Digital Health in Ethiopia

Policy Framework Development for Private Sector Engagement

February 2021

PRECISE
GROWTH ACCELERATED

Contents

Abbreviations and Acronyms

AfCFTA	The Africa continental trade agreement
AI	Artificial Intelligence
AU	Africa Union
CHISU	Country Health Information Systems and Data Use
COVID-19	Coronavirus Disease 2019
DH	Digital Health
DHILC	Digital Health Innovation and Learning Center
ECA	The Economic Commission of Africa
EMR	Electronic Medical Record
GTP	Growth Transformation Plan
HDC	Health Data Collaborative
CHS	Comprehensive Health care Services
HRIS	Human Resource Information System
HRM	Human Resources Management
HSTP)	Health Sector Transformation Plan
ICT	Information Communication Technology
mHealth	Mobile Health
MIT	Ministry of Technology
MoFED	Ministry of Finance and Economic Development
MOH	Ministry of Health
PCI	Precise Consult International
PFSA	Pharmaceutical Funding and Supply Agency
PMO	Prime Minister Office
PPP	Public-Private Partnership
PPPH	Private Partnership for Health
PSE	Private Sector Engagement
SDG	The sustainable development goals
SMEs	Small-Medium Enterprises
STEM	Science and Technology stream
UHC	Universal Health Coverage
UHF	Uganda Healthcare Federation
WHO	World Health Organization

Acknowledgement

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Sincerely,

Henok Assefa

Managing Director, Precise Consult International PLC

Executive Summary

Introduction

Digital Health (DH) is a new term that encapsulates and broadens the existing and simple concept of the use of ICT for bettering health outcomes. Originating from previous terms such as ehealth and mhealth, DH focuses its definition and scope to be outside of the actual technology and DH solutions to its use and impact on health outcomes. Digital technology and its various applications and use across the healthcare value chain are varied but have shown influence and impact on the well-being and economic growth of the population worldwide.

While high-income and developed economies such as the US and Australia have differing appetite for DH technologies and adoptions of innovations and solutions, mainly because of their already established legal and data protection frameworks as well as generally well-performing health system, the imperative and rationale for a DH agenda has more valuable and quick impact for less "regulatory" heavy, and less performing health systems and markets such as those in Africa where the opportunity for adoption and scale up may seem more "transformational" in nature. Indeed, today a large majority of Africans still do not have access to essential health services at primary level and with the large population and youth across the continent, there is more of an imperative for digital strategy as part of the agenda for economic transformation and job creation.

This report summarizes key findings and proposes a policy framework for DH in Ethiopia based on a deep-dive analysis of the Ethiopian context, as well as enabling environment and barriers. In the study, extensive global, regional, and local documents were reviewed, and key informant interviews were conducted across a total of 20 stakeholders from private, public, development partners categories. Key findings from the deep-dive analyses identified key themes relevant to the DH ecosystem and were triangulated with findings from country and regional learnings and case studies of DH policy development.

The following highlights key findings across the specific analyses and major recommendations.

Global Lessons and Country Case Reviews

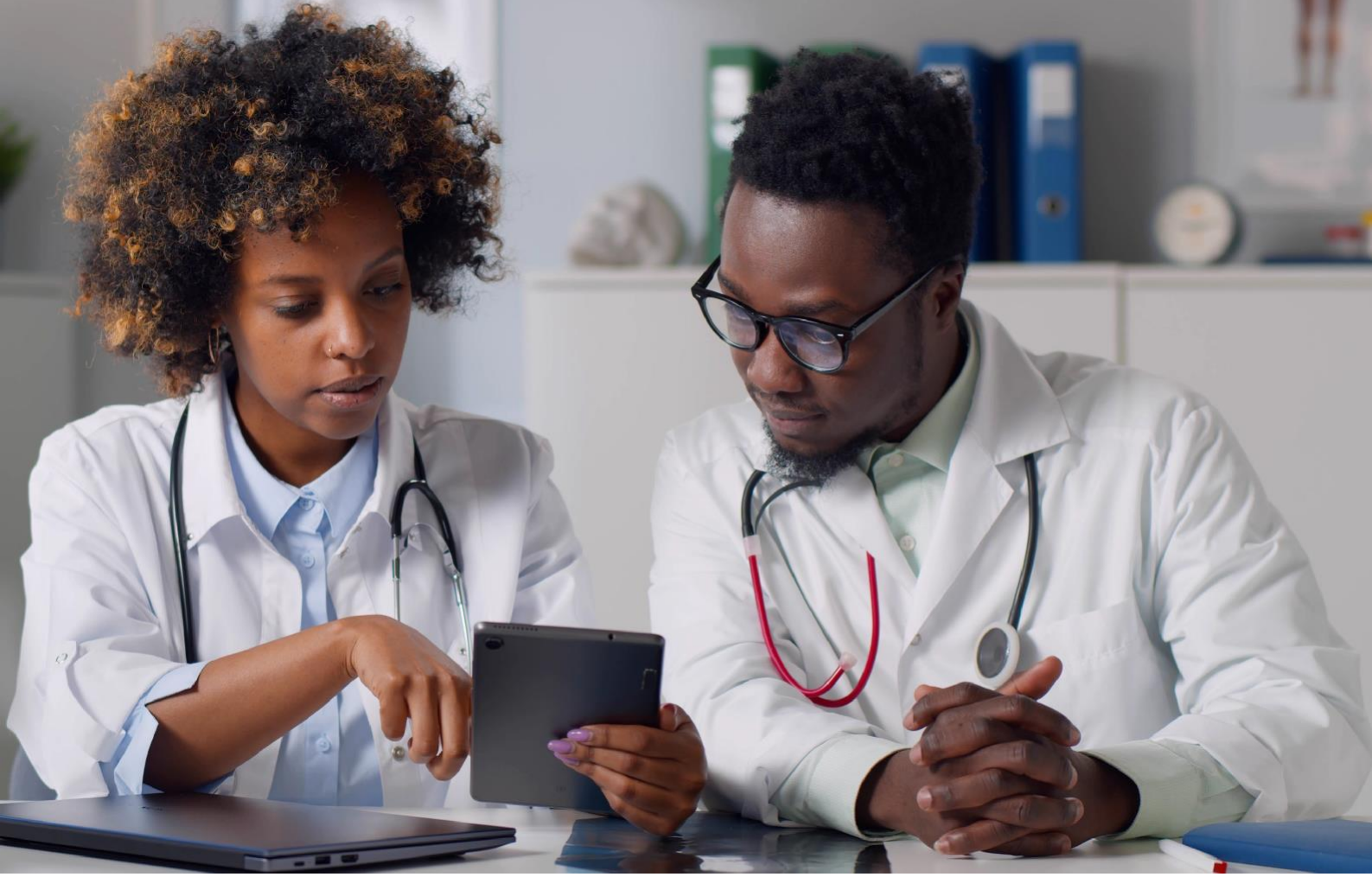
Review of country case studies focused across the African continent showcased that most DH solutions rolled out to date have limited sustainability and do not address key pillars and enablers identified for a comprehensive DH ecosystem. Critical success factors of other DH policy frameworks point to the key enablers including 1) leadership and governance; 2) integration and inclusive view of the ecosystem and recognizing that stakeholders span, public, private, development partners as well as sectors outside of health such as telecom, banking etc. are crucial; and 3) ensuring key resources such as financial, technical (through human capacity and skills) and structural are enabled to support the DH ecosystem.

Beyond these enablers, countries should have a regionalization and global view of the ecosystem in establishing DH and ensure that policy and regulations incentive address the needs of all stakeholders to have a "patient-centric model" and ensure that end users and consumers are empowered and can use the technology for better health outcomes.

Key Findings of the Current Landscape

When reviewing the current landscape of Ethiopia and its readiness for a successful and function DH ecosystem and strategy, it is clear that Ethiopia has clear strengths and opportunities in its inherent structures (e.g. clear vision and leadership from government for a digitally enabled economy; encouraging banking, telecom and business sector reforms) but it also has significant limitations in its limited human expertise, digital literacy, bureaucracy and most importantly the fragmentation and limited private sector engagement in a national digital agenda.

Review of key policy documents in Ethiopia confirms that although Ethiopia has adopted a national digital strategy and encouraged private sector engagement in previously public institutions such as telecom, banking, and others, DH as a key pillar for economic transformation is not mentioned. Private sector is usually a sector that brings finance, innovation, technical expertise, and efficiency. However, the sector is small and fragmented in Ethiopia mainly due to lack of finances, funding and the dependency of development partner funded programmatic areas for DH. The COVID-19 pandemic and previous recognition that private sector dialogue and engagement is crucial to meet national goals have accelerated the organization of private sector and non-state actors under an umbrella (the EHF- Ethiopian healthcare federation) but engagement, inclusive planning and data sharing especially under a digital agenda is not clearly stated under a policy or strategic framework.



Key informant interviews further identified relevant barriers in the DH agenda. Key priority themes and barriers were identified and revolved around: limited human capacity and expertise; limited digital literacy of end users; limited financial incentives for growing innovations and SMEs in DH solutions; other than key structural limitations in terms of infrastructure for telecom, connectivity that is progressing but still remains a barrier to successful implementation. Most importantly, fragmentation of initiatives, lack of clear governance and collaboration were identified as part of the key limitations and barriers to a successful policy development for DH in Ethiopia.

Key Recommendations

- Need to align efforts with the government to ensure the digital agenda helps national priorities and strengthen the system. As mentioned, one of the reasons for fragmentation and nature of DH solutions in Ethiopia is the development partner funds that incentivize market entry across specific areas such as health and data management systems. Ethiopia needs to commit to the digital agenda as part of any development-partner backed intervention and raise the need and urgency to DH inclusion as part of key health interventions.
- A platform for dialogue and multi-stakeholder working groups focused on DH is crucial for Ethiopia as currently the DH agenda is fragmented across selected government institutions.
- There is a need to develop a policy and strategic plan for DH with government leadership and based on health system needs rather than programmatic approach.

Discussion and Conclusion

Key core messages and proposed DH framework for Ethiopia revolve around: 1) DH policy and strategy development should be led by government and support national SDG and UHC national health priorities; 2) The establishment of a national DH ecosystem should be inclusive, integrated and should keep regionalization initiative as a vision; 3) Ensure development partner funds to advocate and support a ONE digital agenda and support financing and incentivizing with a view to strengthen the healthcare system and not a programmatic view; 4) Fostering a DH ecosystem needs key stakeholders such as private sector and government to "self-organize" with strong leadership and advocacy platforms to ensure that the needs of end-users and consumers are at the core of the solution.

Beyond the development of a DH strategy, and roadmap, much attention needs to be given to the implementation and ensuring relevant human and financial resources are available for deployment. The implementation and roadmap should focus on low-hanging fruits and early benefits such as increasing the digital literacy of end-users for priority health services, training of developers, and health workers to the use and analytics of DH data.

