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MINISTRY OF HEALTH-ETHIOPIA

የዜጎች ጤና ለሃገር ብልጽግና!
HEALTHIER CITIZENS FOR PROSPEROUS NATION!

NATIONAL DIGITAL HEALTH STRATEGY

2020 - 2029

Health Information Technology Directorate (HITD)

January 2021,
Addis Ababa



The Strategic Pillars

Foundations

Solutions and Services

Provide tangible means for enabling services and solutions; access to, and exchange and management of information and content.

ICT Infrastructure

Form the foundations for electronic information exchange across geographical and health-sector boundaries

Standards & Interoperability

Introduce standards that enable consistent and accurate collection and exchange of health information across health systems and services.

Enablers

Workforce

Establish Digital Health education and training programmes for health workforce capacity building.

Leadership and governance

Direct and coordinate Digital Health at the national level; ensure alignment with health goals and political support; promote awareness and engage stakeholders.

Legislation, policy and compliance

Adopt national policies and legislation in priority areas; review sectoral policies for alignment and comprehensiveness; establish regular policy reviews

Strategy, Investment and Funding

Ensure a responsive strategy and plan for the national Digital Health environment. Lead planning, with involvement of major stakeholders and sectors.

Research and Innovations

Ensure the effectiveness and efficiency of existing digital health models and technologies, as well as to stay current and innovative with trends in the development and integration of cutting-edge technologies.

The Strategy Team



A team of 6 individuals from Health Information Technology Directorate (HITD) prepared the draft digital health strategy in consultation with other MOH directorates, agencies, implementing and development partners and other relevant stakeholders.



Foreword by the Director of HITD

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LIST OF ACRONYMS

Acronyms	Description		
IS	Implementation Strategies	eLIS	electronic Laboratory Information System
ADS	Ambulance Dispatching System	eLMIS	Electronic Logistics Management Information Systems
AI	Artificial Intelligence	eMEMS	Electronic Medical Equipment Management System
AIDS	Acquired Immune Deficiency Syndrome	EMR	electronic medical recording system
ARM	Annual Review Meeting	ePHEM	electronic public health emergency management
ART		ePHEM	electronic public health emergency management
CBHI	Community Based Health Insurance System	ePrescription	electronic prescription
CDC	Center for Disease Control	EPISA	
CEIL		eRefIS	electronic Referral Information System
CHAI		eRegIS	electronic Regulatory Information Systems
COVID 19		ERIS	Emergency and Referral Information System
CPD	Continuing Professionals Development	eService	Electronic Service Delivery
CTT	Core Technical Team	eSurveillance	electronic Surveillance
DATIM	Data for Accountability Transparency & Impact Monitoring	ETNHIS	Ethiopian National Health Insurance System
DHA	Digital Health Atlas	FHIR	
DHA	Digital Health Atlas	FMIS	financial management Information system
DHIS2	District Health Information System-2	GP	general practitioners
eAPTS	Electronic Auditable Pharmaceuticals Transactions and Service	GPS	Global Positioning System
eAPTs	Electronic Auditable Pharmaceuticals Transactions and Service	HEWs	Health Extension Workers
eCHIS	Electronic Community Health Information System	HIS	Health Information System
eEMS	Electronic Emergency Medical Service	HIT	Health Information Technology
EFDA		HITD	Health Information Technology Directorate
eFMS	electronic Financial Management System	HIV	Human Immuno Virus
EHDAP		HL7	Health Level Seven
eHIMS	electronic Health Insurance Management System	HMIS	Health Management Information System
eHMIS	electronic health management information system	HRH	
eHR	Electronic Health Records	HRIS	Human Resource Information System
EHR-core		HSTP-I	Health Sector Transformation Plan- one
EHR-Extended		HSTP-II	Health Sector Transformation Plan- Two
eHRIS	electronic Human Resource Information System	ICD	International Classification of Disease
eLearning	Electronic Learning	ICT	Information Communication Technology



IFMIS	Integrated Financial Management Information System	NGOs	Non-Governmental Organizations
iHRIS	integrated human resource information system	NHDD	national health data dictionary
INSA	Information Security Agency	NHDD	National Health Data Dictionary
IOT	Internet of things	OpenHIE	Open Health Information Exchange
IR	Information Revolution	PACS	Archiving and Communication System
IT	Information Technology	PPMED	Policy Plan and Monitoring & Evaluation Directorate
IVR	Interactive Voice Response	RHB	Regional Health Bureau
LAN	Local Area Network	RIS	Radiology Information System
LMIS	Logistic and supplies Management Information System	SHR	Shared Health Record
LOINC		Smartcar e	
mBrana		SMEs	
MDL	Master Drug List	SNOMED	
MFR	Master Facility Registry	SWOT	Strength Weakness Opportunity and Threat
mHealth	Mobile Health	TOT	Trainee of Trainers
MiNT	Ministry of innovation Technology	TWGs	Technical Working Group
MoFED	Ministry of Finance and Economic Development	UNAIDS	
MOH	Ministry of Health	UPS	Uninterruptible Power Supply
MPI	Master Patient Index	VITAS	
MPL	Master Provider List	VPN	Virtual Private Network
NAG	National Advisory Group	WAN	Wide Area Network
		WHO	World Health Organization

