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Digital Health Systems in Africa

A convergence of opportunities

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Executive summary

Africa's young tech-savvy population, combined with a rise in non-communicable diseases and a threat from climate change, is creating a convergence in health challenges that can be unlocked by digital technologies.

The needs for digitisation faced by Africa are borne from similar causes as highly developed regions but opportunities manifest themselves differently due to unique features such as:

- **Timing:** Many open-source technologies are maturing right now.

- **Leapfrogging**: Bypassing systemic challenges in infrastructure development.

- **Collaboration**: Opportunity to build pan-African standards and regulations.

- **Open source**: Collaborative approaches are cost-effective solutions and scalable.

- **Determination**: International multi-donor funded initiatives.

The results from the surveys show the following five areas as focus areas for policymakers and other interested parties:

1. **Private/Public sector disparity:** Private sector funding is often greater than that of the public sector, particularly in the initial phases of projects.

2. **Underdeveloped Electronic Health Records:** There is no consistency across countries concerning the existence of operational EHR networks that are both comprehensive and widely used.

3. **Mobile Health prominent but not universal:** mHealth holds the promise of enabling African nations to bypass the historical route to digital maturity, however, there are substantial variations in its implementation across countries.

4. **Scalability and long-term commitment:** Numerous initiatives across Africa generate interest and attention, but their actual impact remains questionable.

5. **Future-fit systems:** African countries primarily emphasise healthcare focused on addressing infectious diseases. However, there is a steady continental shift occurring, from acute diseases to chronic conditions.

Africa stands at a transformative juncture in its healthcare evolution and the continent is increasingly prepared to capitalise on greater digitisation. These advancements will allow Africa to prepare for novel challenges in the evolving healthcare landscape, from evolving disease patterns to the health impacts of a changing climate.

Introduction

Africa stands at the fore of global demographic change, poised for rapid growth as its population is projected to reach 26% of the world's total by 2050, up from 18% today.[1] The continent is full of tech-savvy youngsters entering the workforce, ready to apply new tools to old problems, aided by the presence of robust companies making use of latest generation infrastructure. This is accompanied by a transformation in the epidemiological landscape, with non-communicable diseases expected to be the primary cause of both mortality and morbidity by 2030.[2] Combined, this is on the verge of creating a paradigm shift in how African nations have traditionally monitored and provisioned healthcare.

Simultaneously, there is a rising commitment to fostering self-sufficiency and a commercially sustainable pharmaceutical sector across what is the world's largest free trade zone.[3] This is as major global events, like climate change, future pandemics, and political instability continue to impact the continent, affecting population health as resources deteriorate and conflicts arise.

What's more, the recent pandemic laid bare the deficiencies in Africa's manufacturing, distribution, regulatory, and clinical development capacities, underscoring the effect of decades of underinvestment in healthcare. The tide is changing however, and the timing could not be more opportune: African health systems are gearing up to embrace digital technologies, just as these innovations are gaining global prominence.

Unlocking the potential of a digital Africa

African healthcare will not realise its potential through the routes historically followed by the developed markets. Digitisation will be core to African health system's development because of the following unique characteristics:

- **Timing:** The rise of digital technologies globally will coincide with African health systems' next steps in maturity – from Universal Healthcare, better data collection, development of resilience and responsiveness, and increasing self-reliance in healthcare provision.

- **Leapfrogging**: Bypassing systemic challenges in infrastructure and provision – particularly the absence of existing infrastructure – to build resilient and responsive solutions to future challenges based on latest-generation technologies.

- **Collaboration**: Opportunity to build pan-African regulation that supports and encourages digital healthcare innovation and improved healthcare outcomes.

- **Open source**: A necessary focus on open source, collaborative approaches is driving the development of cost-effective solutions which can subsequently scale with greater ease.

- **Determination**: Worldwide recognition for the need to improve African healthcare has sparked multi-donor funded initiatives to improve infrastructure and technology.

In our first study[4], predominantly focused on Europe, we concluded that many countries had identified healthcare as a core pillar in their digital strategy, but often varied greatly in their success in translating policy into real-world networks and infrastructure to achieve their aims. This new study shows that many of the challenges faced in Africa and Europe stem from similar root causes like cultural attitude, trust in institutions, sustainable financing and competent leadership. These challenges manifest themselves differently in Africa due to the unique features in the continent, which include:

- Large public and private innovation divide
- Greater use of mobile technology
- Majority of care distributed across rural areas
- A traditional focus on infectious diseases
- A lack of healthcare IT backbone, limiting the development of applications

A dedicated study benchmarking countries within the African continent is necessary to further assess the challenge of increasing digital maturity and any potential solutions.

Digital maturity scores across African countries

Summary of results

The summarised results from the Digital Health System Maturity Score are the average of all scores from fourteen elements, covering Initiatives, Infrastructure and Implementation and detailed in the Methodology section of this paper. The scoring corresponds to discrete stages in a country's path towards maturity and are summarised in Figure 1.

Unlike our first study, we find that there is no correlation between per-capita purchasing power and digital maturity score. A pivotal determinant for digital growth in African nations is the presence of political will and effective coordination to allocate resources effectively. Infrastructure projects are expensive – for instance, the UK's NHS digitisation efforts, which incurred significant costs and yet failed, ranked as one of the most expensive civilian computer projects ever undertaken.[5] While these budget overruns can be shouldered by affluent countries, the risk appetite and fiscal bandwidth for such endeavours are limited in Africa.

A more sustainable approach involves leveraging several key factors. Firstly, the presence of motivated individuals in government positions with the resources and mandates to engender action is crucial. While hard to pin down, indicators are being refined to assess this, such as the UN's E-Government Knowledgebase. Secondly, open-source tools offer cost-effective solutions and maximise interoperability, and lastly, knowledge-sharing and partnerships enhance coordination among stakeholders.

The problem then, is less one of loosening the purse-strings, but of finding the right human capital and empowering them to execute clear objectives.

Initiatives

POLICY MOMENTUM WAVERS

In the last decade, numerous African nations have initiated digital health strategies; however, a recurring issue lies in the lapse of these strategies without subsequent updates, especially after the COVID-19 pandemic. Figure 2 shows the status of these strategies and their launch sequence.