I Introduction

Project Context

Precise Consult International (Precise) recently conducted a policy consultation to identify the opportunities and challenges in private health sector development particularly along with policy, regulations, standards, and procedural impediments for market entry and expansion of private enterprises in the health sector.

The consultative workshop conducted across key non-state health actors held in Addis Ababa in September 2020, identified three key areas of interventions for deep-dive analyses, namely, (1) the need to review health facility standards and licensing; (2) the need to develop a new standard for office medical practice such as "doctors' plaza" and (3) the need to review and expand private sector engagement whilst leveraging on DH. The consultation confirmed the fact that despite the country's significant progress across key health indicators, the private sector in health remains small, engagement remains limited, and more needs to be done given the known advantages of strategic private sector engagement in other countries to support and scale public health and government responses.

Ethiopia is among the first of many similar low-income countries to have acknowledged and actively sought to enable more inclusive private sector engagement as a key pillar across its national plans and response to the country's healthcare challenges. Indeed, across its many policies and proclamations such as the PPP framework of action and implementation plan, the Ethiopian government, and the FMOH has acknowledged the fact that without engaging non-state actors in health, the potential for scaling government plans remains underutilized and untapped.

This document outlines CHS advisory's response to Precise´s request for an independent consultant to review, conduct deep-dive analyses, and develop a policy framework for private sector engagement in the DH stream of potential intervention.

Objectives of the Study

The main objective of this study is to conduct deep-dive analyses to better understand the DH ecosystem in Ethiopia and provide Precise with an independent, objective deep-dive policy review, analyses, and framework development of the private sector in health engagement across DH solutions in the Ethiopian market.

Specifically, the study focused on specific objectives to understand:

a. The rationale, what, and why of DH,

b. Current DH ecosystem in Ethiopia including identification of barriers and opportunities for creating an enabling environment,

c. Current gaps as it pertains to other global and country lessons (triangulation of results).

d. And develop a DH policy framework with key pillars, recommendations and proposed roadmap for implementation that will accelerate and enable the scale-up and effectiveness of DH solutions in helping meet key health outcomes such as access, utilization, quality, and equity.

Approach and Methodology

The project was conducted across a rapid-4-week deep-dive analysis of the current Ethiopian digital health landscape as well as extensive document and case study review of global and country case studies.

Key informant interviews (a total of 13) and informal consultative discussions (~7) were conducted across categories of relevant stakeholders to further understand key policy issues and barriers for the DH ecosystem of Ethiopia.

In-depth interview guide was applied to understand the current private sectors engagement in DH, opportunities and barriers and include experts' recommendation for better engagement in Ethiopia DH solutions. The discussion was recorded, thematically content analysis on the finding was conducted and presented in 13 themes.

Most of the stakeholders were from private companies (8). Two participants were from International NGOs supporting digital technology, two from associations and one from government organization.

Informal consultative discussion (off record) was also conducted with a number of leaderships, donors and policy makers currently working in Ethiopia and their opinions and recommendations were also considered in the recommendation sections.

II Rationale: What and Why of Digital Health

Digital technologies and accelerating technological changes will benefit the future of well-being and economic growth worldwide.

What is Digital Health?

While DH is a simple concept — using technology to help improve individuals' health and wellness — it's a broad and growing sector.

The term DH is rooted in eHealth, which is defined as "the use of information and communications technology in support of health and health-related fields". Mobile health (mHealth) is a subset of eHealth and is defined as "the use of mobile wireless technologies for health". More recently, the term DH was introduced as "a broad umbrella term encompassing eHealth (which includes mHealth), as well as emerging areas, such as the use of advanced computing sciences in 'big data', genomics and artificial intelligence" (WHO 2019).

DH is not healthcare; it is what is done in and concerning healthcare. DH is about health, not just the healthcare delivery system. It is enabled by exponential increases in the pervasion of ICT throughout economies and driven by individuals' demands to control their health and wellbeing (Rawlands 2019).

"The practice of employing routine and innovative forms of information communication technology (ICT) to address health need." WHO, 2019

Tools and Uses of DH/Digital Solutions

There are a number of components or tools and uses of DH today. There are several thousand different digital solutions across key categories of the healthcare ecosystem as below (not intended to be exhaustive).

Components or tools of DH can cover everything from wearable gadgets to ingestible sensors, from mobile health applications to artificial intelligence, from mobile medical applications and software that support the clinical decisions doctors make every day to artificial intelligence and machine learning.

DH tools have the vast potential to improve healthcare professionals' ability to diagnose and treat disease accurately and to enhance the delivery of health care for the individual.

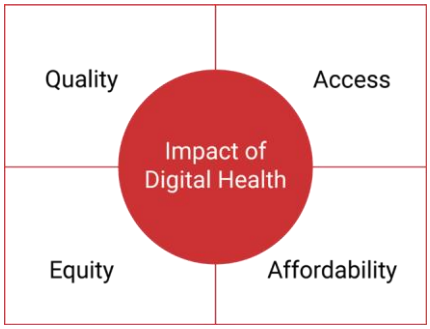
DH technologies use computing platforms, connectivity, software, and sensors for health care and related uses. These technologies span a wide range of uses, from applications in general wellness to applications as a medical device. They include technologies intended for use as a medical product, in a medical product, as companion diagnostics, or as an adjunct to other medical products (devices, drugs, and biologics). They may also be used to develop or study medical products.

Why is DH Important?

Digital technologies are an essential component and an enabler of sustainable health systems and universal health coverage.

DH offers real opportunities to improve medical outcomes such as quality, access, equity, and enhance efficiency. Some examples of the use of digital technologies include:

- Digital technologies give providers a more holistic view of patient health through access to data and giving patients more control over their health.



- Telemedicine, mobile health, and access to remote health have improved access to communities far to reach. Technologies like 3D printing have changed the landscape for orthotics, prosthetics, and other medical device manufacturing.
- In recent years the use of machine learning has enabled healthcare to predict public health emergencies and plan management and service deliveries. The advent of mobile phones and digital technologies has also changed how individuals manage their health through free access to health-related information.

- Furthermore, digital technologies are being used to improve the training and performance of healthcare professionals as well as to address persistent low performance in health systems to develop a framework for improvement.

The Unique Importance of Digital Transformation for Africa

The second largest continent, Africa has 54 countries, one sovereign state, and an estimated population of 1.3 billion combined. In recent years Africa has experienced rapid urbanization and growth and transformation. At the same time, the majority of the population lives in rural and remote communities with little or no connectivity. Some of the reasons for these barriers to improved connectivity include the location and landscape where these communities live, and the poor return on investment.

The growth of digital technology is mainly driven by the mobile phone revolution and related technologies have enabled millions of people in urban and remote areas to connect, share information, create income generation activities, and improve their economic status. More than 80% of the African population has at least one mobile phone subscription (Songwe 2020 -URL).

"Digital transformation is a driving force for innovative, includive and sustainable growth. Innovations and digitalization are stimulating job creation and contributing to addressing poverty, reducing inequality, facilitating the delivery of goods and services, and contributing to the achievement of Agenda 2063 and the Sustainable Development Goals." UNECA 2020

Even though there is remarkable progress, bringing more people online, Africa's internet penetration is quite low compared to the rest of the world (e-economy 2020). For example, Africa's internet penetration is at 39.6% compared to the global average of 62.7%.

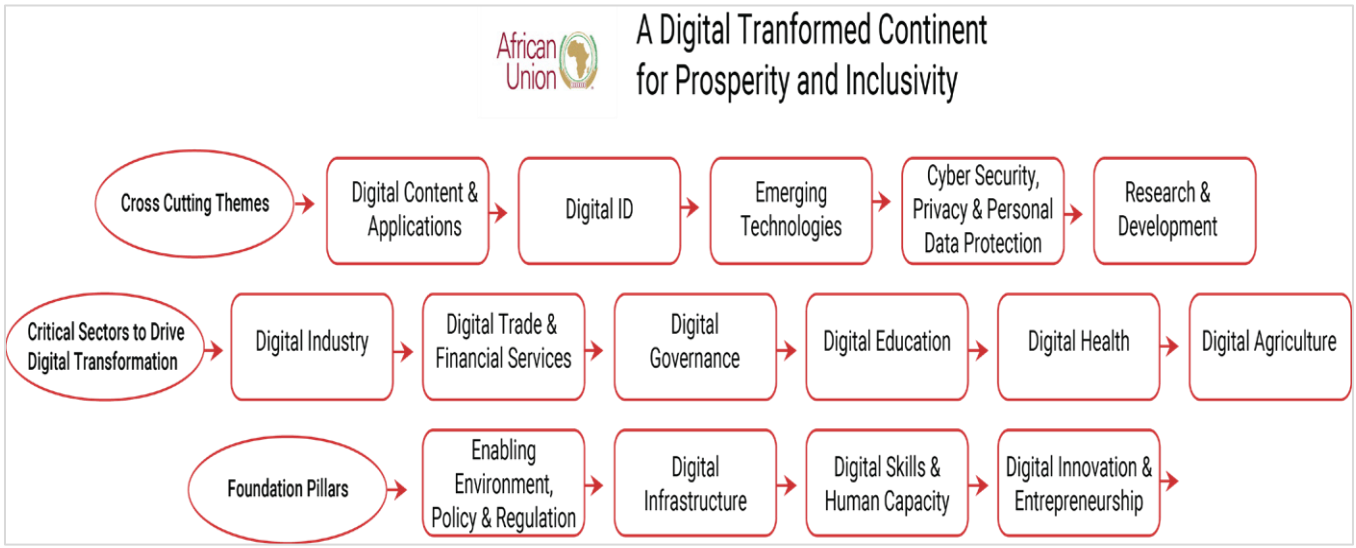
Digital technologies offer the expanding youth population the chance to unlock new paths for rapid economic growth, innova- tion, job creation, and access to services that have been unim- aginable a few years ago. Africa has the opportunity to harness digital technology as a driver for economic growth.

The digital divide between African countries has hindered the fair and equal distribution and access to advanced technologies, for example, while Kenya is averaging 89.9% Burundi is at 5.3%.

- African leaders gathered at the May 2017 World Health Assembly to affirm their commitment to digital health and the pathway to a holistic application of ICT to support and improve health care delivery.
- The African Union Agenda 2063 has put a strategy for economic growth and industrialization to alleviate poverty and improve the lives of people in Africa.
- This is supported by the Digital Transformation Strategy which was co-developed by the African Union (AU) and the Economic Commission of Africa (ECA) which has a focus on supporting African countries' efforts to capitalize on the socio-economic benefits of digitization and advanced technologies.

Specific objectives of the digital strategy are:

- Build a secured digital single market in Africa by 2030 (based on the AfCFTA – the Africa continental trade agreement) and this is relevant for pharmaceutical imports and pooled procurement (see the African medical supplies plat- form (AMSP), a digital platform that allows African governments to "group" purchase items)
- By 2030, all Africa to be digitally empowered and able to access safely,
- Harmonized enabling environment,
- Entry into force by 2020 of the AU convention of cybersecurity and personal data protection.