Executive Summary

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1. INTRODUCTION

Over the past decade MOH has recorded remarkable achievements in building a resilient health system and advancing with universal health coverage, due to strengthening strategic interventions aligned with the health service delivery. With the advent of the first Health sector transformation plan (HSTP I) of the sector, CRC (Motivated compassionate and competent in HSTP II), Woreda transformation, equity and information revolution were strategized, implemented, and reviewed. One of the four transformation agendas in the current HSTP is the Information Revolution. It refers to the phenomenal advancement in the methods and practice of collecting, analyzing, presenting, and disseminating information that can influence decisions in the process of transforming economic and social sectors. It entails a radical shift from traditional methods of data utilization to a systematic information management approach powered by a corresponding level of technology. The Information Revolution is not only about implementation of digital health initiatives, it is also about bringing fundamental cultural and attitudinal change regarding perceived value and information use practices.

In order to further strengthen the IR initiatives, MOH has considered developing and formulating a national digital health strategy for coordinating and streamlining the various ongoing digital health initiatives as well as establishing a foundation for sustainable digital health implementation.

In the context of Global Strategy, Digital Health is understood to mean *"the field of knowledge and practice associated with any aspect of adopting digital technologies to improve health, from inception to operation"*. This definition is in line with WHO EB142/20 of 2017 which states *"Today the term 'digital health' is often used as a broad umbrella term encompassing eHealth as well as developing areas such as the use of advanced computing sciences (in the fields of 'big data', genomics and artificial intelligence, for example)"*

The digital health strategy will consider and realize standardization and implementations of national digital systems that include: access to health information and knowledge-sharing planning and decision making; health system capacity building in terms of creating enabling digital health environment and (Human resource, legal framework, privacy and compliance and funding) to pull together various disparate initiatives into a shared vision with a process oriented roadmap to move ahead.

The realization of the strategy will involve the establishment of national digital frameworks and infrastructural components that can be leveraged at national, regional and local levels to deliver solutions that are able to be integrated and share data across geographic and health sector boundaries. The strategic plan encourages national alignment and connectivity whilst providing the region and district, individual care providers and care provider organizations with the ability to take different approaches to solving their specific digital health challenges.

The digital health strategy is crafted with the alignment of HSTP, information revolution and other strategies of the health sector at large. MOH management and staff, Agencies, implementing partners and other stakeholders are consulted in one way or another.



This digital health strategy is organized into current status of digital health (including content analysis, situational analysis and stakeholder analysis), digital health strategic preambles (vision, mission, objectives, target and implementation strategies), implementation plan, costing and budget, and monitoring and evaluation sections among others.

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2. CURRENT STATE OF DIGITAL HEALTH SYSTEMS IN ETHIOPIA

Several attempts have been made to strategically approach the implementation of digital health in the health system mainly to strengthen the quality, efficiency and intensity of health service provision and thus well-being of the society. MOH and agencies have considered developing and formulating a national eHealth strategy for coordinating and streamlining the various digital health initiatives underway in the country as well as establishing a foundation for sustainable eHealth implementation, in the Information Revolution Strategy of HSTP-I. Despite these efforts, most of the Digital Health initiatives are still characterized as small scale, duplication of efforts, isolated and unable to effectively communicate (interoperable) with each other.

2.1. Content Analysis

During the first health sector transformation plan (HSTP-I) and earlier, MOH has implemented different digital health systems and subsystems to support the healthcare service provision and enhance a quality data generation for program design and decision making. Moreover, MOH, its agencies and partners have strived to improve the digital health infrastructure, digital health system implementation, eHealth governance and the likes to realize digital health at different levels. This section briefly highlights key health information system solutions implemented, the infrastructure availed, the digital health workforce deployed, and governance and policies that were implemented so far.

