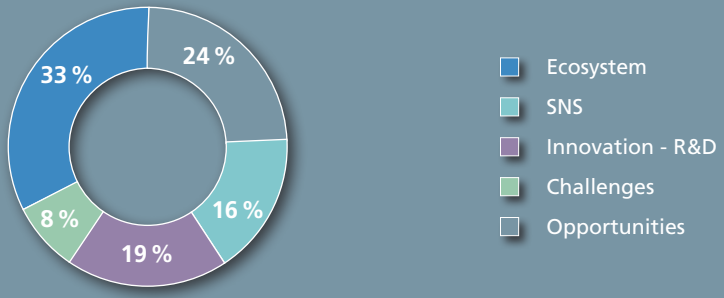

COHORT ANALYSIS REPORT
What are your top devices?
Sessions by device
Sessions by country
Czechia
Slovakia

Annexures

Annexure 1

E-health stakeholder roundtable, April 3, 2021

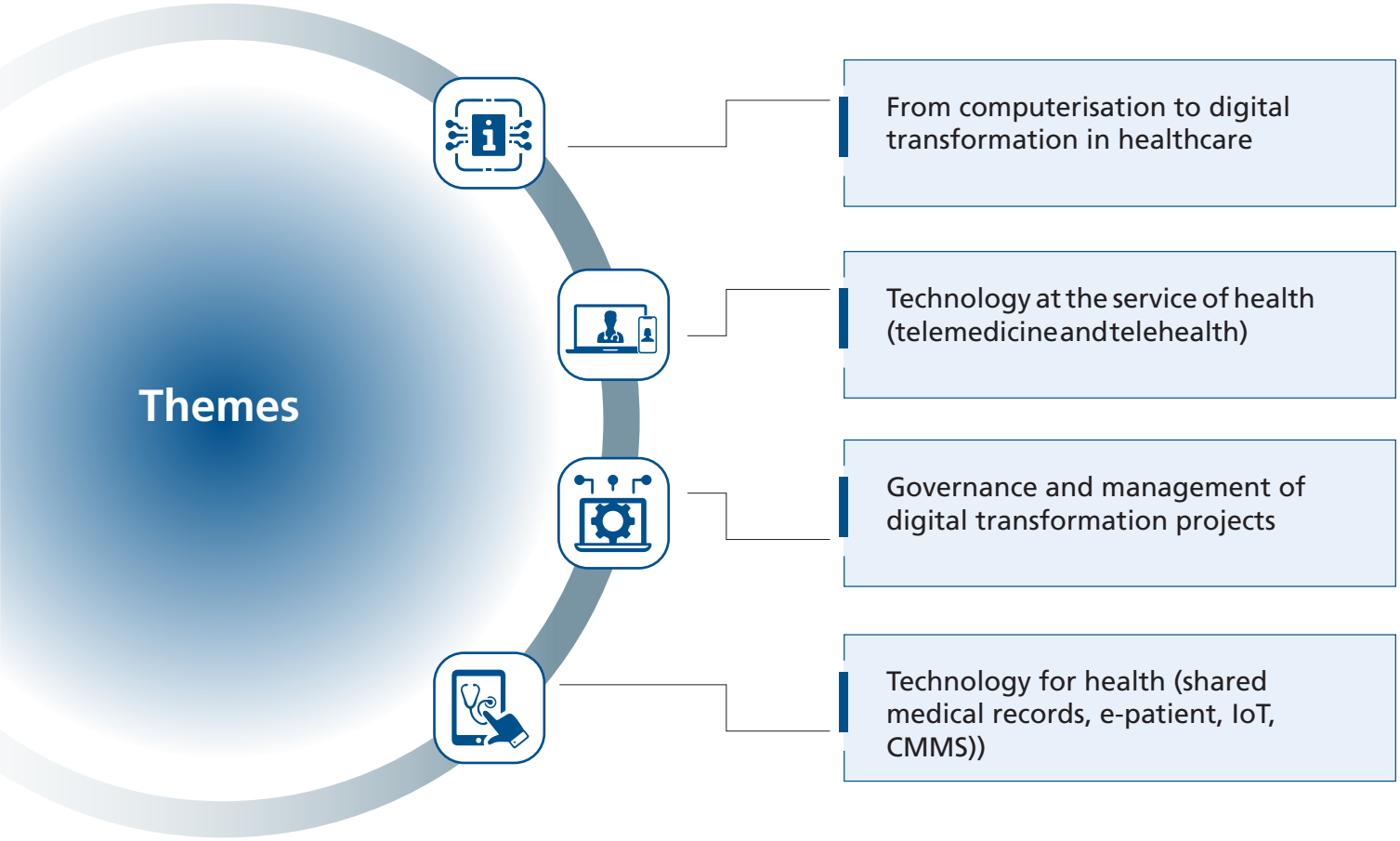
Breakdown of themes by interest



1. **Opportunities**, **Ecosystem and Innovation** - **R&D** (76%) are the top priorities of stakeholders and reflect their optimism in striving for success in e-health projects in Morocco
2. "**Difficulties**" come last (**8%**), which explains the stakeholders' desire to overcome all unnecessary obstacles

Annexure 2