Overcoming stale policies requires a structured approach involving the establishment of defined expiration dates, as well as a long-term continuity plan.

Figure 1: Level of digital health system maturity across Africa
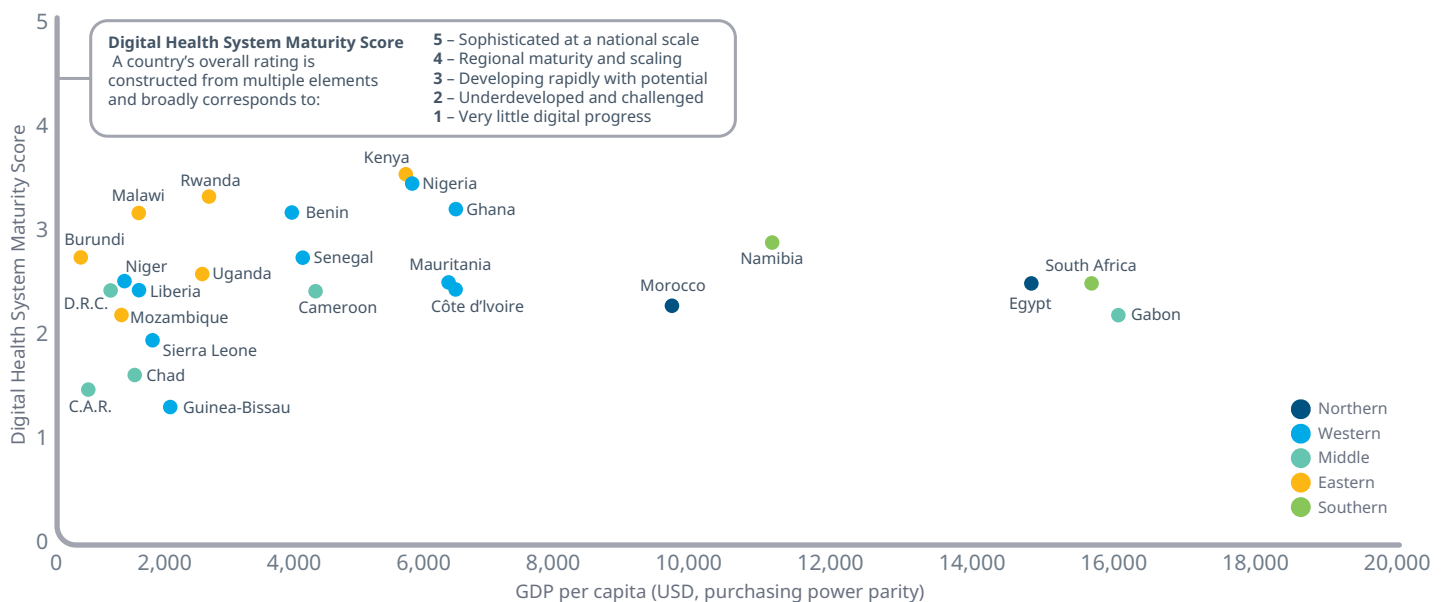
Source: IQVIA EMEA Thought Leadership; Based on interviews, surveys and scores from the Global Digital Health Monitor May 2023.
Notes: D.R.C. = Democratic Republic of the Congo; C.A.R. = Central African Republic

Figure 2: National digital health strategies in African countries

Source: IQVIA EMEA Thought Leadership; HELINA.
Notes: Not exhaustive.

Such time limits serve to ensure the timely completion of associated projects, mitigate runaway costs, and establish clear provisions for strategy refreshment.

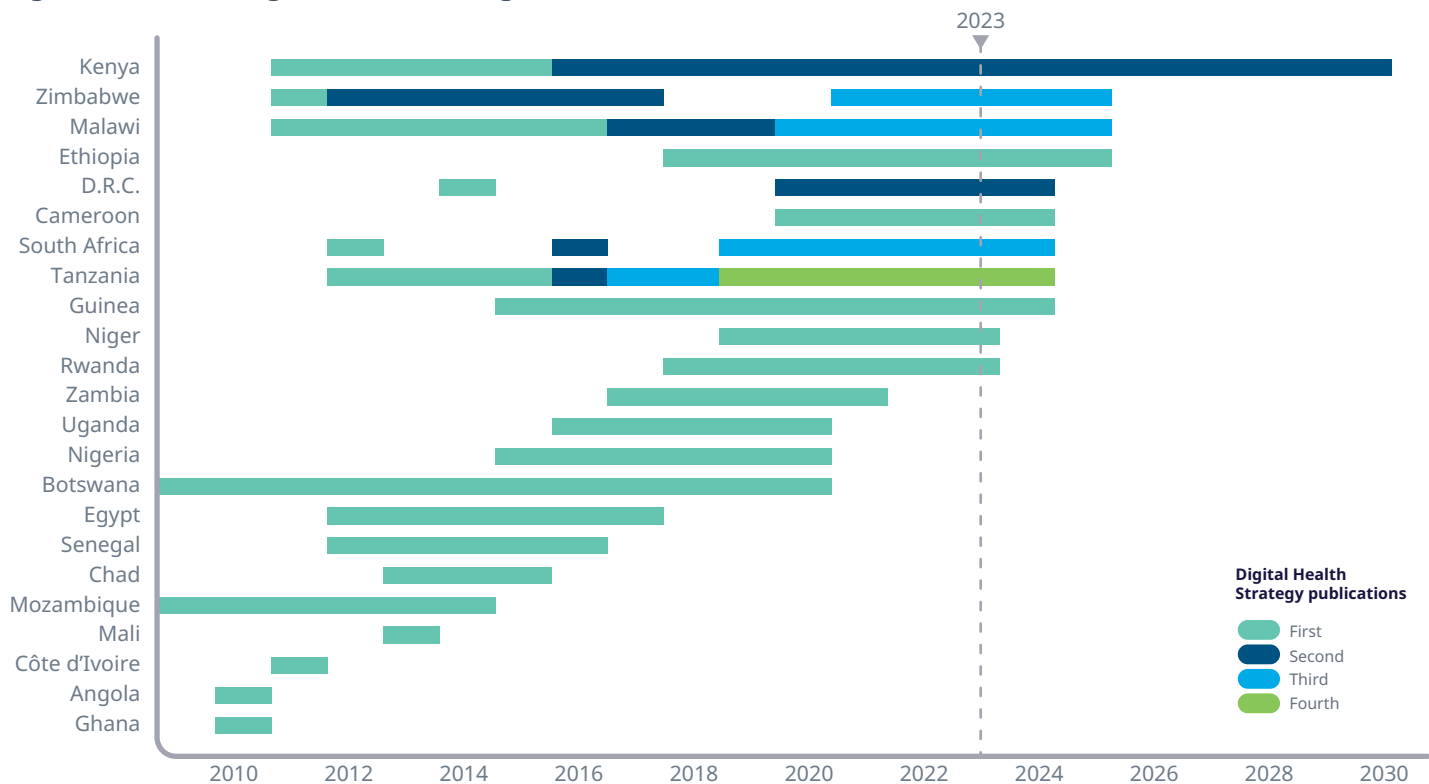A notable example is Nigeria, which has previously exhibited a commendable digital health strategy instilled with legally mandated time-bound provisions. However, it is now outdated, and whilst stakeholders are seeking the formulation of a revised strategy there are no fixed plans for one on the horizon.