1. *Institution Based Systems/ Resource Administration and Decision Support Systems*

- **Electronic HMIS:** The health management information system (HMIS) has been automated and implemented initially using the two eHMIS systems (between 2012 and 2017) and then DHIS2 (as of January 2018) for the last more than three years now. After iterative testing, implementation and improvements, DHIS2 has now become a stable national HMIS platform. DHIS2 was implemented in online and offline modalities and by now 3,065 (67%) of public facilities and health offices can access the online (hosted centrally) instance and remaining are offline, which covers 95% of the public facilities. The reporting rate is also improving over time. Currently, service reporting rate has reached more than 95% for HMIS and more than 80% for diseases, with an average of 65% of the reports being submitted timely as per the national standard. [Source: ARM Report 2020].
- **Logistic and supplies Management Information System (LMIS):** Implemented since 2014, the health commodity supply management has been supported by the implementation of the likes of mBran - an open source mobile software platform designed to manage vaccine inventory, VITAS - an enterprise level procurement, inventory and warehouse management technology system; Dag - an inventory management system designed to manage daily transactions at



health facilities, and Fanos - a supply chain dashboard to support decision making Systems for EPSA and EFDA for the last few years. They are Health Commodity Management Information Systems used to record new drugs (stock) and vaccines, calculate consumption rate, issue drugs to Units (departments) and manage inventory.

- **Human Resource Information System (HRIS):** Handling the health workforces' detailed profiles, sites of assignment, work experience, and the likes - and using the data as a reference for promotion, professional license, transfer, cost-sharing, etc. has been exercised using the electronic HRIS since 2004. However the system has not been consistently functional across all levels of organization units and facilities. Moreover, the source code is not available to incorporate new requirements and redesign the system. As such, the Ministry decided to customize an open source eHRIS system called iHRIS to handle the functionalities HR ADMIN, HR Development, and the HR Licensure services - and it is currently making good progress.
- **HRIS Licencing System:** This system served as a tool to collect, store and manage health professionals' licenses. It was initially developed and maintained by EFDA, but currently its function is moved to Professional Licencing and Accreditation Directorates of MOH. The functionality of this tool may end once the iHRIS is finalized and ade functional.
- **Fleet Management System:** MOH implemented a fleet management system to effectively manage office-based and rental vehicles. Originally the application was implemented to have a system that can track the whereabouts of the vehicles at any given time with the GPS-enabled on each car - and it served the purpose for about two years since 2016. The fleet management system is currently not operational due to the need for maintenance on the system.
- **Medical Equipment Management System:** This system was developed with the purpose of alleviating the medical equipment management/handling problems observed at facilities. The system was developed in 2018, and is currently on pilot stage.
- **Emergency and Referral Information System (ERIS):** Helps to manage the service provision, bed management, referral management, and emergency management across the health facilities. The system was developed in 2018 and the system was deployed at five Addis Ababa Hospitals for piloting. But because of the changes in the requirements the implementation soon got stacked.
- **Health Information Exchange and Dissemination System:** Web portals from EHDAP, and Social Media Outlets have been tried out to enhance information exchange among health taskforces and the public. Still a great deal of work is expected especially in strengthening, upgrading and sustaining these outlets, including call centers, e-news so that the systems serve the intended purpose.



- **Digital Library System:** Developed with the intention of enabling reading and downloading of different electronic books and subscribed journals in which collections are stored in digital formats and accessed by the staff of the public health sector. The system was customized and partially implemented in 2018 but not functional now.
- **DATIM (Data for Accountability Transparency & Impact Monitoring):** A customized DHIS2-based system used to report HMIS data from ART Sites in the country (mainly from the sites that are supported by USAID and CDC) since 2015.
- **Electronic Regulatory Information System:** is implemented by EFDA to carry out the regulatory tasks. It integrates the **i-report** (an open source customized by EFDA and that allows importers to apply for and receive permits to import medicines online and EFDA staff to manage these applications online), **i-Register** (allows importers to apply for market authorization and product registration), and **i-Licence** (allows importers, exporters, wholesalers and Manufacturers to apply for certificate of competency). The system is currently operational.
- **eSurvey and Surveillance tools:** In recent years, MOH and its stakeholders have widely implemented electronic surveys and program-based assessments. The likes of Apps Inventory and PRISM Assessment have been administered via eSurvey tools. Efforts have been made to establish public health systems - such as eSurveillance/ Early Warning Systems, Case Tracking Systems, etc too. Though promising practices are already there, it takes consistent implementation and governance of these systems. Furthermore, SPA+ assessment and other quick assessments have been carried out to understand the Digital Health infrastructure readiness - including availability and sufficiency of computers, connectivity equipment and communication materials.
- **Email Services:- G-Suite (Google Workspace) and System Administration:** G-Suite has been implemented at MOH, Agencies and Regions by availing and managing corporate email, teleconferencing, messaging and many other technology features for health workers.

2. *Point-of-Service Systems*

- **Smartcare EMR:** The electronic medical recording system (EMR) has been developed and partly implemented in selected health facilities in all regions of the country, since 2007. However, it has been a long time since the system was developed, and as such there are various emerging requirements that needed to be addressed. Furthermore, the source code of the Smartcare system is not accessible to MOH, which makes it hard to further extend the system. There is also a growing demand to put the EMR standards in place and help data exchange among the EMR instances in the country.