Experts' seminar, October 26, 2021



Annexure 3

Interview guide

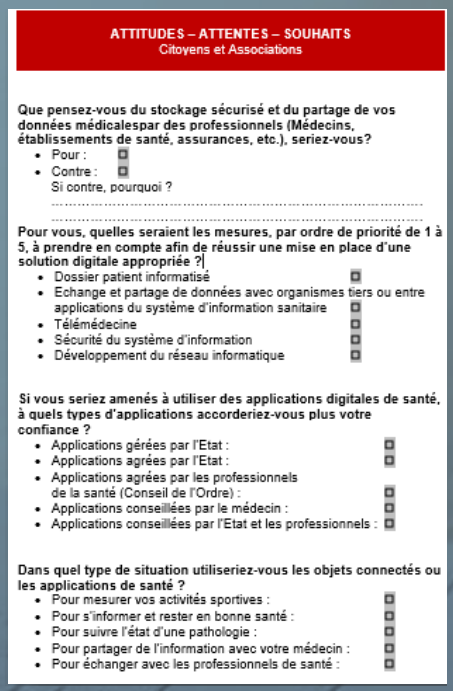
4 key themes

- Concept and Morocco' positioning
- E-health issues and impacts
- Security, regulation and development
- Future

Target audience

- Decision-makers
- General public

Annexure 4
2 digital surveys



ATTITUDES – ATTENTES – SOUHAITS
Citoyens et Associations

Que pensez-vous du stockage sécurisé et du partage de vos données médicalespar des professionnels (Médecins, établissements de santé, assurances, etc.), seriez-vous?
- Pour : ☐
- Contre : ☐

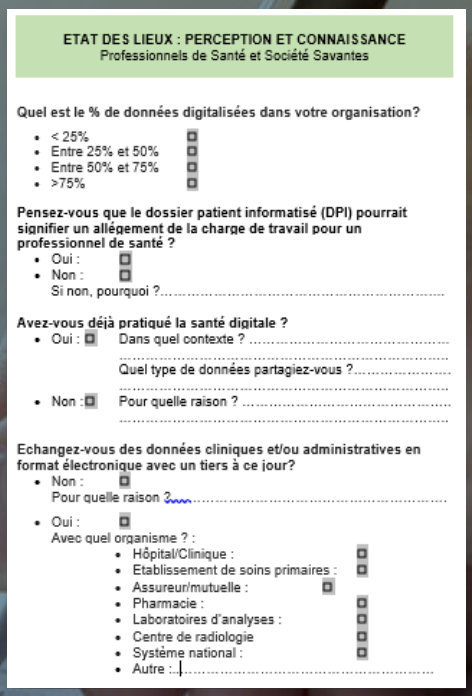
Si contre, pourquoi ?
.....
.....