Infrastructure

CONTINUOUS NEED FOR RIGOUR WITH STANDARDS

In our first study, we found that many developed countries struggled to turn their digital strategy into reality because of the complexity of constructing infrastructure, given the various standards and legacy systems already in place. A 2013 paper[6] identified the many barriers in choosing and adopting standards in Africa and this study concluded that these challenges continue to persist. These include the lack of recognition and implementation of standards at a national level, coupled with a workforce gap. Ghana is an example where many separate health systems roll up into one central tool, but the data is not necessarily clean. Even when interoperability is obtained, **Healthcare providers (HCPs), patients and administrators must be trained to input data and make these networks useful.**

The 2013 study suggests that these challenges can be overcome by:

- **Leadership, governance and multi-sector engagement**: To ensure coordination, provide political leadership and engage stakeholders. We recognise that strong leadership at all levels in government is a critical success factor.

- **Strategy and investment**: Align funding to strategies that are a priority for the country so scarce resources can be allocated effectively. Focus on setting up healthcare IT backbones to accelerate ecosystem development.

- **Legislation**: Policy and compliance. Creates the environment and necessary legal frameworks to protect intellectual property, resolve conflicts and instil trust.

- **Workforce**: Having an adequately skilled workforce available to enact policies is necessary. Most countries in our study scored poorly on this element and a glaring area needing action is the gender gap between internet users, with countries such as Tanzania, Cameroon and Niger exhibiting a nearly 10% difference in fewer women using the internet (2016–17).[7] Improving the gender gap is an effective way to augment a skilled workforce.

ELECTRONIC HEALTH RECORDS UNDER PRESSURE

Electronic Health Records (EHRs) are digital versions of patient's medical histories, treatment plans, and critical health information. In our first study, we found that EHRs had a profound impact on understanding care provision on a deeper level and, importantly, provided a backbone from which other applications could interact at a national level. However, the implementation of EHRs in African countries comes with a unique set of challenges, primarily stemming from resource limitations and inadequate infrastructure throughout remote areas. Despite successful pilot programs, the transition to publicly managed EHR systems is challenged by a lack of strong leadership, technological competence and the lack of legal preparedness in governing data collection and storage.
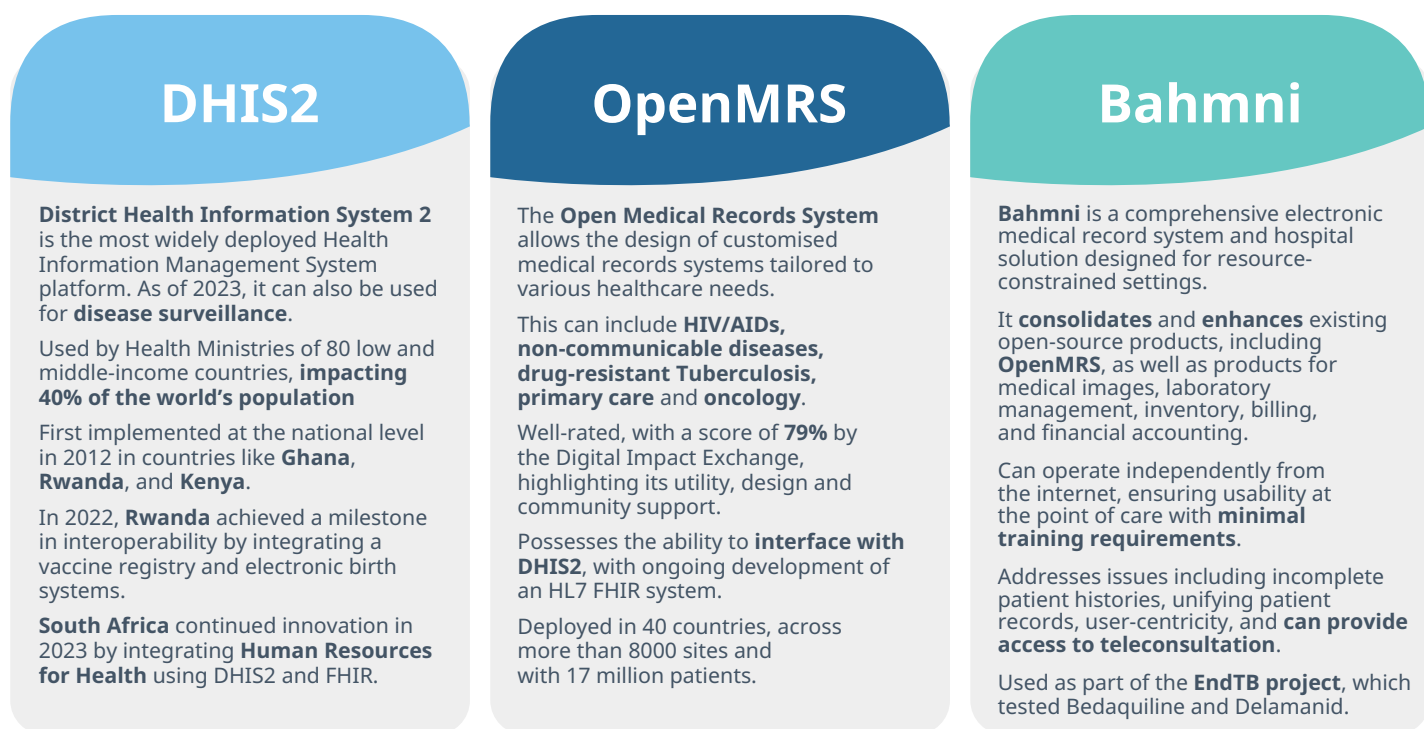
In Africa, well-established EHR systems tend to focus on specific areas, such as infectious diseases including HIV/AIDS, Tuberculosis, or Malaria. Additionally, they are a prerequisite for the collection and collation of anonymised patient data for the purposes of public health management including:

- Disease surveillance and routine immunisation tracking
- Health information exchange
- Health facility and patient records management
- Health education and promotion
- Facilitating innovation through software-as-a-service applications

EHRs are also necessary to develop the large data lakes that can be used by private initiatives developing tools to augment public health provision.

Three noteworthy open-source EHR systems have risen to prominence in Africa: DHIS2, OpenMRS, and Bahmni. These three common EHRs in Africa collectively contribute to the transformation of healthcare management across the continent. They are described in detail in Figure 3.

Figure 3: Commonly used EHR systems in Africa

DHIS2

District Health Information System 2 is the most widely deployed Health Information Management System platform. As of 2023, it can also be used for **disease surveillance**.

Used by Health Ministries of 80 low and middle-income countries, **impacting 40% of the world's population**

First implemented at the national level in 2012 in countries like **Ghana**, **Rwanda**, and **Kenya**.

In 2022, **Rwanda** achieved a milestone in interoperability by integrating a vaccine registry and electronic birth systems.

South Africa continued innovation in 2023 by integrating **Human Resources for Health** using DHIS2 and FHIR.

OpenMRS

The **Open Medical Records System** allows the design of customised medical records systems tailored to various healthcare needs.

This can include **HIV/AIDs, non-communicable diseases, drug-resistant Tuberculosis, primary care** and **oncology**.

Well-rated, with a score of **79%** by the Digital Impact Exchange, highlighting its utility, design and community support.

Possesses the ability to **interface with DHIS2**, with ongoing development of an HL7 FHIR system.

Deployed in 40 countries, across more than 8000 sites and with 17 million patients.

Bahmni

Bahmni is a comprehensive electronic medical record system and hospital solution designed for resource-constrained settings.

It **consolidates** and **enhances** existing open-source products, including **OpenMRS**, as well as products for medical images, laboratory management, inventory, billing, and financial accounting.

Can operate independently from the internet, ensuring usability at the point of care with **minimal training requirements**.

Addresses issues including incomplete patient histories, unifying patient records, user-centricity, and **can provide access to teleconsultation**.

Used as part of the **EndTB project**, which tested Bedaquiline and Delamanid.

Whilst these EHR systems are widespread throughout Africa, as shown in Figure 4 with at least one system deployed in most countries, this does not tell the whole story. Although the data may initially suggest wide adoption of EHRs in Africa, what is not shown is the scale of deployment of these systems, their degree of use by HCPs, or the quality of the data they contain. These factors are the true determinants of the efficacy of an EHR system, and indeed the implementation and use of these systems vares widely in countries where they have been deployed.

Figure 4: EHR system country coverage

DHIS2 | OpenMRS | Bahmni

(Combination of colour and shading indicates systems used)
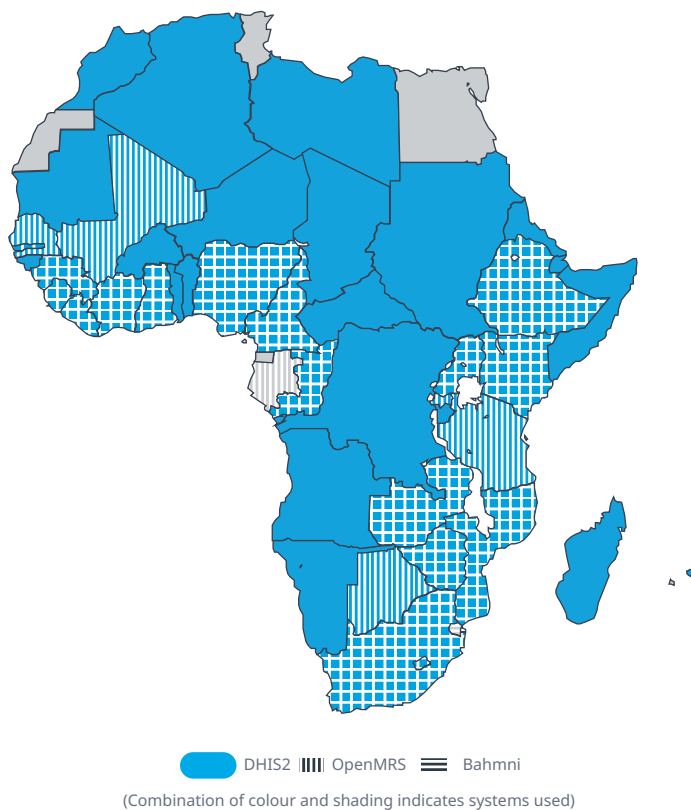
Source: See references 8–10.

Implementation
MOBILE HEALTH LEAPFROGGING

By leveraging mobile technology, African countries have leapfrogged traditional technology barriers with success in mobile finance throughout Sub-Saharan Africa. They have bypassed the need for extensive physical infrastructure and adopted innovative solutions that are more adaptable to their unique challenges, including access to healthcare in remote areas and affordability of services.