Source: UNECA Digital Transformation Framework

III Global Lessons: Key Pillars/Enablers of Digital Health

The success of digital health depends on the accessibility, affordability, scalability, and sustainability of person-centric digital solutions to prevent, detect, and respond to healthcare needs at the individual and population level.

Key Findings: Review of Global, Regional and Country- level Documents

The Sustainable Development Goals (SDG) acknowledge the transformational impact that digital health technologies such as mobile health (m-health) will have in a context of continued global population growth, inequitable access to health, increased healthcare costs, and the limited number of healthcare workers.

A review of the digital health ecosystem for Africa countries identified these core pillars of success:

1. Digital health supports the SDG and UHC (Universal Healthcare Coverage),
2. The establishment of a national digital health ecosystem should be based on an integrated framework (and not individual pilots, today mainly supported by development partners and governments),
3. There is no one-size-fits-all solution for digital health
4. Four building blocks: strategy, roadmap, implementation elements, and evaluation,
5. Close coordination of all stakeholders with strong leadership from governments, and
6. Needs a cooperative investment approach.

To realize their potential, digital health initiatives must be part of the more comprehensive health needs and the digital health ecosystem. It needs to be guided by a robust strategy that integrates leadership, financial, organizational, human, and technological resources and used as the basis for a cost action plan which enables coordination among multiple stakeholders.

These initiatives should be led through strong governance structures. The country's digital health strategy should address an approach that works across multiple health priorities under- pinned by standards and an architecture that enables this integration (WHO 2020).

The common AU Digital strategy is based on:

- Enabling the necessary digital infrastructure and enhancing the capacity of transport and logistic activities for e-commerce, complemented by the right investment climate to attract private sector investment,
- Developing digital literacy and skills particularly in Science and Technology stream (STEM),
- Fostering digital transformation for growth, entrepreneurship, job creation, and private sector empowerment, especially technology start-ups and Small-Medium Enterprises (SMEs), and innovative community initiatives using digital technologies.
- Expanding new solutions offered by digitization across other sectors such as health, agriculture, energy, e-commerce, and electronic payment systems.
- Creating an enabling environment for good governance to allow national stakeholders to manage digital risks and coordinating the private sector. To support this, a legislative framework known as the AU Convention on Cyber Security and Personal Data Protection was established in 2014, for member states to develop a national cyber security policy and responsive actions against cybercrime.
- The strategy also acknowledges that the digital transformation process cannot be the sole responsibility of African governments; active participation from the private sector is crucial due to different financial conditions hindering large public investments in this area. Besides, the private sector can back the ecosystem through knowledge, expertise, and finance.

Key Findings: Enablers/Barriers Identified from Selected Country Case Studies

The Eastern and Southern Africa (ESA) regulatory study ranked sub-Saharan African countries in terms of their eHealth priority ranking: Tanzania, Rwanda, Namibia, and Kenya scored in the top 5 places. Each country's readiness and success for implementation of a DH policy and strategy varies extensively across key pillars and structural factors and how well they have understood the relevant ecosystem. Overall, the study identified the following different pillars/enablers of this digital health ecosystem.

Key pillars/factors that need attention in the development of a country DH policy are:

1. Organizational structural framework/Leadership and Coordination
2. Infrastructure and Interoperability
3. Skills and Human Capacity
4. Product standards, licensing, liability, and reimbursements
5. Data Security, Privacy, Confidentiality
6. Information Quality
7. Funding/financing
8. Monitoring & Evaluation

Selected pillars are further elaborated below in light of their relevance to Ethiopia:

Digital Infrastructure and Interoperability: At the core, the infrastructure comprises an internet platform that offers digital healthcare services. It promotes interoperability by allowing intercommunication among healthcare professionals. It also enables the sharing of Electronic Medical Record (EMR) for a 360-degree view of the patient's health.

Interoperability is among the key focal areas of a new global partnership known as the Health Data Collaborative (HDC) and the Principles for Digital Development (WHO). Interoperable systems can 'speak' to one another, and more importantly, share information to avoid duplication, reduce the burden on healthcare workers and clients, and magnify impact through collaboration.

"A digital health ecosystem is the holistic application of ICT to support and improve health care delivery, its coordination and integration across providers in a given domain (Local, regional, national)."
Digital health ecosystem for African economies 2020

Digital Skills and Human capacity: It is recognized that successful digital health needs new skills and approaches for existing human resources, as well as new cadres of staff. Success needs two parallel strands. Firstly, hard components, such as skills in ICT sciences, health sciences, and workforce management and development. Secondly, soft skills, such as culture, leadership, motivation, and change management help to ensure efforts are tailored to local needs and challenges.

Africans have already eagerly embraced new technologies for applications like digital cash, banking, e-commerce, and governance.

Substantial investment in DH solutions in recent years has already shown improvements in health services. This has demonstrated that there is both appetite and willingness that can be leveraged, with the same potential for DH to play a crucial role in digital transformation. It focuses on leadership, talent, and creativity on the part of stakeholders throughout the private sector, government, and civil society to realize the promise of these new capabilities.

Digital Innovation & Entrepreneurship: Global DH Strategy outlines the vision for fostering an environment that supports innovation to improve the experiences of consumers and clinicians and enhance their ability to improve health outcomes for their communities through safer, more efficient, and effective healthcare delivery. Accelerating Innovation in the healthcare system means facilitating meaningful partnerships, working together to remove barriers, and learning from successful products and projects, both locally and internationally. Entrepreneurship is an additional component needed to promote the progress of the emerging sector and its contribution to economic development. Ensuring that there are sufficient, competent digital health workforce capabilities across all disciplines is crucial to the success of the strategy.

Selected Successes from Regional Country Case Review: The development of multiple DH initiatives through the collaboration with government, private (national and international), and development partner sectors have facilitated the development and improvement of supporting and collaborating sectors through infrastructure development and digital transformation. The following is a list of examples from five African countries that have successfully piloted and scaled up DH initiatives through government sectors and/or in collaboration with the private sector.

Box 1: Rwanda Country Case Study

Overview: Although a much smaller country to Ethiopia, Rwanda is interesting as a country case study for digital health policy framework due mainly to its strong and successful private sector engagement. Private sector especially in terms of human capital development is well-integrated in national health priority planning and set up.

Key highlights: successes in PPD platform, Health financing and incentives for SMEs; other sectors relevant to DH are well developed such as Telecom, banking and has a well-elaborated vision for a digital/smart city concept backed by strong innovation and RnD "industrial park".

Select DH Solutions: Jembi - Rwanda Health Information Exchange (RHIE); ZipLine - Blood Delivery by Drones; Babyl Rwanda - Artificial Intelligence and Machine Learning; IntraHealth International - Integrated Health Service Delivery; TeleMedicine - Rwanda Military Hospital.

Box 2: Uganda Country Case Study

Overview: Interesting lessons can be learned from Uganda in its application and use of ICT in achieving better health outcomes. For one, Uganda has a similar large population, geography and decentralized health system that closely resembles the system in Ethiopia and its governance. The country follows a similar focus to Ethiopia on local manufacturing and industrialization for economic growth. The private sector is larger in Uganda than Ethiopia lending to key learnings on how to better organize a growing private sector in health.

Key highlights: The government chose to align the goals of digital health with a broader national health strategy. Uganda has a comprehensive e-health policy and strategy for health information and digital health 2020-25. Key priority areas of intervention the strategy wants to address: Quality of Care; HRH supervision, training, and communications; Community engagement and participation in health services; Availability and use of relevant data. In Uganda, the Private Partnership for Health (PPPH) policy is operational and a PPPH health sector working group chaired by the Uganda Healthcare Federation (UHF) which is the recognized Secretariat for the private sector healthcare providers that include manufacturers, healthcare providers at all levels spread over the entire country. UHF is also the agency that is now working with WHO, The World Bank, and Makerere School of Public Health to support the Ministry of Health in the development of the UHC roadmap. Uganda Healthcare Federation (UHF) is an umbrella body that brings together all the private sector actors to harmonize service delivery, regulate the operations and promote good governance and accountability of the health sector. UHF is comprised of all the medical bureaus, private for-profits providers, professional bodies including the Uganda Medical and Dental Practitioners' Council, Uganda Medical Association, Uganda Allied Health Professionals Council, Uganda midwives and nurses' council, insurance companies, health training institutions, and other bodies such as Uganda manufacturers association, medical technologies and civil society.

Select DH Solutions: Through the PPPH node, a PPPH strategy was developed, and an online registration portal has been launched to foster regulation and accountability for the stakeholders. This will enhance capacity building, regulate the market prices and mode of operation, but also direct appropriate business areas for the private sector where the public system is still remote.

Box 3: Kenya Country Case Study

Overview: If we were to map investments and development of digital health solutions across the continent, we have seen that close to 40% of digital technology investments and innovations are first implemented in Kenya. This is mainly due to Kenya's open and easy business environment, significant interest from development partners as well as reforms in the banking sector and strong academic sectors that has allowed private sector innovations and technologies in the country.

Key highlights: Several notable digital health solutions are in Kenya. One of the key successes of Kenya in terms of Healthcare financing is the M-Pesa and mobile banking that has revolutionized access to health information to consumers. Secondly, Kenya through its strong education system has built significant "digital literacy" for end-users and awareness and use of social media platforms, and advocacy is an important pillar for KenyaAnother pillar of the DH ecosystem that is well-developed in Kenya is in the digitization of health information throughout (Afya Rekod is a health management medical data storage of patients' health record).

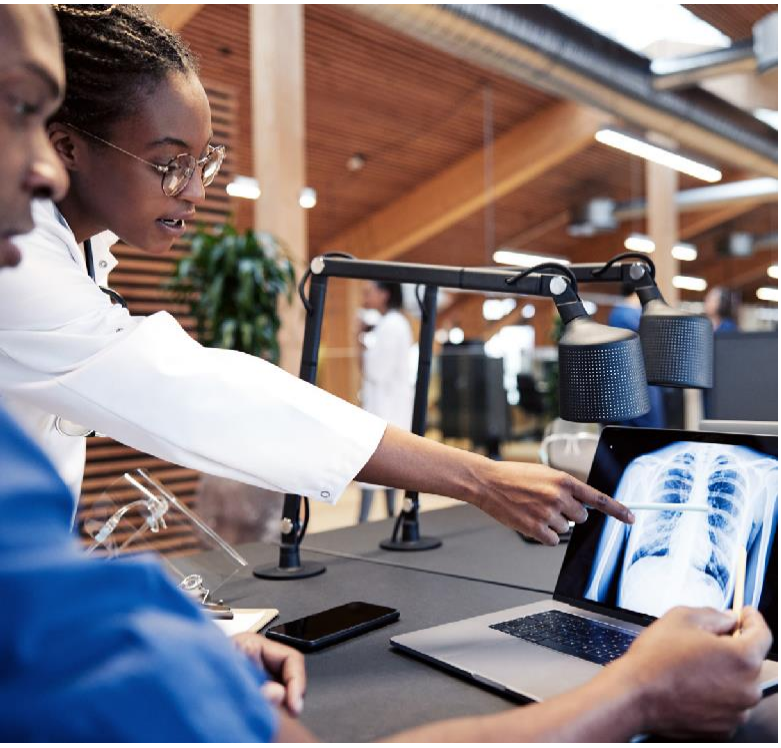
Although there are several challenges, the pharmaceutical supply chain management is relatively more mature than in other African countries and Kenya has a successful Pharmacy level digitization of information and health financing solution through M-pharma that offers a pharmaceutical inventory management system by subscription.