- **Smartcare ART System:** This system was designed by the initiative of the US Center for Disease Control (CDC) specifically for low resource countries to supplement the UNAIDS 95-95-95 HIV targets. The ART system is used for tracking HIV Positives, Case Based Reporting, Retest and Index case testing. It is a desktop and Microsoft based system deployed at those facilities providing ART service.
- **Electronic Auditable Pharmaceuticals Transactions and Service (eAPTS):** This system delivers information concerning the types of medicines arrived for patients, therapeutic category, types of programmes served, stocks at hand, consumed, wasted and emergency stocks so as to control and monitor the services and supplies. The system is also helpful to manage pharmacy payments and measure staff performance. The development of the system started in 2019 and is ongoing. It is desk reviewed at St. Peter's Hospital and ready for pilot implementation at five selected Hospitals.
- **eCHIS:** Electronic Community Health Information System (eCHIS) has been developed and its implementation is progressing well in more than 1,700 agrarian health posts. There is a mobile app at the health posts, which helps as a job aid for the HEWs and also to gather data and eventually sync with the web-based instance deployed centrally. The urban and pastoralist versions of the eCHIS are also planned to be deployed based on the lessons learned from the agrarian eCHIS.
- **Interactive Voice Response (IVR):** An IVR system has been developed and implemented in selected health posts to receive voice information on key community health aspects and to provide training to the HEWs and their supervisors. Dashboard also has been developed on the top of it - to help individual directorates/departments get tailored information on the areas of their concern. As the implementation of eCHIS has started since 2018, the role of IVR has somehow narrowed. However, the system is still being implemented to enhance quick information transfer on community level emergencies - including COVID 19 related ones.
- **Archiving and Communication System (PACS) and Radiology Information System(RIS):** It is a medical imaging technology which provides economical storage and convenient access to images from multiple modalities (source machine types) and provides mechanisms for remote consultations. It is implemented at 19 hospitals.
- **Community-based Health Insurance System (CBHI) & Ethiopian National Health Insurance System (ET-NHIS):** The CBHI system was designed to manage a health facility patient payment and to report it to respective woredas that are included in the CBHI agreement. An ET-NHIS on the other hand is a CHAI-supported mobile application (at kebele level) and web application (at health offices) newly developed to streamline workflows, automate processes, and handle the CBHI Agency's records. The system is piloted in seven kebeles of a woreda in Tigray Regional



State with motorola phones. The development process is ongoing to include some modules required for Hospitals.

- **Laboratory Information System:** Is a system that automated the laboratory activities. It was developed in 2007 by Polytech Consulting and development PLC for federal and regional laboratories - and is currently in use. Recently the system has been integrated with the COVID-19 Tracker to ease the data exchange between the case managers and lab technologists.
- **eLearning/Tele-education:** MOH and partners strived to incorporate electronic technologies to access health education outside of a traditional classroom, and particularly to deliver via the Internet to the health workers and the public. The initiatives launched in the OpenHIE academies are examples of such efforts. However, a lot still remains regarding enhancing this area. One such tangible effort at MOH level in this regard includes the Continuous Professional Development (CPD) Program that has been launched in a small scale.
- **Surveillance Systems:** There are electronic systems for ongoing systematic collection, compilation, analysis, and dissemination of data on reportable diseases and other events that present a potential threat to public health security. The COVID-19 Response App that has been developed and used by MOH and EPHI is a typical example. The HIV/AIDS surveillance system has also been implemented by EPHI at selected facilities in Addis Ababa.
- **Exam Administration System:** This refers to a system developed to administer online exams. A typical example is the system MOH uses to conduct entrance examinations for general practitioners (GP) in specialty programs. The system enhances the confidentiality of the examination process and eases grading mechanisms.
- **IFMIS (Integrated Financial Management Information System):** Used to manage the budgeting and expenditure of the FMOH Finance. It was developed by MoFED for sector offices - and FMOH has implemented it as of 2012. It has also recently been implemented at other MOH Agencies.
- **Online Ticket Registration System:** A system used to provide an interface for internal maintenance and support. Using this application, users request hardware and software maintenance and troubleshooting by filling a form. While the system was implemented and evaluated as of 2018, the level of utilization of the system has been minimal.