The next logical step from mobile finance, is the extension to Mobile Health (mHealth), often using the same platforms, e.g. M-PESA and M-TIBA. mHealth initiatives have expanded healthcare access, particularly in remote areas, providing telemedicine consultations, health education, and appointment reminders via SMS and smartphone applications. This has been beneficial in the chronic space, where patients benefit from remote monitoring, and in emergency situations where rapid communications have saved lives. RapidSMS is an example tool that helped community health workers track pregnant women in 15,000 villages in Rwanda for their first 1,000 days.[11] The national rollout was seen as a success, although some challenges were encountered, such as access to electricity and cost of sending SMS messages.[12]

Outside investments
Precedents exist for successful investments into African infrastructure, and telecommunication infrastructure delivery is an analogous case to digitising health systems. It has morphed from a traditionally public sector responsibility to increased private sector involvement due to funding constraints and a demand for dynamic tech innovation. While private investment, especially in mobile telephony, has surged, governments still retain a control over regulation. Public-Private Partnerships (PPPs) form to develop telecoms infrastructure by mobilising private capital without overwhelming public finances. This is done by clearly delineating responsibilities and spreading the risk across multiple parties. These collaborations have worked well, increasing access to telecoms across Africa, and the same could be applied to advance digital health system maturity.

However, outside investments in African countries comes with systemic risks, including political instability and the potential for assets to be seized or nationalised by succeeding governments. To mitigate these associated risks, international organisations can:

- **Conduct independent due diligence**: Before making any investments, organisations should commission thorough risk assessments that consider political, economic, and security factors. This assessment should include an analysis of the country's history of political stability, the rule of law, and the protection of property rights.

- **Shape contracts and purchase insurance**: Contracts can include legal safeguards like dispute resolution and matched payments to spread risk. Political Risk Insurance can be purchased to protect investments against the risk of asset seizure, nationalisation, or non-payments.

- **Build strong partnerships**: Collaborating with local organisations and governments can help establish a stronger presence and gain a better understanding of the political landscape. Local partners can provide valuable insights and support in navigating political challenges. Moreover, demonstrating a commitment to the development of the local community can help build goodwill and support among local stakeholders, which can be valuable during times of political uncertainty.

- **Stay informed and flexible**: Maintain flexibility in investment strategies and diversify investments where possible. Risk assessments should be updated regularly based on changing political conditions, and preparations should be put in place to adapt plans as needed.

It is important to recognise that investing in regions with political instability does carry inherent risks that cannot be eliminated entirely. Therefore, organisations should carefully weigh the potential risk-benefits of their investments and ensure they have a robust risk management plan in place when considering investments in African countries with political challenges.

Rwanda's success in digital health

Rwanda, a small country of 14mn inhabitants (2022)[13], boasts a highly mature digital health system driven by several key enablers, some of which are listed below:

- **Commitment from the government**: Rwanda's government has displayed strong commitment to healthcare digitisation. Their vision for a technologically advanced healthcare system is reflected in comprehensive national strategies, the latest being the "Rwanda eHealth Strategic Plan 2018–2023". In the broader sense, Rwanda has some of the highest African scores in government effectiveness[14] and political stability[15], giving reassurance to outside investors.

- **Telecommunications infrastructure**: Investment in infrastructure, including nationwide 4G and 5G coverage, has laid a solid foundation for digital health initiatives. This connectivity extends even to remote areas, where national 4G coverage rose from 62% in 2016 to 99% in 2021.[16] Recently, Rwanda opened up the market for network providers to encourage competition and greater affordability.[17]

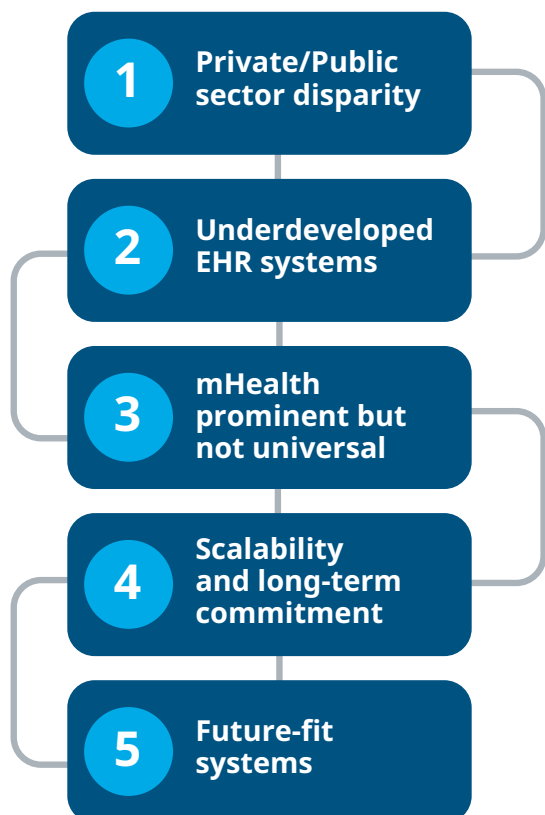- **Early EHR rollout**: The implementation of a unified EHR system over a decade ago, the Rwanda Health

Information Exchange (RHIE), has made medical histories easily accessible amongst healthcare providers. The first phase of RHIE served maternal and paediatric uses.[18]

- **National ID and health insurance**: The rollout of a national ID for Rwandans aged 16 and over simplifies patient identification and reduces errors.[19] In addition, the country's universal health insurance system, *Mutuelles de Santé*, has played an important role by promoting efficient record-keeping.

- **Community Health Workers (CHW)**: Rwanda has leveraged its extensive network of 45,000[20] CHWs who use mobile phones and tablets for data collection and patient care in rural areas. The CHW programme is seen as a key driver of success in the country.

- **Global partnerships**: Collaborations with international organisations and donors have provided technical and financial support for digital initiatives. Notable collaborations include Partners in Health; Gavi, the Vaccines alliance; The Global Fund; and USAID amongst others.

Moving forward, bit by bit

Many recurring problem areas were identified during the expert interviews. These problem areas, which must be addressed to progress digital maturity in Africa, are highlighted in Figure 5.