Box 4: Ghana and South Africa Country Case Study

Ghana: Ghana is another African country, although smaller than Ethiopia and with a different healthcare system and readiness for Digital Health, has some notable successes in digital health strategy and policy implementation and models that are worth a mention. Ghana has a very strong private sector but also human capital capacity both in the local as well as in its diaspora population. Much of the healthcare investments today in Ghana are either financed by diaspora investments or in health service delivery (big private hospital chains) but also through telemedicine and e-learning platforms thus creating significant economic growth through its human capital. An example of a telemedicine initiative is ComHIP, an effective end-user training for community-based hypertension improvement project. Other successes in Digital Health are in the logistics and pharmacy sector similar to Kenya for its Pharma health management platform but also in logistics using Zipline prototypes in Rwanda for transporting key health commodities.

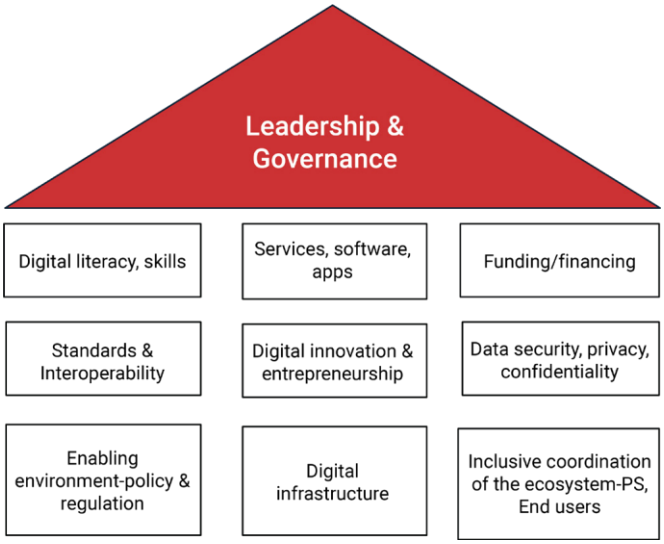
South Africa: Within the Digital Health ecosystems, South Africa cannot be ignored for its significant innovations in health, manufacturing and a more or less patient-centric model as its overall approach with numerous health management platforms and self-management and education platforms and digitization of health information throughout its value chain. South Africa is somewhat an outlier as a significant proportion of health services (some 70%) are today offered through the private sector but access is very expensive. South Africa has deployed several reforms in healthcare financing (through the use of digital technology such as health fintech companies like Aligned to provide financial solutions for palliative care patients) in order to achieve UHC vision for fair, equitable, quality and affordable access to health services but that is work in progress. Some notable digital solutions in health are: MonConnect program in educating women to take care of themselves providing antenatal and postnatal service; mHealth application for stock visibility system and workforce training and development. South Africa has a well-documented presidential health compact supported by the WHO country office that involved the private sector in its drafting and specifically mentions engagement with the private sector as a primary focus area for health improvement.

The use of digital technologies for functions such as supply-chain management, public health emergency, disease surveillance, electronic payment systems, data storage and sharing, e-learning applications and telemedicine has shown how DH has influenced the digital transformation within Africa. In some instances, it has accelerated the progress of the implementation, scale-up, and integration of digital technology and initiatives in other sectors. One instance of acceleration is the current COVID-19 pandemic that has facilitated the digitization of other activities but also accelerated private sector engagement through its financial, technical and efficiency expertise to work more closely and align to national goals.



Summary: Key Enablers/Pillars of DH Identified from Review

- Inclusive coordination of all stakeholders of the digital health ecosystem: especially private sector integration and inclusion of end-users is paramount.
- Leadership and Governance: role clarity and capacitated governance structure.
- Enabling Environment, Policy, and Regulation: alignment to broader health policy and national priorities is essential.
- Digital Infrastructure: create the technical global good that supports all workstreams and regionalization of standard and interoperability.
- Standards and interoperability: lay foundation for a local and regional interoperability.
- Digital Innovation & Entrepreneurship: ensure relevant financial resources availability and collaboration with academic sector to ensure sustainability and scale-up.
- Data Security, Privacy, Confidentially
- Funding/financing: include private funding for increased resources and buy-in.
- Digital Literacy, Skills and Human capacity: build required capacity and literacy for end-users as well as developers.
- Services, Software, and Applications need a User-centered program design development of reusable and interoperable and IP protection issues for developers.



- *To realize their potential, digital health initiatives must be part of the more comprehensive health needs and digital health ecosystem.*
- *It needs to be guided by a robust strategy that integrates leadership, financial, organizational, human, and technological resources and is used as the basis for a costed action plan which enables coordination among multiple stakeholders.*
- *These initiatives should be led through strong leadership and governance structures.*

IV Key Findings: Ethiopia's Current Digital Health Ecosystem

Ethiopia's Socio-Economic Context for DH

- The Human Dividend- Ethiopia is the second-most populous country in Sub-Saharan Africa and home to an estimated 105 million people in 2017 and growing, and presents, in virtually every sector, a sea of economic opportunities especially in this digital era.

- Focus on industrialization as the core of its economic growth -over the last decade and more, Ethiopia has made great strides economically and has sustained a GDP growth of about 10%, one of the highest in the region (Africa GDP growth average is ~3%). The country's per capita income of 470$USD is substantially lower than the regional average. The government, however, aspires to reach middle-income status over the next decade. Public investment has increasingly played an important role in recent years. Industrial development focused on agricultural, rural development and infrastructure was an important component of the Ethiopian Government's national growth vision under the Growth Transformation Plan I (GTP I) 2010-2015 that contributed to this growth. This is followed by Ethiopia's second-growth transformation plan GTP II (2015/16 – 2019/20) that rests on a vision to accelerate and sustain this growth and "reach the level of lower-middle-income countries by 2025 and middle-income by 2035".

The Business and Investment Environment

- Rapidly reforming business and investment environment- the business and investment environment that is seeing significant recent reforms (not currently publicized formally but with key proclamations have been announced) shedding a more positive light to prospects of investment in the country overall. Based on the International Monetary Fund (IMF), the general annual consumer Price Index inflation rate was 10.1% and the Ethiopian Birr is the official currency of the country´s foreign exchange market at 28.4/ USD in 2019.

- Doing Business, a World Bank Group measuring business regulation, ranked Ethiopia at 132 out of 189 economies in 2015 (went down from 129 in the 2014 ranking). The report found that despite Ethiopia ranking on the lower end on the ease of doing business when compared to similar economies, it ranks a little higher than average. Significant efforts are currently underway in the country to improve this ranking and Ethiopia taking benchmarks and learning from economies such as Rwanda in improving its business environment.

- The Ethiopian growth-oriented economic pol- icies under the GTP II and encour- aging private sec- tor engagement have created an attractive atmos- phere for local and foreign investors, providing them with a number of investment incen- tives. Ethiopia's economic devel- opment vision is summarized in the Ethiopian government's five- year Growth and Transformation Plan (GTP), 2010- 2015 and GTP II, 2015-2020. Three of the 16 reforms by EAC economies are in Sub-Saharan Africa; particularly, Ethiopia introduced an on-line system to share credit information and allowed the debtor to review their data.

- Recently, regulations have allowed a joint venture partnership with an international investor/operator for local healthcare service providers in Ethiopia when it was not allowed previously and created significant barriers to access to finance and quality.

The Healthcare System and Uptake of Technology

Despite scaling up health interventions and enormous pro- gress in health service delivery in terms of infrastructure, human resources, and service provision, the quality of health- care in Ethiopia, in terms of patient safety, effectiveness and patient-centeredness remains limited and unreliable.

The decentralized system is still highly dependent on external donor sources: Even though the health sector has been decentralized, the health bureau's budget and activity plans are based on the city's strategic plan. The health sector receives funding from the Ministry of Finance and Economic Development (MoFED) and international donors and partners (such as USAID, DFID, UNICEF, USAID, WHO, etc.). The Ministry of Health is responsible for developing policies, regulations, and programs. Service providing facilities are categorized into three tiers: Primary, Secondary, and Tertiary, and each tier varies by capacity and type of service provided.

Development partners support digital health: There is promising support in Ethiopia's DH from development partners and donors. For example, the Ethiopian Ministry of Health (MOH), Saint Peter's Specialized Hospital, and JSI Research & Training Institute, Inc. (with support from the Bill & Melinda Gates Foundation) established the Digital Health Innovation and Learning Center (DHILC) in Addis Ababa. It is envisioned to be a place where health professionals can design and validate DH tools, synthesize and promote best practices, scale-up innovations, and to serve as a clearinghouse for new DH tools that will be implemented in the health system.

The USAID's Country Health Information Systems and Data Use (CHISU) program also launched a DH program in collaboration with JSI Research & Training Institute, Inc. for a five-year cooperative agreement with a budget ceiling of $200 million. The program is designed to support integration and harmonization of systems across health areas, enhance the capacity of local partners to support health ministries to improve data collection, analysis, and use at national and sub-national levels.

- Increasing enablers for the private sector in health engagement in Ethiopia: In 2015, the FMOH transitioned to the Health Sector Transformation Plan (HSTP) which covers the timeframe between 2015 to 2020. Under this HSTP, various health sector-specific strategies have been developed and implemented to impact health service delivery. The major strategic themes of the government are to improve the quality of health service delivery, enhance leadership, governance capacity, and develop health infrastructure and resources. Some examples of strategies and reforms developed are:
  - The Public-Private Partnership Reforms (significant effort to engage the private sector)
  - The Health Procurement Process reforms to improve key system hurdles such as pharmaceutical supply chain management and creating an enabling environment for profes sional and resource mobilization in this sector.
  - Universal Health Coverage – Case Study and Health financing strategy, 2015 that are a key cornerstone of reforms and address "affordability" and access.
  - Ethiopia e-health Strategy and Health information Strategy that attempts to leverage on advancing technology to create accountable and sustainable progress.
  - Health Strategies and Implementation Plans.
  - National Drug and Pharma Policies and Plans.
- Shortage and Low-skilled Workforce remains a challenge in Ethiopia: Strategic challenges and issues remain despite the remarkable achievements stated above and some relate to:
  - Quality of Health workers' education and training: the rapid expansion was not matched with essential inputs such as qualified faculty, skills, lab materials, libraries and resource centers.
  - Geographical distribution and professional skills mix: Critical shortages of the selected health profession and low retention in remote and rural areas.
  - Human Resources Management (HRM): HRM functions remain traditional instead of playing a strategic role. Health workforce motivation and retention also remains a critical challenge.
  - Human Resource Information System (HRIS): the national system is not effectively utilized to collect and manage HR information and data thus there is a lack of planning.
  - Health workforce regulation: Capacities for regulation are not well-developed and require additional investments.