3. Shared Services and Data exchange initiatives



- **MFR:** Master Facility Registry (MFR) has been developed and implemented with the intention of making the MOH's facility list a sole source of truth about the facility information, and to enhance systems interoperability. Though it was implemented as of 2017, there have been system related and governance challenges that hampered its full implementation. Remedial strategies have been devised and implemented to ensure strong governance and backend stabilization.
- **NHDD:** The national health data dictionary (NHDD) has been developed with a few data domains (like the National Classification of Disease (NCoD), HMIS Indicators and Registers, and HSTP Indicators) included, and MOH is planning for more priority domains - to ensure common understanding on data concepts, formats and meanings across the board. While it was implemented since 2017, the number of domains included in the terminology management service are very limited. The next priority domains (that are based on the maturity of the E-Health Architecture) are identified, and they will be included in the NHDD on the current strategy period.

4. E-Health Architecture and Interoperability

MOH has prepared and endorsed key guidelines to ensure that the digital health technologies and technology projects support the digital health strategies and objectives in a way that maximizes the investment. Efforts also have been made to ensure that different information systems and applications to access, exchange, integrate and cooperatively use data in a coordinated manner. Few examples include the MFR/DHIS2 and the eCHIS/DHIS2 data exchange efforts. The digital health Systems App Inventory has been conducted and the findings are published in the WHO Digital Health Atlas (DHA). Preliminary tasks are underway to conduct the HIS and Interoperability Maturity assessment for key health information systems. Way forward, we need the Interoperability and messaging standards to ensure systems speak to each other.

5. Data Warehousing and Business Intelligence:

Within Ethiopia's health system, data are collected and managed at different levels and the available data sources are siloed or stored in separate systems. This siloed approach has created barriers for the use of data from across the health system in a combined manner suitable for analysis, and this limited the types of research and decisions that could have been supported. To solve this problem, MOH has started the development of the data warehouse step-by-step (i.e., based on priority use cases). The

subsequent analytics and business intelligence tasks will also be coupled with this effort during HSTP-II.

6. Digital Health Infrastructure

Over the last decade MOH, Agencies and partners have made significant investment on digital infrastructure at facilities and health offices to support information system implementations and to carry out day to day health activities. While the efforts are promising in this regard, a lot more investments are required to ensure a digital health infrastructure that can shoulder the current aspirations.

- **Hardware/Electronic Devices:**

The data center of the Ministry is equipped with low-end to few high-end servers, 2 smart UPS, a firewall and cooling systems. As the number applications to be hosted at the data center is growing in terms of size and complexity, the existing data center and equipment were not sufficient and as a result the ministry is currently on the upgrading process of the existing data center. Moreover, a similar data center is being built at a different location to resume the operations in case of catastrophic or unexpected event which may damage or destroy data, software and hardware systems. Cloud backup is also used as an alternative for selected applications. A significant number of personal computers, Printers, Laptops, Tablets and other gadgets are distributed to regions and service points to promote digital health. However, there still are huge resource gaps.

- **Networking:** MOH has made significant investment to improve eHealth connectivity infrastructure both at national level and in regions. One of the massive initiatives in this regard is the HealthNet initiative that is helping regions, woreda's and facilities to be connected from Ethio-Telecom's Virtual Private Network (VPN). There are 3,605 health facilities and health admin offices connected to the HealthNet in 2020. Several endeavors, including distributing network materials, training Small and Micro-Enterprises (SMEs) and RHB zonal and woreda staff, have been achieved to connect the different units of the health facilities with data networks that can ease health information exchange.

- **Electricity/Power:** The main grid electricity is intermittent and not capable of nurturing power all the time to very sensitive devices such as servers. The alternate power generator maintained by the Ministry is operational on working hours in the absence of electricity and the servers often shut down during the non-office hours where the electricity power goes off. The data center requires a dedicated power generator which is capable of providing power all the time where there is no electricity. Smart redundant UPSs should also be available to control the power management in the server room. These efforts are currently in the pipeline.
- **Systems Hosting:** The availability of the likes of HealthNet and the improvement of local capacity meant local hosting of eHealth systems has been possible. Secure Cloud Hosting was also an alternative based on the nature of the data and the level of complication of managing the systems. Both local and Cloud hosting will continue to be considered as applicable based on the hosting parameters set.
- **Availability and Security:** The MOH and partners implemented the body of technologies, processes, and practices designed to protect networks, devices, programs, and data from attack, damage, or unauthorized access. As a result, the availability of the systems are progressively increasing. But still there are a lot of gaps to be addressed in order to enhance the availability and security levels of the hosted systems. Cyber security services that include data retention, data sharing, data privacy and encryption protocols have also been implemented to some extent as part of IT policy implementation, which is yet to be endorsed and implemented in its entirety.

7. Leadership, Governance and Multi-Sectoral Engagement

Supported by the Information Revolution Roadmap, MOH has strived to put in place a governance structure and multi-sectoral collaboration in the digital health systems development, implementation and sustaining efforts. In most digital initiatives, a team is established to handle the very technical tasks. When the initiative is cross departmental, the members are composed of technical experts from

different departments and partners. A technical working group which provides the technical guidance on the initiatives is in charge of providing support to the technical core team. The National Advisory Group (NAG) provides the overall guidance on the digital health matters and reports to the Steering Committee/Joint Steering Committee, composed of top level management, RHB heads, donors and development partners, providing the high level guidance including setting out investment and strategies.