Figure 5: Five key recommendations

1	**Private/Public sector disparity**
2	**Underdeveloped EHR systems**
3	**mHealth prominent but not universal**
4	**Scalability and long-term commitment**
5	**Future-fit systems**

A challenge arises from the lack of coordination between the private and public sectors in securing long-term financial support for initiatives and so it is imperative to couple both sectors progress harmoniously.

Private/public sector disparity

Private sector funding is often greater than that of the public sector, particularly in the initial phases of projects. A challenge arises from the lack of coordination between the two sectors in securing long-term financial support for initiatives and so it is imperative to couple both sectors progress harmoniously; otherwise, there is a risk that private enterprises may encounter predicaments.

Firstly, they may introduce innovative solutions that the country is ill-prepared to fully leverage. For instance, deploying advanced machine learning models when the underlying data is shallow and unclean may yield limited results. This concern was highlighted in Nigeria, where it was suggested that adopting a people-centred healthcare model[21] would limit the over-implementation of digital solutions.

Alternatively, they may face limitations in their ability to thrive, primarily due to inadequate infrastructure development at a national scale. A common example of this is when there is no widely adopted EHR system in place to support the innovations being introduced.

To mitigate these challenges, both sectors can secure adequate funding and synchronise the pace of innovation with the country's readiness. This requires a collaborative approach and in Table 1 we list strategies that all parties can employ.

Underdeveloped EHR systems

There is no consistency across countries concerning the existence of operational EHR networks that are both comprehensive and widely used (see EHR section above and Figure 4). EHR networks serve as the foundational bedrock of systems infrastructure, a fact underscored in our prior report, where we noted that all European countries have harnessed EHRs to provide population-level insights.

Table 1: Potential actions to mitigate the disparity between private and public sectors

PRIVATE SECTOR ACTIONS	PUBLIC SECTOR ACTIONS
Demonstrate value: Clearly articulate the value of digital solutions by providing evidence of how these tools can address specific healthcare challenges that are aligned to the national digital health strategy.	Policy and Regulatory frameworks: Establish supportive frameworks that include data privacy and security regulations, interoperability standards, and licensing procedures.
Capacity building: Private organisations can offer training and capacity-building to public sector employees to enhance their ability to manage digital tools effectively.	Resource allocation: Prioritise innovation within limited budgets by allocating resources strategically. Recognise the long-term benefits of digitisation and allocate funds accordingly.
Sustainability plans: Outline how the digital solution will be maintained and funded over the long term, and ultimately transferred to the public sector.	Incentives: Incentivise private organisations to invest in healthcare innovation. This could include tax breaks, grants, or access to public healthcare facilities for testing and implementation.
Mobilise finance: Access to private capital is a key advantage and sustainable, catalytic funding must be sought from investors with a long-term perspective.	Monitoring and evaluation: Implement robust mechanisms to track the impact of projects. Data-driven assessments can help justify ongoing support and inform decision-making.
BOTH PRIVATE AND PUBLIC SECTOR ACTIONS	
Advocacy and awareness: Advocate the importance of digital health and educate the public by collaborating with NGOs and community leaders about the benefits, to garner support and create demand for these services.	
Public-Private Partnerships: Explore opportunities for PPPs that include sharing innovations, demonstrating potential benefits, and gathering feedback from government stakeholders.	

To address this challenge effectively, a full evaluation of which open-source EHR systems are suitable for the country is imperative. Then, they should be systematically introduced into primary and secondary care centres, particularly those handling the highest patient volumes and rare cases.

Crucially, this integration must be coupled with extensive physician and patient education, ensuring a deep understanding of the advantages and risks associated with hosting health information digitally.

Mobile Health prominent but not universal

mHealth holds the promise of enabling African nations to bypass the historical route to digital maturity, however, there are substantial variations in its implementation across countries.

While the recognition of the imperative to bolster mobile capabilities is widespread, a critical gap persists: there is a lack of solutions that are open source and can be implemented across multiple countries.

To bridge this gap effectively, Pan-African initiatives should actively promote the creation of open-source mHealth backbone infrastructure that is intricately linked to national infrastructure. This approach not only empowers established mobile technology operators to expand their offerings in this domain, but also promotes the adoption of data standards and legislative clarity.

Nigeria is an exemplar, boasting a thriving health tech sector and a large array of mobile apps under development.

Scalability and long-term commitment

Numerous initiatives across Africa generate interest and attention, but their actual impact remains questionable. The root causes lie in their limited scalability and inadequate long-term funding, leading to a trail of failed projects that never achieve national implementation, which is commonly referred to as "pilotitis" — this even resulted in a moratorium on new projects in Uganda in 2012.[22]

To address this challenge effectively, it is vital to identify projects with the potential for scalability, particularly those capable of spanning multiple countries. These initiatives should be closely aligned with policy objectives that are tied to secured funding and have well-defined timelines that facilitate regular reviews and updates.

Ensuring stakeholder buy-in is paramount, and this can be achieved by establishing Technical Working Groups that can include representatives from private companies and NGOs, but which are primarily led by the government, an approach that has seen success in Malawi.[23]

Future-fit systems

African countries primarily emphasise healthcare focused on addressing infectious diseases. However, there is a steady continental shift from acute diseases to chronic conditions.[24] As cardiovascular diseases, neonatal conditions, and musculoskeletal disorders steadily increase in their contribution to the overall disease burden, this will warrant proactive monitoring to meet future demands.

Consequently, it is important to carry out strategic measures to equip hospitals and specialist centres with the requisite hardware and digital tools to ensure they are adequately prepared to meet the burgeoning demand for services in these changing areas of healthcare. Underpinning this change is the need to first implement backbone infrastructure to provide a healthcare information system that can monitor and track disease change.

Conclusion

Africa stands at a transformative juncture in its healthcare evolution. With a young population and an increasing rise in the burden of disease from non-communicable diseases, the continent is increasingly prepared to capitalise on greater digitisation.

Sustainable financing will expand access to promising services, and collaboration amongst nations will be a crucial step for this transformation. Building robust EHR platforms should be a priority, allowing for patient-focus and disease monitoring, better health outcomes and addressing emerging health threats effectively. The expansion of open source mHealth platforms offers a means to bridge gaps in access in remote areas. All this will accelerate Africa's ambitions to provide universal health coverage.