Enabling Environment, Policy, and Regulation of DH in Ethiopia

As summarized from the global learnings section, the environment in which the digital healthcare initiative is intended to function needs alignment with broader healthcare policy as is a sustainable funding that will support long-term growth. Equally as important as the program, human and technical factors are key pillars of the enabling environment. This includes:

- Sufficient financial allocation that enables long-term sustainable operations,
- Regulatory standards and frameworks that ensure compliance with national health guidelines and strategies.
- Close collaboration with government stakeholders and other policymakers is useful to help inform emerging digital health policies and to provide information to technical teams about regulatory changes on the horizon.

Current enabling environment in terms of policy and regulation of DH in Ethiopia was conducted through a review of relevant documents available in Ethiopia in terms of DH. Please see Annex 2 for a summary of the review. Selected documents of interest are:

- National Digital Vision – MinT and PMO
- National Health Financing strategy (not much mention of DH)
- National ICT Policy
- National e-health strategy – the old one and now a concept stage new one being revised
- National HIS roadmap – FMOH IT department
- Other strategies such as the pharma, PFSA, and others do mention digitization, but it is not under ONE document.

The key takeaway from the Ethiopia DH policy review is that although there are several mentions across key policy documents about the need to focus on digital transformation and the need to further engage private sector, there is not ONE DH policy and strategy that encompasses the above key enablers and sets a national framework of engagement. Ethiopia today has a revolutionary vision for a digital transformation with its newly launched national digital strategy as a backbone for its economic transformations, but health and DH is a missing core component of it although recognized as a key economic pillar for transformations.

Mentions and drafts of "ehealth and Health Information Strategies" have been developed but with little capacity to implement and without a financial backing to ensure sustainability.

Summary of Ecosystem-SWOT Analysis

The below SWOT analysis summarizes the current DH ecosystem in Ethiopia and key opportunities and barriers to mitigate.

Strengths	Weaknesses
• Human Dividend: High, young and growing population. • The country has significant leadership for Digital Transformation – National Digital Strategy. • Ethiopia is at the heart of regionalization agenda and AU. • Focus with committed resources (funds and infrastructure) on Industrialization and job creation for youth – IT park, Pharma park. • Rapidly reforming business and banking environment – although has some way to go as compared to others. • The healthcare sector status of the country has been improving especially for Access (primary care) although areas such as quality, financing, and workforce need improvement but are the focus today. • Mobile and Data IT infrastructure expanded significantly.	• The national Digital Transformation does not put health at the core although manufacturing. • Small Private sector Innovation / limited engagement. • Fragmented systems – Public (within), private. • Donor supported government (not private). • Existing digital strategies are fragmented (see policy review). • Lack of skilled personnel, brain drain, low literacy. • Financial Commitment is limited especially domestically for health and IT although growing. • Data/Digital security not yet patient-centric – Very government heavy. • Lack of standards, IT procedures but improving for Supply Chain Management. • Bureaucracy heavy: Customs clearance and regulatory hurdles and bureaucracy for logistics and supply chain.
Opportunities	**Threats**
• Regionalization opportunity from its geographic position -AU and AfCFTA. • Travel hub with strong logistics infrastructure (Ethiopian airlines). • Industrialization vision and human dividend. • Health outcomes/access are still poor and NCD increasing that lend for digital tools/solutions to make a bigger impact – leapfrog. • Covid-19 accelerated the PSE governance and PPD platform.	• Health Data complexity: most medical information is textual and not well-structured as in other industries. • Cultural complexity: a wide variety of actors, regionals, languages, religion. • IT complexity and vendor lock-in. • Very rural population. • Lack of trust: private sector amongst themselves as well as lack of trust with gov entities.

V Key Findings: Ethiopia's Key Digital Health Policy Themes Identified

Ethiopia's Stakeholders in DH

There are several global, regional, and local organizations that are making a significant contribution to Ethiopia's digital health ecosystem today. Some of the select ones are:

- Global organizations: BMGF, World Bank/IFC, USAID.
- Innovators/SMEs: PITCH, coding, AI, and other innovators in product development (COVID test kits), etc.
- Digital tech companies (local/global): Orbit Health, Perago systems, Ali baba, SAP, IBM, etc.
- INGOs/Local NGOs: AMREF, Path, CHAI, JSI, MSI, PSI.
- Financing Institutions: Private Investors (PE, VC); Philanthropists; banks (local/global) such as Abyssinia or afriexim bank to enable loans and financing for software, etc.
- Academic institutions (global and national): John Hopkins, AAU
- Health Institutions (private/public): Different levels matter (hubs vs. primary level/pro-poor); private (AMC, ICL) or Gov such as St Paul's, etc.
- Supply Chain actors: Pharmacies, Distributors, Importers, or international supply chain players (Chemonics, Crown agents).
- Government: MOH, MinT, MOE, Ethio Telecom, MOFEC.
- Civil Society/Consumers: Not much represented but an important category for health literacy and use of these digital tools.

If we were to map them across the different areas of intervention of DH categories seen from the global lessons and the health sector for the improvement of health outcomes, we would see that there is a significant emphasis on Data health information due to the high dependence on donor funds.

Limited financial incentives have resulted in very small private sector innovation as compared to countries such as Rwanda or Ghana or South Africa that have significantly incentivized that pillar.

Global Digital Heath landscape – Patient Centric Stakeholder Map

Key Findings in Ethiopia:

- Limited private sector innovation,
- Fragmented systems,
- Donor supported government DH ecosystem
- Existing digital strategies do not include the full landscape of key pillars for DH ecosystem

Key Policy Themes Identified through Key Informants Interviews

Formally and informally conducted interviews of key stakeholders of DH in Ethiopia have identified the following key policy and strategic issues when it comes to DH ecosystem:

Limited Digital Literacy (consumers and end-users): The private sector digital technology use is relatively ahead of the government's current capacity and potentially has the resources to support the progress of digital health. However, issues such as digital technology literacy, its use, and penetration in the country are a few of the concerns. Currently, the demand for digital health by private and public sectors is limited; most settings stop the need for digital technology at the patient registry, lab, and pharmacy orders level. There is a lot of resistance from health staff to use digital health due to workload, capacity to use technology, and difficulty of the software itself. A large- scale fear of technology among healthcare professionals is a problem that worsens in regional and remote areas. The level of human resources capacity, resistance, and fear to use technology, and lack of access to technology equipment hinders people's ability to be familiar with and comfortable with using digital solutions.

Business Acumen of private sectors in digital health: There is the problem of availability and access to big software developing companies in Ethiopia, most are being developed locally on a small scale at an individual or group of individual level. There are more than 20 tech products in Ethiopia providing Digital health. All of these focus on one area rather than looking at the holistic approach and the bigger picture of digital health. Only a few technology providers and end-users under- stand that Electronic Medical Record (EMR) is only one aspect of digital health.

Digital health is becoming part of the healthcare business, so digital health developers and digital service users need to have a better understanding of DH business ideas and growth. Currently, the focus of PS is on service development rather than business development. This is also highly influenced by avail- able funds that usually stem from development partners with their own focus on certain aspects of digital health.

Limited private sectors platform for common voice: Private sector actors do not have a strong collaboration platform within their sector and are not unified in progressing the digital health agenda. The private sectors do not have a collective voice, are competitive and everyone works in a silo. The private sectors (service providers) are also not organized among themselves to be involved in governance and leadership at the moment. The private sector's achievement in digital health so far relies upon individual efforts.

Nascent Public-Private dialogue and no private sector engagement in planning: There are nominal collaboration efforts between pri- vate sector represent- atives and government in the form of the steer- ing committee, work- ing group as the form of the currently exist- ing HRH committee, etc. There is no sys- tem for a platform to engage the private sec- tors at the moment to work with the govern- ment in digital health, but COVID has initiated the discussion. The Ethiopian Healthcare Federation was estab- lished as a platform for private hospitals. Even though it is at its early stages, it can be used as a starting platform for stakeholders to dis- cuss and identify chal- lenges and find solu- tions for private sector engagement in digital solutions.

No standardization and integration of digital innovations across private and public: The private sector digital system has no connection with the public system, raising sustainability concerns. The government has not taken the lead in centralizing and linking information through digitization from the private sectors and public sectors. Systems, software, and platform development in DH should be considered from the customers' perspective (end-user in mind) and interoperability among each other.

The absence of standardized tools and integrated platforms makes private sector and government partnership incomplete. There is a need for an interoperable system to link the public and private sectors for information and data sharing. At the moment none of the systems link and talk to each other. Disease codes are not harmonized with standard WHO codes nor between the private and government system. Private health facilities utilize digital technology for service delivery, but they use different systems that do not interface.

At the beginning of COVID, shortage of reporting regulation made digitally shared and network reporting across sites difficult. The EPHI developed a directive for reporting and collabo- ration which is widely used at the moment. Due to the absence of digital technology import standards, the quality of digital equipment and accessories imported are poor and there are problems of maintenance capacity.

Under-developed and limited understanding of use and value of DH data: DH data is not properly used for health service improvement purposes; patient information is not used for purposes like clinical decision making, the study of disease epidemiology, and understanding the health markets. In another perspective, patient information is also not being used to improve care through data analysis and research for digital technology improvements. Currently, there is a huge gap in the implementation of digital technology to support the delivery of quality healthcare; digitization of health centers and clinics at zone and woreda level to improve supply chain management, finance, and patient experience is not developed.

Underdeveloped digital technology infrastructures: Infrastructures for enabling digital technology are underdeveloped. Particularly internet availability and interruption, telecommunication services, electrical power, bureaucracy to set up and receive consistent services, access to good software and hardware, availability, accessibility and maintenance services, and affordability of functional and user-friendly systems are challenging. There is a shortage of technology equipment for healthcare professionals at the woreda level. Lack of a reliable local cloud or server storage system to store data is another problem.

Limited technical skills and experience of human resource: Human resource technical capacity and experience to implement the standards and policies even if they existed, is limited across the country both in government and private sectors.

Government system; governance, transparency and accountability related issues: At the moment, governance is solely carried out by the government. The private sector is not involved in the development of a digital health governance structure. The bottleneck is with the government's focus on strategy and policy, not on its applications. The global experience shows progress in the use of digital technology forced policymakers in developing policies. The government cannot implement and monitor while the private sector is not involved and the private sector can influence the government to change its policies.