8. Strategy and Investment

Solutions to specific health issues may require a predominance of few components over others, but to the extent possible, MOH and partners believed on implementing different components (like HMIS, Case-based systems, population-based systems, business intelligence systems, etc.) with understanding that any sustainable and comprehensive solution will require elements of each. In HSTP-I's five years investment plan and in the Information Revolution Roadmap, the digital health investment roadmap was developed, implemented and evaluated. As such, there is a plan to further expand and implement the HSTP-I's experiences in the HSTP-II period too.

9. Workforce

Given the ever increasing demands for the technology solutions in the health sector, MOH has made significant improvement regarding the digital health workforce at federal level and regions. Reorganization of Health Information Technology (HIT) human resource structure in collaboration with the Ministry of Public Service and Human Resource Development in order to minimize the outgrowing compliments of most HITs was one of the major tasks performed in this regard. Recruitment of Digital Health professionals with a variety of calibre at all applicable levels, deployment of IT interns, establishment of Help Desks, hosting and participating in global digital health forums, and many other initiatives speak of the level of emphasis given. At the regional level and lower level hierarchies, a lot of work still needs to be done to put the structure in place as well as the Health IT workforce to support the perpetually growing demand for information management endeavors.

10. Legislation, Policy and Compliance

MOH has prepared the Information Technology Policy in compliance with the umbrella policy of the Ministry of Innovation and Technology. The policy covers security, do-no-harm, data sharing, IT equipment use and others. The policy is yet to be endorsed and implemented at the intended levels.

11. Research and Innovation

MOH and its partners promoted research, learning and improvement in digital health - that covers the areas of service readiness assessments, systems development, infrastructure assessments, technology shifts and trends, Open Sources, E-Health architecture and interoperability, syntactic and semantic standards, and the likes. MOH has established an IT Innovation and Learning Center at federal level and has a plan to extend it to regions too. A few digital health surveys have been conducted and utilized at different levels of the health system. Compared to the research needs of the sector, however, much is expected in the future.

2.2. Stakeholders Analysis

MOH has a long list of digital health stakeholders. The stakeholders include government, agencies, donors, strategic partners, private sectors, system users and the public that is directly affected by MOH's systems and services. In light of advancing the digital health endeavors and strategizing the approaches of implementation, it is paramount to do deep analysis of these stakeholders (people and organizations); grouping them according to their levels of participation, interest, and influence in the project; and determining how best to involve and communicate each of these stakeholder groups throughout. Moreover, stakeholders retention and turning around the fragmented management of stakeholders should be given equal attention.

While there are several different types of stakeholder matrices, we used here a Power Interest Matrix to do our stakeholder analysis and to make decisions accordingly. By **Power** we mean the ability of the stakeholder to stop or change the project. On the other hand, the term **Interest** refers to the size of the overlap between the stakeholder's and the project's goals. In light of this:

- ❑ Stakeholders with **high power** and **high interest** are major stakeholders that are heavily invested in the digital health endeavors. MOH must actively manage them.

- ❑ Stakeholders with **high power** but **low interest** must be kept satisfied by MOH. Otherwise they can leave the digital health efforts over seemingly minor issues.
- ❑ Stakeholders with **low power** but **high interest** must be kept informed by MOH. Otherwise they can create high influence if they don't get what they want.
- ❑ Stakeholders with **low power** and **low interest** must be monitored by MOH. Otherwise, in case they become more powerful, they can negatively affect the digital health efforts in the future.

Table 1: Stakeholders Power-Interest Matrix

PO WE R 	[Keep Satisfied] • Service Provider (Ethio-telecom) • Legislation offices - like Cyber Security Institutions • Insurances • Power Sources (EELPA)	[Manage Closely] • MOH Leadership • MOH Directorates • Regional Health Bureaus • FMOH Agencies • Zonal and Woreda Health Offices • Electronic Technology Regulatory government organizations (MiNT, INSA) • Donors, Investors • Implementing Partners • Development Partners • Health facilities (Hospitals, Health centers, Clinics, and Health Posts) • Health related academic Institutions • Public health professionals • Patients and caregivers
	[Monitor] • Communities/Public • Other Government sectors • Non-health academic institutions	[Keep Informed] • Professionals in research and practice • Health-related businesses • Suppliers and vendors • External Systems Owners (MoFEC-IFMIS) • Private organization • Professional Associations(Health Informatics, IT, Computer Science)
 INTEREST		