These advancements, coupled with visionary leadership and a focus on collaboration, will allow Africa to succeed in tackling the novel challenges it will face in the evolving healthcare landscape, ranging from evolving disease patterns to the health impacts of a changing climate.

With a young population and an increasing rise in the burden of disease from non-communicable diseases, the continent is increasingly prepared to capitalise on greater digitisation.
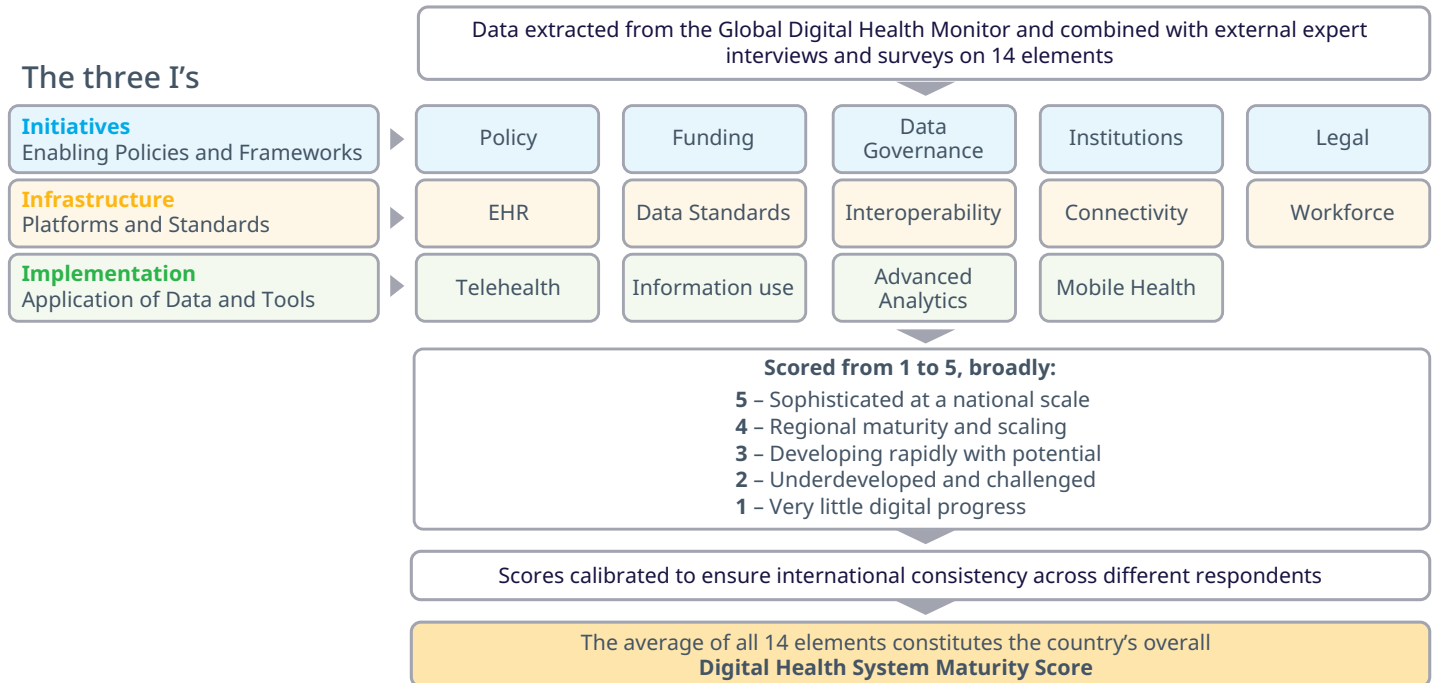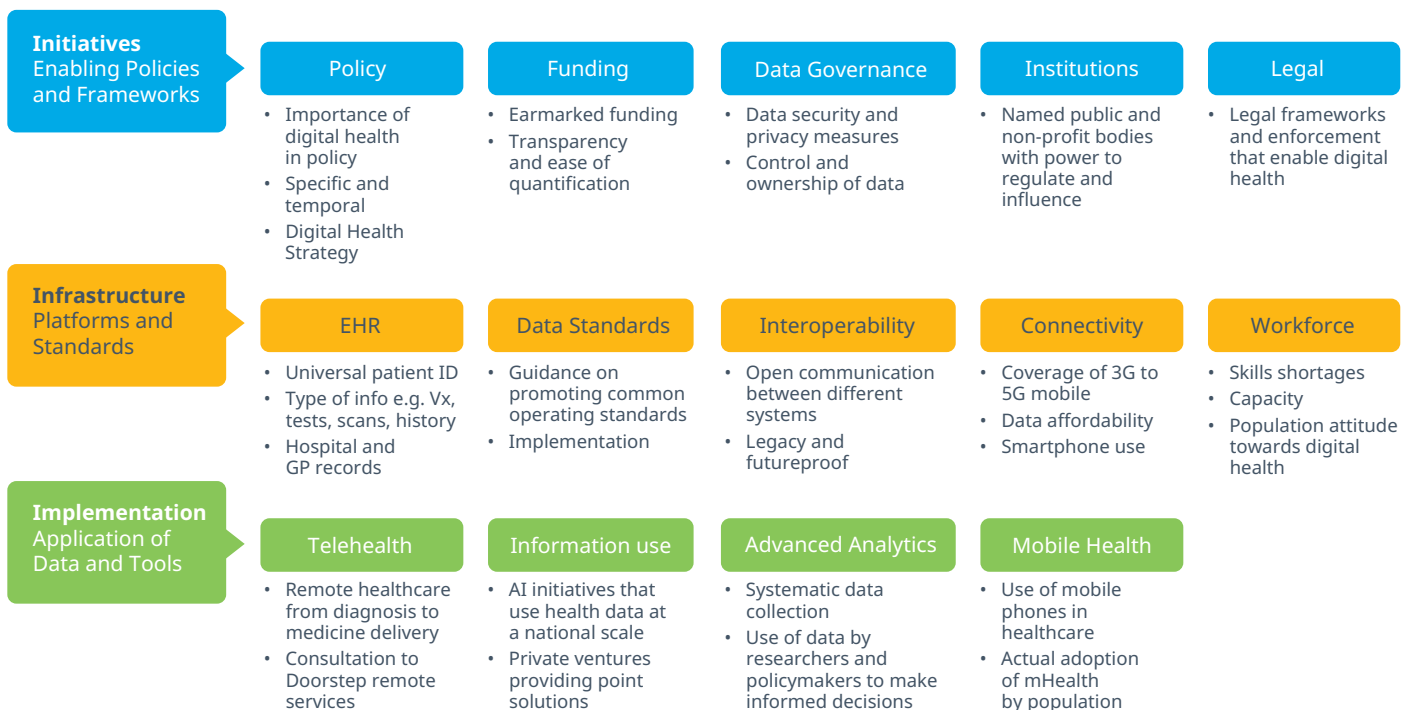
Methodology