The private sector engagement in government service is commonly awarded based on connection rather than current skills. When it comes to outsourcing services, the government either does it to other government sectors or previous connections and acquaintances. It is not based on transparent competition based on capacity and current skills.

Financial sectors engagement and investment opportunities: : There is a problem with the mindset at government and private higher level as such the private sector's role in digital health is a donor fund driven project. Almost all initiatives are directed and withheld from progressing until donor funding becomes available. Donor funding is not sustainable for ongoing work forcing organizations to take on contextually inapplicable digital technologies instead of developing locally viable and sustainable technology to improve training and capacity building for the provision of better healthcare service. The private sector has challenges with financial capacity in accessing resources to purchase and import technology equipment. There is difficulty in accessing foreign currency.

Lessons from other African countries have shown that a developed finance system in the use of technology results in spillover to other sectors. For example, the wide use of mobile banking and mobile money transfer in far reaching and unbanked part of the community builds trust in using technology. It also increases the culture of technology use. This has a spillover effect on health and other sectors as well as promoting digital health use and technological innovations. Therefore, the private sector can play a big role here; especially the banking and financial institutions. This also somehow increases the digital literacy of the community in the process.

The current preparation to launch e-commerce via Alibaba cloud platform could benefit health through engaging digital technology and banking sectors. This will facilitate a digital payment system to settle bills and pay online and the development of a framework to establish and facilitate different digital discussion platforms.

Trust in local capacity/well organized local company: The local companies are concerned that government institutions are open and willing to work with foreign companies more than local companies. The local private sector often gets overlooked by government sector, engagement with foreign companies is preferred over the local private sector. Government institutions assume foreign companies know more. This could be a result of the knowledge of local decision-makers as well as lack of communication of technology needs with the private sector.

In the past two years, the government's view of technology has increased, and started to understand and access the private sector technology and human power to support the government systems. Private-public partnership in digital health is progressing in a piecemeal pattern between digital solutions companies and referral hospitals; examples include Black Lion and Zewditu Hospital engagement with private sector to improve health service delivery, quality of care provided, improving the use and efficiency of medical equipment.

There is a lack of opportunity for collaboration and spillover experience sharing from other private/public sectors in digital technology use. However, an organization like the International Clinical Laboratory (ICL) is an exemplary private sector currently providing lab services working closely with the government public institutions (30 hospitals and EPHI) through developing reporting systems using digital networking.
The private sectors also need to find out the areas of collaboration with the government initiatives for outsourcing digital health opportunities that strengthen their link. Currently, digital health needs to support the licensing of healthcare professionals through automation of CPD hours calculation, documentation and records for annual credentials, HR capacity building through skills development and accountability, healthcare financing management and scale-up, etc.

Digital technology developers´ customer service: The service providers do not base their service on customer needs, so the system developed does not meet the customers' needs. Commonly they provide cheap software, systems, and platforms that break down, and poor quality of imported technologies and equipment. The digital service user wants to use innovation for the service but due to the unorganized gap in service providers, they use fragmented services. The delayed delivery of service creates no trust and if the provider who developed the system goes out of business the user will have to start all over again. Ethiopia is lagging behind the global stage and the cost of the service does not consider service consumers, what is on offer could be expensive. Most private sectors don't focus on the use of data for decision making in improving customer service but are only interested in minimizing cost and maximizing profit.

VI Recommendations and Proposed Policy Framework

Based on insights from the Key Informants Interviews and the desktop research and global lessons, the below are proposed recommendations and policy framework for the development of a DH policy and ecosystem in Ethiopia. Although the initial scope of this project's analyses was focused on the policy and enabling environment, it is very clear that all other "pillars" such as finance, private sector and others are interrelated and need to be addressed for a comprehensive framework.

Understanding the "readiness" of the country across those key pillars is primordial prior to developing a policy framework and DH strategy for Ethiopia.

Proposed Recommendations

Recommendation 1: Develop policy and strategic road map for Digital health

- Development of an inclusive, bottom-up policy, strategy, and regulation for the implementation of digital health. This should encourage its adoption in collaboration with relevant private sector and end user stakeholders. Government to provide directives and guidance in the implementation, progress, and regulation.
- The policy should look at what is required to digitize the health system and what are the key national priorities it needs to address first and subsequently such as the cost, affordability, and access to digital equipment, software, installation, administration, and maintenance.
- Existing PPP policy needs to add and clarify directives and regulations in digital health use and recognize the contribution of private and independent sectors in digital solutions.
- The government in collaboration with the private sector should develop a strategy that embraces digital health technology from early stages – school, university, etc. Digital technology use should be introduced in the education system to encourage familiarity and build confidence.
- The PS involvement in strategy and policy development should go parallel with the implementation of digital technology implementation and supporting the government.

Recommendation 2: Pave a clear way for effective governance in digital health technology

Build the foundational pre-work activities in a staged approach for problem identification, developing strategy, and implementation to create a system that engages all stakeholders for collaboration, clear direction, accountability, and transparency.

- The private sectors should agree on a legal framework and ethical participation between technology companies and health facilities when it comes to the development, marketing, and sharing of software and systems.
- Government regulations for DH should be encouraging the engagement of private sectors. The government should think about the solution for resource issues by prioritizing DH over other needs such as other equipment.
- The governance strategy should link MOH, PS, MInT, telecom, and other relevant stakeholders for decisions in the development and improvement of infrastructure.
- Establish a regulatory standard on access to patient information as well as utilizing information for decision making, research, etc. At the moment private sectors use software that is vulnerable to hacking and gives unregulated access to patient information.

Recommendation 3: Establish a strong digital health platform

- The government needs to start a dialogue with the private sectors and representatives from both sectors need to engage in a discussion to identify problems, develop solutions, and create collaboration to develop ideas.
- Create one strong platform for digital health transformation through a collaboration of care providers, end users, solution providers, and government and development agencies, to create a strong voice from each entity to shape policy and develop the solution.
- The government as the leader together with the private sector needs to look at forming and supporting a strong professional association for one voice on digital solutions.

Recommendation 4: Integrate and standardize the digital innovations for health

- Development of health facilities management standards (clinics and hospitals) incorporating guidelines for digital health technologies both for PS and public services. MOH should take the lead in collaboration with the PS and develop a framework for standards of digital health interoperable systems.

Recommendation 5: Cultivate the digital health financial sources and investments

- Shift digital health financial support from donor funding to a self-sufficient government and private sectors engaging innovative and sustainable sources.
- Establish a link between banks, insurance agencies with patient digital health technologies like EMR under a well-controlled system regulated by MOH and the Private sectors.

- The private sector has to explore untapped areas that could be supported by the private sector through government out-sourcing opportunities; examples, development of health software and systems contextualized for use in Ethiopia, platforms or systems for administration, data protection, and security, installation and maintenance.

- Software and system developers must be supported to organize themselves into larger IT solution companies to have a competitive local capacity in the local markets.

Recommendation 6: Enhance the digital health capacity and literacy

- The private sector can provide teaching and clinical placement support to healthcare professionals and universities for skills transference and access to technology. The positive relationship and collaboration of the private sector with public healthcare facilities should be encouraged and progressed on multiple fronts.

- For Ethiopia, there is a strong linkage with diaspora and universities in health (especially with the US and European countries) that can be leveraged both for e-learning but also digital literacy – some examples of programs could be mentorship and internship opportunities for students across countries to start exchanging information and technical expertise and other that builds digital literacy.

- The government should trust, test, understand, and give priority to local companies to strengthen their capacity and create a competitive environment. Locally developed systems are sustainable and cost-effective– the overall cost of development, installation, administration, maintenance, and pay is in local currency.

- End-use literacy is crucial and media channels and social media platforms can be leveraged to encourage youth and other segments of the population to understand how to "improve" their health through digital technologies such as mobile phones and others. Some platforms such as "hello doctors" have started up in Ethiopia but not entirely succeeded due to lack of literacy from consumers.

Recommendation 7: Align DH policy and strategy to Global, Regional and National Goals

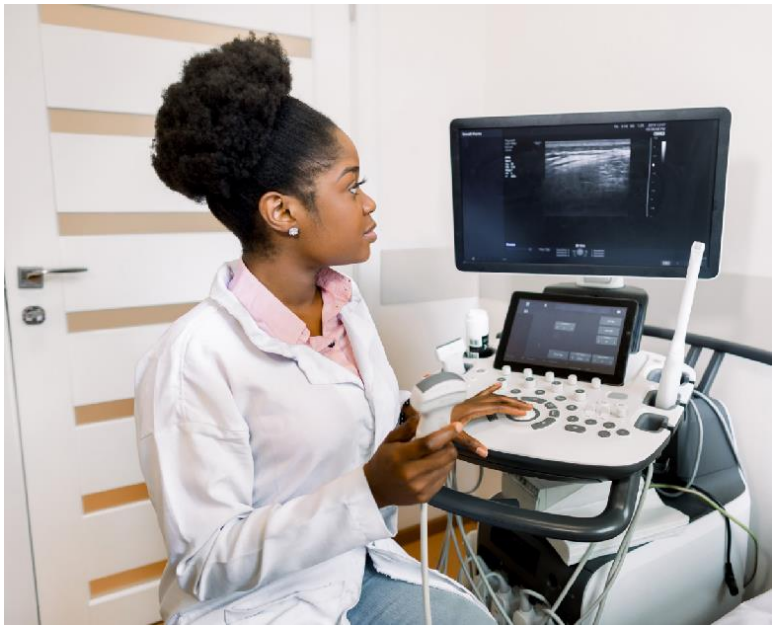
- Align to National Goals: Any policy framework and strategy that is derived from this strategy should aim to address key national health priorities and answer questions such as:
  - ✓ Are we trying to increase quality? Of which priority health sector? (E.g., pharmaceutical, delivery?)
  - ✓ Are we producing a skilled workforce?

- Regionalization: The policy and strategy developed needs to consider regional frameworks and alignment for best integration. Dimensions of the digital health strategy to consider alignment with:
  - ✓ Regional health surveillance and data-sharing platform (e.g., COVID and others).
  - ✓ Setting policies that are aligned regionally for technology use.
  - ✓ Developing a workforce.
  - ✓ Technology standards and interoperability

Recommendation 8: Develop a patient-centric DH ecosystem

- Healthcare service delivery has for long been organization-centric. The providers were in the center, and the patients had to adjust. But recent trends in healthcare delivery suggest a transition towards patient-centric care. This includes multidisciplinary teams and multiple care delivery settings working together to provide patient care.