Table 2: Stakeholders' Engagement Strategy Matrix

Stakeholder Name	Expected Stakes/Roles	Stakeholder Engagement Strategy
<i>Telecom Service Provider (Ethio-telecom)</i>	Provides Telecom services (Internet, Wide Area Network infrastructure, licenses, service monitoring, etc.)	Closely work with them and communicate; help them understand the digital health demands; engage them in launching processes of massive initiatives that depend on Telecom services; share annual plans.
<i>Legislation offices - like Cyber Security Institutions (Example: INSA)</i>	Provide approval and advice in areas that have national security concerns; Include digital health information in their policies, legal frameworks, guidelines, plans and operations; Support innovation and skill transfer.	Receive periodic advice; share the bigger initiatives/agendas, and periodic reports that have national impacts.
<i>Insurances</i>	Provide Insurance coverage on valuable investments; provide cyber insurance.	Establish good relationships with the available insurance companies via legal representatives; get insurance coverage for mega digital health investments.
<i>Electricity Power Sources (EELPA)</i>	Provide uninterrupted power supply.	Provide heads up on the available initiatives; develop joint MoU; ensure uninterrupted power supply for digital health services.
<i>MOH Leadership</i>	Endorse all digital health initiatives and provide oversight and support for their executions.	Submit the digital health vision and strategies document; get approval; continuously provide updates and detailed reports; align with the bigger HSTP and other health sector goals.
<i>MOH Directorates</i>	Owners of digital health Use Cases.	Help and support the directors and staff understand the available digital health solutions; support the design of the systems with full engagement of the directorates; use the available digital health platforms; share reports and feedback; create champions.

Digital Health Strategy 2020-2029



<i>Regional Health Bureaus</i>	Owners of the digital health Use Cases and key for any digital health solution's success.	Consult during the planning; Create joint vision; get buy-in; engage in system development and implementation; promote the use of available digital health platforms; share/get feedback and reports.
<i>FMOH Agencies</i>	Owners of some of the digital health Use Cases and key for the implemented digital health solutions' success.	Consult during the planning of the areas that concern them most; Create joint vision; get buy-in; engage in system development and implementation; promote the use of available digital health platforms; share/get feedback and reports.
<i>Zonal and Woreda Health Offices</i>	Implementers of the digital health systems and they are key for any digital health solution's implementation success (whenever it is going to be implemented at lower levels).	Get buy-in; ensure the friendliness/simplicity of the available systems; build their capacities; provide/get feedback and report.
<i>Electronic Technology Regulatory government organizations (MiNT)</i>	Provide umbrella policies and procedures for technology implementation; Provide supports as applicable.	Share sector-level digital health vision and get policy and technical inputs. Consult in the course of the implementation of key initiatives.
<i>Donors, Investors</i>	Providers of financial and technical support for digital health endeavors.	Submit the Digital Health Strategy document for their inputs; provide detailed information on the bigger picture of the digital health initiatives in the country; identify and communicate the priority areas of investment along with return-on-investment analysis; provide regular performance reports and get feedback; conduct regular joint review of digital health implementation.
<i>Implementing Partners; Development Partners, NGOs, FBOs</i>	Tailored support to the health sector in digital health implementation.	Create digital health partners'/funders' forums; mobilize resources; create structures for concerted support in the areas of their presence; avoid duplication of efforts; create synergy; share performance reports; create joint review forums.



<i>Health facilities (Hospitals, Health centers, Clinics, and Health Posts)</i>	Actual implementers of the available systems for health service improvement.	Engage the service providers in systems development and conduct Users Acceptance Test; make the system as friendly as possible; provide trainings and avail simplified guides; provide continuous mentoring and TA; provide feedback; get reports. .
<i>Health related academic Institutions</i>	Centers for Research, Innovation and sustainability of digital health endeavors.	Create strong partnership with the institutions; establish centers of excellence/innovation centers; mobilize performance based grants; fund digital health researches; conduct joint review and provide necessary support.
<i>Public health professionals</i>	Sources of Use Cases	Continuously engage in Use Cases identification and prioritization; get inputs during User Acceptance Testing; engage in trainings and TA during systems implementation.
<i>Patients and caregivers</i>	The subjects of the digital health solutions	If the system is directly used by the patient, test the system with different ranges of users and improve. For other systems, make sure that the system is not distracting with the actual care provision (example, time spent for data entry); protect data privacy and assure the users of their safety.
<i>Communities/Public</i>	The environment for digital health systems implementation.	Consult the community members who are directly affected by the digital health systems and infrastructure, and make consensus; help the community buy the digital health endeavors.
<i>Professionals in research and practice</i>	Potential sources for Innovation and technical resources.	Identify potential digital health professionals' pool; create strong partnership with them; engage in the areas based on their expertise.
<i>Health-related businesses; Suppliers and vendors</i>	Providers for digital health infrastructure and solutions.	Create strong partnership with providers/vendors based on the type, quantity and quality of the items needed for the digital health business.
<i>External Systems Owners (Example, MoFED-IFMIS)</i>	Owners of multi-sectoral information systems.	Use the system for the intended purpose and share the required reports per the plan.