Figure 6: Study Framework

The three I's					
	Data extracted from the Global Digital Health Monitor and combined with external expert interviews and surveys on 14 elements				
Initiatives Enabling Policies and Frameworks	Policy	Funding	Data Governance	Institutions	Legal
Infrastructure Platforms and Standards	EHR	Data Standards	Interoperability	Connectivity	Workforce
Implementation Application of Data and Tools	Telehealth	Information use	Advanced Analytics	Mobile Health	

Scored from 1 to 5, broadly:
5 – Sophisticated at a national scale
4 – Regional maturity and scaling
3 – Developing rapidly with potential
2 – Underdeveloped and challenged
1 – Very little digital progress

Scores calibrated to ensure international consistency across different respondents

The average of all 14 elements constitutes the country's overall
Digital Health System Maturity Score

Figure 7: Description of each element

Initiatives Enabling Policies and Frameworks	Policy	Funding	Data Governance	Institutions	Legal
	• Importance of digital health in policy • Specific and temporal • Digital Health Strategy	• Earmarked funding • Transparency and ease of quantification	• Data security and privacy measures • Control and ownership of data	• Named public and non-profit bodies with power to regulate and influence	• Legal frameworks and enforcement that enable digital health

Infrastructure Platforms and Standards	EHR	Data Standards	Interoperability	Connectivity	Workforce
	• Universal patient ID • Type of info e.g. Vx, tests, scans, history • Hospital and GP records	• Guidance on promoting common operating standards • Implementation	• Open communication between different systems • Legacy and futureproof	• Coverage of 3G to 5G mobile • Data affordability • Smartphone use	• Skills shortages • Capacity • Population attitude towards digital health

Implementation Application of Data and Tools	Telehealth	Information use	Advanced Analytics	Mobile Health
	• Remote healthcare from diagnosis to medicine delivery • Consultation to Doorstep remote services	• AI initiatives that use health data at a national scale • Private ventures providing point solutions	• Systematic data collection • Use of data by researchers and policymakers to make informed decisions	• Use of mobile phones in healthcare • Actual adoption of mHealth by population

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Aurelio creates topical and forward-looking strategic content relevant to pharma executives and publishes articles, blogs and white papers on a regular basis. He is involved in numerous projects related to increasing access to medicine as well as the interface between healthcare and digital technology. He is considered a subject matter expert in these areas and speaks at numerous conferences worldwide, presents at board-level meetings and engages with consulting projects.

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Julia is a recent alumna of Oxford University's founding cohort for the Applied Digital Health Master's program, passionate about the intersection of technology and healthcare. Her academic journey began with an Honours Bachelor of Science in Biomedical Sciences in Scotland and Singapore. Her scholarly pursuits culminated in a Master's thesis titled "Examining the post-2020-Landscape: Ethical and Policy Consideration of Artificial Intelligence in Digital Healthcare Technologies". Julia's recent projects include but are not limited to a publication on Trends in Biopharma M&A and a project on Digital Health systems maturity in Africa. Her interests are in Digital Health, Med Tech and AI application in healthcare.

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Based in London, Aaron joined the EMEA Thought Leadership team in 2021. His areas of focus include the rollout of COVID-19 vaccinations globally, as well as RNA therapies as part of the wider field of emerging advanced therapies, digital health systems, and the autoimmune product landscape.

He has an MEng Biomedical Engineering degree from Imperial College London.
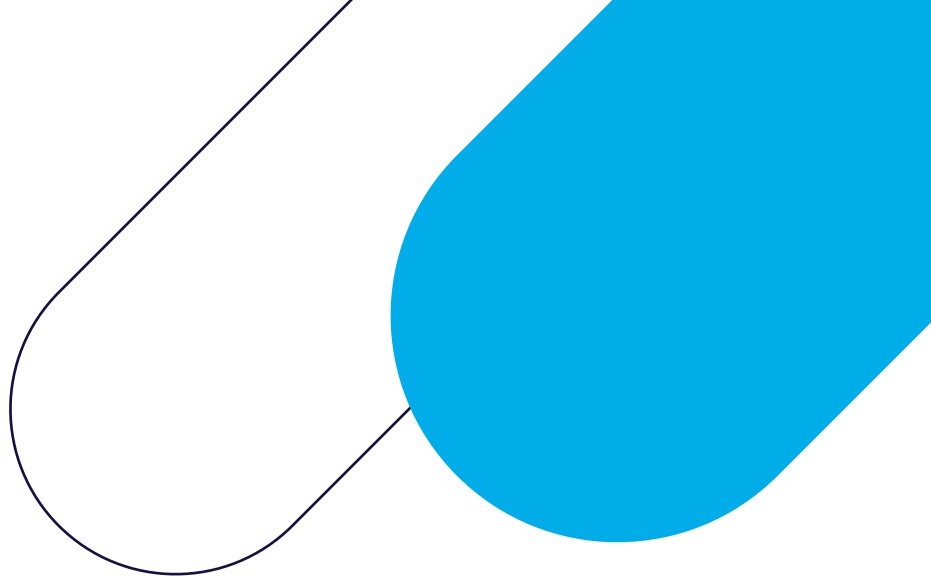
Acknowledgements

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