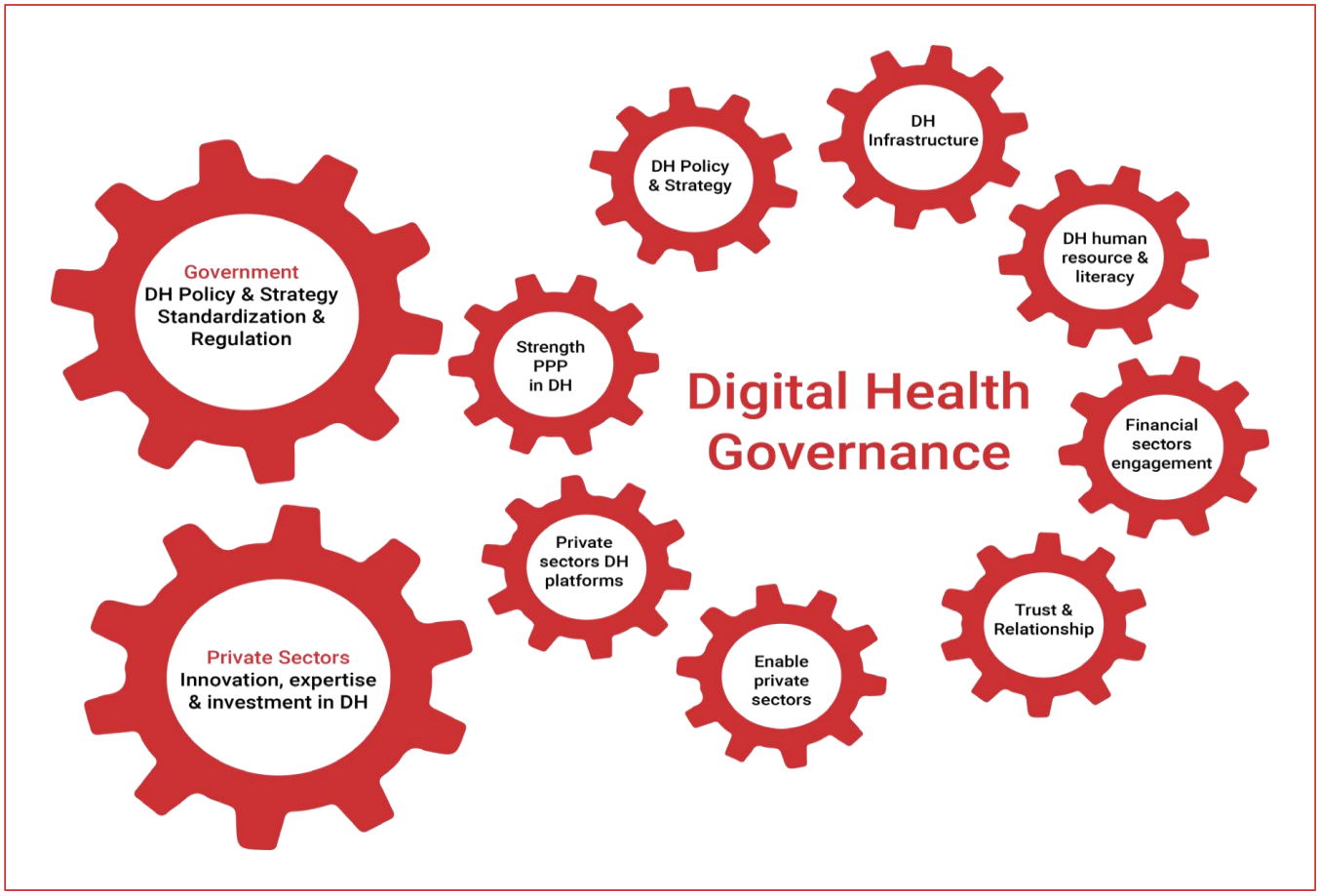
- A digital healthcare ecosystem is an infrastructure that supports the shift from an organization-centric to a patient-centric model of delivering healthcare services using digital platforms. The primary goal of this system is to encourage cross-organizational, multidisciplinary, and collaborative healthcare delivery. Placing the patient in the center means focusing on prevention and wellness rather than only treatment. It includes addressing the social determinants of health such as the physical, mental, and spiritual needs of people.



Proposed DH Policy Framework

The proposed DH policy framework (see figure below) incorporates all learnings from global, regional as well as current Ethiopian context. It is designed to portray the complexity and the interconnected Ethiopian DH Ecosystem and the key pillars that policy and strategy development needs to address.

It follows extensive consultation with stakeholders, including contributions from the private sector, and government departments, whose perspective shaped the framework. The objectives and principles contained in this framework will determine our approach to policy planning and strategy development. This Framework will remain consistent in the face of new challenges as technological change accelerates and it contributes directly to the development and implementation of a sustainable dig- ital ecosystem.



Below are some of the key principles of the proposed framework:

Inclusive/integration or private sector and other actors in the planning process to ensure strategy and policy alignment

- The creation and implementation of a comprehensive digital health policy development and planning should transcend the technology sector and embrace different sectors of society and the economy so that relevant stakeholders such as the academic/education, telecom, and economic sectors should be included.

- **Key Principles** -Adequate government structures, mainly regulatory in nature, are needed to manage the digital transformation and to protect digital infrastructure, services and data. Multi-stakeholder (Government, Private, Development and other sectors) collaborative governance models are unique in their ability to address the complexities of networked digital health, societies and economies.

  Partnerships are essential to accelerate positive socio-economic outcomes and implementation of enabling strategies, particularly for improving communications infrastructure and creating digital public services. This collaboration in the development of strategy and governance should not be restricted to a top-down approach and must also include implementing partners but also consumers under the "patient-centric" model we strive to adapt.

Harmonization of standards and interoperability national and regional initiatives and collaborators

Providing better care to help people healthier lives and live longer is the goal of governments and others delivering healthcare services in Ethiopia, the African region and globally. Connected care through interoperable systems is key to that ambition. Healthcare facilities across the globe have made tremendous gains in shifting their record-keeping from paper to computerized systems that support this.

- **Key Principles** - The interoperability of clinical data and healthcare related information is essential for high-quality, sustainable healthcare. This means that patient data is collected in standard ways and that it can be shared securely, in real-time and with a common meaning. Effective interoperability of information is key to the attainment of the health-related Sustainable Development Goals and to the improvement of the health and wellbeing of people nationally and within the region, through the best use of evidence-based digital technologies.

  Interoperability is key to improving coordination of care services, equity of access to them, as well as their effective delivery. It improves prevention of communicable and non-communicable disease and supports optimal responses to population health priorities. The government, in collaboration with relevant stakeholders, can take a coordinating role and ownership to create a standard and guideline as well as a platform to ensure interoperability of DH systems and platforms across healthcare settings.

Human capital development in digital skills and capacity the end-user both at provider and consumer level

- Digital skills are vital for the growth of the digital sector and increasing productivity across the economy. Enhancing digital skills at all stages of life will help to ensure that consumers and service providers can access the benefits offered by new technology.

- **Key Principles** - Digital skills are increasingly becoming essential to society as a whole. Government, in collaboration with the private, development, and other sectors, will support better understanding, at the highest levels of business, of technology's potential to transform or disrupt established industries. The digital sector requires specialist skills, such as software development, which should be provided through mainstream education, initiatives to promote reskilling and where necessary, by facilitating high-level support to local experts as well as collaboration with regional experts.

  Government will ensure that students receive the education they need to achieve digital skills in preparation for the work environment. As the requirements of the industry evolve, links between business and education providers should be developed to ensure that the supply of digital skills meets future demand. Through initiatives to promote and accelerate digital literacy, the government should also provide support to ensure users feel confident using technology in the workplace and at home.

Safety and security through a robust approach to cybersecurity

- Cybersecurity plays a crucial role in supporting economic growth and ensuring the safety of information collected from patients and other individuals. Potential cybersecurity threats do not just affect data and systems in government and business, but also critical infrastructure, including emergency services, energy, health, transport, and water.

- **Key Principles** - To protect the population's information and wellbeing, the government will work with the private sector and the operators of Ethiopia's critical national infrastructure for investment in robust cybersecurity. Government itself must also be able to operate with confidence in the digital environment, be trusted to handle data, and remain capable of protecting Ethiopians' privacy. As society becomes more connected, the government must also promote awareness of cybersecurity and ensure people know how to stay safe online.

Efficient and convenient public service and well-maintained digital infrastructure

- Including improved finance legislation, service infrastructures such as network, electricity, and availability, and access to affordable hardware/technology. Ethiopia's digital infrastructure is in its infancy. Developing this digital infrastructure as both technology and consumer demand evolve will be critical to achieving its digital health and national digital strategy.

- **Key principles** - Government will make it a priority to engage the private sector and development partners, associations, and others to support projects that improve the reliability, resilience, and affordability of Ethiopia's infrastructure. Government policies will also look further to the future, encouraging innovation and resilience in the telecommunications sector, to ensure that next-generation services are available in Ethiopia in the long term. The delivery of advanced digital infrastructure will be supported by a telecommunications strategy that will describe the specific steps to be taken and improved access to consumers to the range of services they require.

- The government will continue to encourage a competitive market that promotes affordability and high quality of products and services. The government in consultation with the relevant stakeholders will review, adjust, and fast track the implementation of financial and tax legislation that is encouraging and conducive for increasing access to goods and items essential for the development of digital infrastructure including equipment and software.

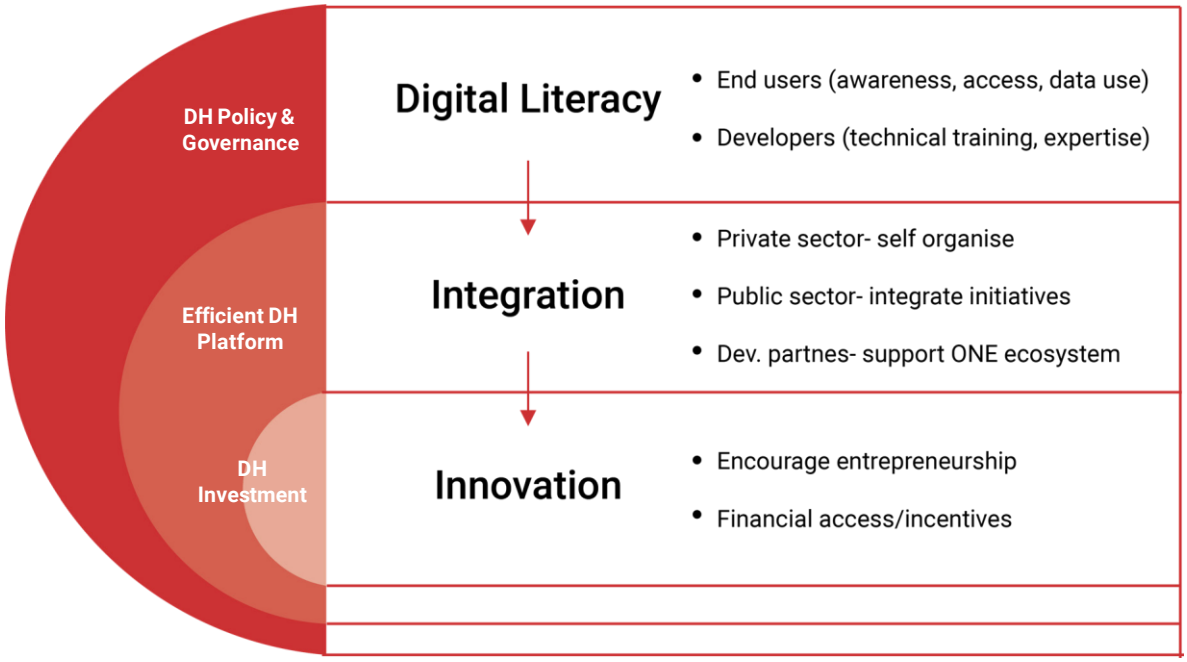
VII High-Level Roadmap

While the above sets out the key principles of Ethiopia's Digital Health Policy Framework it does not set out priorities of actions for development and implementation. As per the proposed DH policy framework, establishing the DH ecosystem of Ethiopia needs to take account of several key pillars.