Pour vous, quelles seraient les mesures, par ordre de priorité de 1 à 5, à prendre en compte afin de réussir une mise en place d'une solution digitale appropriée ?
- Dossier patient informatisé ☐
- Echange et partage de données avec organismes tiers ou entre applications du système d'information sanitaire ☐
- Télémédecine ☐
- Sécurité du système d'information ☐
- Développement du réseau informatique ☐

Si vous seriez amenés à utiliser des applications digitales de santé, à quels types d'applications accorderiez-vous plus votre confiance ?
- Applications gérées par l'Etat : ☐
- Applications agrées par l'Etat : ☐
- Applications agrées par les professionnels de la santé (Conseil de l'Ordre) : ☐
- Applications conseillées par le médecin : ☐
- Applications conseillées par l'Etat et les professionnels : ☐

Dans quel type de situation utiliseriez-vous les objets connectés ou les applications de santé ?
- Pour mesurer vos activités sportives : ☐
- Pour s'informer et rester en bonne santé : ☐
- Pour suivre l'état d'une pathologie : ☐
- Pour partager de l'information avec votre médecin : ☐
- Pour échanger avec les professionnels de santé : ☐

#Questionnaire-1
General public



ETAT DES LIEUX : PERCEPTION ET CONNAISSANCE
Professionnels de Santé et Société Savantes

Quel est le % de données digitalisées dans votre organisation?
- < 25% ☐
- Entre 25% et 50% ☐
- Entre 50% et 75% ☐
- >75% ☐

Pensez-vous que le dossier patient informatisé (DPI) pourrait signifier un allégement de la charge de travail pour un professionnel de santé ?
- Oui : ☐
- Non : ☐

Si non, pourquoi ?.....

Avez-vous déjà pratiqué la santé digitale ?
- Oui : ☐ Dans quel contexte ? .....
  .....
  Quel type de données partagiez-vous ?.....
  .....
- Non : ☐ Pour quelle raison ? .....
  .....

Echangez-vous des données cliniques et/ou administratives en format électronique avec un tiers à ce jour?
- Non : ☐
  Pour quelle raison ?.....
- Oui : ☐
  Avec quel organisme ? :
  - Hôpital/Clinique : ☐
  - Etablissement de soins primaires : ☐
  - Assureur/mutuelle : ☐
  - Pharmacie : ☐
  - Laboratoires d'analyses : ☐
  - Centre de radiologie ☐
  - Système national : ☐
  - Autre :..

#Questionnaire-2
Healthcare professionals

- Quota-based sampling
- Quantitative and qualitative analysis
- 3 similar components # Different formulations
- Questions adapted to the respondent's profile

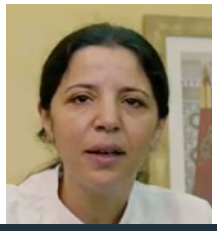
3 key themes

- General data and characteristics
- State of play: perception and knowledge of the subject
- Attitudes, uses, expectations and priorities

Annexure 5

Winners of the call for e-health projects

Prize awarding ceremony, June 12, 2021



Pr. Hanan RKAIN
Professor in Physiology, Rheumatologist
FMPR-UM5

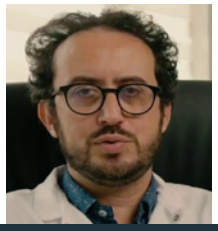
Platform for educational therapy on preventive medicine and healthcare

Pr. Mohammed CHERTI
Head of the Cardiology B Department at CHUIS
FMDR-UM5

Remote electrocardiogram reading

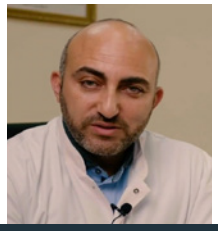
Pr. Amal SATTE
Neurophysiology Department at HIMMV
FMPR-UM5

Connected watch application for insomnia diagnosis and management



Pr. Saber BOUTAYEB
Day Hospital responsible
Medical Oncology
FMPR-UM5

Information Chabot for cancer patients and their families



Pr. Hicham BENYAHYA
Dental-facial orthopaedics
FMDR-UM5

AR/VR simulation of dent-maxillofacial pathology treatment