This section proposes the priority pillars of the proposed framework that Ethiopia needs to consider enacting as a priority given the level of readiness of Ethiopia's DH ecosystem.

Ethiopia's DH Priority Pillars and Roadmap

The below figure depicts the priority pillars to address or enact for Ethiopia's digital health ecosystem policy and planning process.



Digital Literacy – one of the key barriers identified in the digital health ecosystem in Ethiopia is the limited human skills, capacity, and digital literacy. The average population being rural and with low literacy in general, beyond access to mobile, digital literacy remains limited to the uptake of digital health solutions. Factors such as awareness, data use, and infrastructure barriers affect digital literacy.

Beyond the end-users, digital literacy of the workforce in employment as well as skills and training and expertise in software development of hardware use is also a big challenge.

Integration – The other priority pillar for Ethiopia is looking to integrate the various fragmented DH initiatives across the private sector, within the public sector and encourage development partners to support ONE integrated ecosystem rather than vertical support. Indeed, Digital health should intersect and help strengthen at system level and avoid vertical or disease-specific support.

Innovation – As a third pillar of priority for Ethiopia, we propose developing financing sources and investments that can encourage SME and entrepreneurship and for the government to "harness" through relevant financial incentives for some of the private sector innovations. Some of the ways to encourage innovation may be ensuring that some development partner funding is allocated directly to strengthening capacity And training of private sector innovation. Such funding can also be allocated to the academic sector to encourage research and development and within that support and finance STEM and other incubators for innovations and local talent production.

Although the above figure depicts, based on the deep-dive analyses, the 3 priority pillars, it is important to note that a cross-cut- ting priority would be to set up the relevant leadership and governance structure. The governing structures would have different focus and technical advisory groups and divisions that will encourage the policy framing to allow the development of the digital health platform as well as encourage DH investments as part of the larger national vision and strategy for digital transformation.

Annex 1: Ethiopia DH Policy Documents

Ethiopia Strategic Documents	Descriptions	Keynotes on DH and Private Sectors
• The National eHealth strategy of Ethiopia (*2012-2015, Addis Ababa ver.1. April 2012*),	• The document that remained in a draft for a long is aimed at guiding and streamlining the Information and Communication Technology (ICT) solutions in the healthcare sector focusing on Health and healthcare providers, Consumers of health, and Health and healthcare service managers. • The vision of the strategy was to provide equitable, quality, and timely health services through the use of digital technology. The strategic areas of interventions were identified to be adapting e-health standards (Legal and Regulatory framework), implementing the national ICT infrastructure for e-health (Infrastructure, standards, and system for eHealth), establishing governance and leadership for eHealth, educational promotion to all stakeholders on e-health (financing and Investment as well).	• The whole eHealth implementation was designed to be entirely led and governed by the FMOH. • The strategic document had fallen short of mentioning the private sector's critical roles in digital health implementation, leadership, and governance.
• The 20-year health sector vision document (draft 20-year health sector vision, version 2015)	• Indicated the overall government direction about non-state actors (private for-profit, local and international NGOs, civic and professional societies) and their contribution in the health sector should be enhanced as the health sector's needs cannot be addressed by the public sector alone. Besides, health is generally regarded as a public good demanding a concerted effort of all stakeholders' Private health facilities including hospitals, clinics, pharmacies, diagnostic centers, and other health sector partners, will increase access to services and leverage resources for health care.	• It recommended having a balanced approach in which the public facilities contracts with private sector providers (both for-profit and nonprofit) in areas where the government sector is unable to fill the demand or where public-private partnerships (PPPs) might be an efficient way to improve quality and access. • Advised establishment of a separate PPP unit in FMOH. • Not specifically mentioned on digital technology support of private sectors.
• The Ethiopian Public-Private Partnership implementation guide	• Developed in 2017 through a series of in-country learning visits, experience-sharing visits to other countries, and consultation with various organizations of development partners, FMOH, and donors' representatives. • PPPH highlights the need for collaboration between the public and private sector in which both parties carry out a partnership based on agreed tasks, while each party retains its own identity and juridical responsibilities. • The document prioritized the creation of effective platforms to address untapped opportunities, and facilitate the exchange of technology, knowledge, and practices between the public and private sectors. The guide indicated the project development team to use a strict flow chart for deciding to engage a public sector institution to a project idea or receive project ideas from the private sectors. The national PPP board, the management team from FMOH, RHBs, CEOs decides based on the review team report.	• Its development did engage private sectors for profits and associations. • Even though the document did not mention the roles of the private sector in digital health technology, it encourages the private sector to provide high-end diagnostic services (laboratory and imaging), and high-end clinical services, such as organ transplantation, cardiac and orthopedic care, hemodialysis, radiotherapy, neurosurgery, and rehabilitation. • The document guides the partnership of the private sector to complement government public health programs in terms of coverage, standardization of services, and improvement of service quality.

Ethiopia Strategic Documents	Descriptions	Keynotes on DH and Private Sectors
• *National Health Information System road map (2012-2020)*	• It is the joint work of stakeholders represented by directorates and agencies of Ministry of Health, central statistical agency, ministry of justice and core technical working group composed of CDC, WHO, JSI/MEASURE Evaluation, Tulane University, Italian cooperation, USAID. • There were five strategic objectives planned to achieve in the road map; to strengthen HIS governance, legislation, coordination, and Leadership, to improve, strengthen and institutionalize HIS resources, to improve health data coverage, to improve health data management and quality, and to strengthen and institutionalize information use for evidence-based planning, performance monitoring, feedback and action at all levels. • Under these objectives, 31 key interventions were identified for implementation but no mention of the role of the private sector in achieving these objectives as well as digitizing, harmonizing standard indicators with private sectors. The road map admitted the health services-based information system has not effectively brought together data from all private facilities. So far, only a few aspects of the data on private facilities are covered in the annual publications. There is no national roster of public and private sector health facilities and a limited human resource database and system to track the number and professional mix both in the public or private sector.	• Again, the private sector for-profit and associations were not part of the strategic document preparation. The eight-year plan envisioned timely, complete, and accurate health and health-related information from an integrated data repository made available and used for evidence-based decision making at all levels in the country. • The road map outlined the importance of using Electronic Health Record (EHR). The document advises the importance of reviewing and harmonizing the various efforts that were being applied in EHR use in different regions and levels. • It stated the lack of coordination and standardization among various efforts and lack of a clear long-term plan to move the whole system as a major concern. It stated the adoption of information technology in the health sector EHR-Smart Care that has been used by utilizing basic telecommunication infrastructure (Ordinary Phone or CDMA) and computers to send and receive reports and software updates.
• The draft ehealth architecture document	• Developed by the Ministry, outlined the different components and the mechanisms of how components exchange data among themselves. Concerning the technology that enables the components to be interoperable, a landscape analysis was done to seek solutions that have been implemented in other countries and to choose the ones which fit our requirements. Based on the set criteria, the Ministry has selected Open HIM to pilot the data exchange between different systems. In light of this, FMoH is currently testing the interoperability layer using OpenHIM. In the reporting period, two use cases, DHIS2-MFR, and eCHIS-MFR were selected for interoperability testing. The DHIS2-MFR interoperability using OpenHIM has been tested successfully.	• The Ethiopia eHealth Architecture is a conceptual framework that depicts the information systems, data sources, and integrations that the Federal Ministry of Health proposes to implement and maintain to achieve its strategic goals. • The eHealth Architecture illustrates how distinct IT components form a coherent and holistic national HIS that provides an increasingly sophisticated set of business capabilities to the health sector. The eHealth architecture is designed to help guide decisions about FMOH digital health investments that support improvements in service delivery while ensuring alignment with the broader strategic context. • The e-health architecture did not indicate the role and contributions of the private sector.

Ethiopia Strategic Documents	Descriptions	Keynotes on DH and Private Sectors
• FMOH Annual health sector performance 2019	• FMOH conducted a comprehensive, national inventory of software applications. The inventory identified a total of 228 apps being utilized at FMOH regional health offices, private hospitals, and clinics. FMOH came up with its own Digital Health Atlas (DHA) with custom attributes included and published in WHO Digital Health Atlas (WHO-DHA). FMOH believes this is a promising step regarding standardization of the apps that are going to be implemented in the country - and will also inform the envisaged Ethiopian eHealth Architecture. Anyone can visit the WHO-DHA site and get detailed information on the published apps	• Did not mention of private sectors role
• The Ethiopia HSTP 2016-2020	• Outlined a strategic objective that involves enhancing the use of the existing technology, the introduction of new technology, technology transfer and development, and the use of local technology. It also addresses finding better ways of doing things through more effective products, processes, services, technologies, or ideas. It encourages the efficient and effective internal business processes of the health system and self-reliance in biotechnology, use of eHealth services (e-HMIS, EMR, M-health), telemedicine, Tele education, and technology transfer for vaccine and diagnostic materials production.	• This five-year strategic plan did not indicate much on digital technology and the private sector's contribution to the area.
• The Information revolution road map, 2016	• Developed following the HSTP plan. It indicated the Woreda Network as a state-of-the-art ICT infrastructure deployed by the Ministry of Communication and Information Technology. It has high bandwidth connectivity between ministries and agencies for sharing data, voice, and video communication throughout the country. • WoredaNet is mainly used to connect government institutions that exchange sensitive data electronically. WoredaNet has reached almost all woredas, which is a cost-effective way to connect RHBs, ZHBs, WorHOs, hospitals, health centers, health posts, and communities. Moreover, since some major nationwide electronic systems such as IFMIS (Integrated Financial Management Information System) have already deployed in the WoredaNet infrastructure, it will be much easier to create interfaces and coordinate with national eHealth systems. Therefore, WoredaNet will be one channel to implement various eHealth systems during the implementation of HSTP	• There is no mention of the private sector's contribution to digital health in the Information revolution road map document.

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