<i>Private organization</i>	Contributors in the digital health endeavors	Value the contributions of the private sectors; create strong Private-Government digital health partnership and engagement platform; deliberately ensure participation of the private sector in key initiatives.
<i>Professional Associations (Health Informatics, IT, Computer Science)</i>	Promoters of the digital health strategies and endeavors	Value the contributions of the associations; create strong partnership with them; provide key digital health agendas for promotion and resource solicitation; deliberately ensure participation of the associations in key initiatives.

2.3. SWOT Analysis

This section describes the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis on the execution of the digital health initiatives to date, as to where improvement is required and where it is doing well, both internally and externally. It will also enable the health sector in trying to decide whether or not to embark on the upcoming ventures and strategies by visualizing the pros and cons. This SWOT analysis on digital health systems is based on several sources - including HSTP-I Mid-term Review, Annual Review Meeting Report (ARM), view of national and regional experts through quarterly review meetings, partners annual reports, and other relevant sources.



Strength

- Presence of organized IT Unit (Health Information Technology Directorate - HITD) at national and few regional health bureaus levels;
- Presence of IT support staff seconded/embedded by partners;
- Availability of a well-defined workforce structure for HITs, and dedicated staff for internal IT support;
- Establishment of career development mechanisms for HITs;
- Promising efforts in terms of availing Help Desks at different levels (including customization of a Ticketing System called ORTS);
- Implementation of both local and Cloud-based hosting strategies;
- Procurement of a significant number of computers to address the gaps in regions;
- Implementation of a Virtual Private Network (VPN) called HealthNet to interconnect several health facilities and org units;
- The development and availability of several digital health applications to serve multifaceted health service requirements;
- Flexibility in adapting different technologies and platforms as applicable;
- Promising efforts in automating and using soft institutional assets (example, including the implementation of knowledge management system);
- Establishment of Innovation and Learning Center at national level;
- Rehabilitation of datacenter and the soon to-be-constructed disaster recovery site (DRC);
- Digital health has attracted attentions of clinicians, health managers, policy makers, partners and funders;

Weakness

- There is no dedicated IT/Digital Health unit at several regional health bureaus;
- Low digital literacy among health workers;
- Shortage of skilled IT professionals at all levels;
- Low level and less organized IT support at different levels;
- Insufficient ICT equipment maintenance at all levels;
- Inefficient infrastructure and configurations;
- Intermittent power disruptions that hampers the systems available to the end users;
- Absence of dedicated alternate power sources for the data centers;
- Shortage of computers, printers, and tablets at regional, zonal, woreda and mainly facility levels;
- Low HealthNet coverage compared to the available health facilities and org units; Total dependence on the pace of the Ethio-Telecom for the connectivity coverage;
- The HealthNet connectivity speed is very slow at some facilities and org units;
- Lack of internal network within most health facilities that interconnect the various units;
- Several digital health applications lack standards, and are not interoperable;
- Several of the applications developed by partners are with no source code or documentation to maintain and might be left with no implementation;
- Absence of central repository that mediates data access from several siloed applications;
- The level of technology absorption by the Ministry is still very low;
- IT procurement system is not efficient, delays of suppliers is common;
- Lack of sufficient innovations and research in IT areas by the Ministry;
- There are very few national Innovation Centers/incubation centers to adapt from (and they are not fully functional);
- There is very low engagement of the private sector innovators;
- The digital health monitoring and evaluation efforts are insufficient;
- Lack of sufficient global partnership with digital health academies and innovation centers;
- Top management engagement often depends on individuals' commitment;



- Wide experience has been gained in implementation and cascading of digital health initiatives;
- There is strong commitment and ambition at the top management level for the scaling up of digital health endeavors;
- Comprehensive IT Policy has been prepared for the health sector;
- HSTP-I and Information Revolution (IR) Roadmap paved the way for digital health promotion; HSTP-II also emphasized on digital health;
- Recent practice of creating a strong partnership with the academic institutions is commendable;
- There is a clearly defined procedure and collaboration with predefined donors;
- There is a strong demand for data from stakeholders;
- Application inventory was performed to identify the existing digital health solutions;
- An eLearning Scheme in the Ministry is enhancing digital literacy;
- Digital public outlets are implemented to share the updates with the public.

- Delay in endorsing digital health governance SOPs, Procedures and Directives;
- Loose compliance to the digital health governance procedures;
- Long-term digital health funding strategy has not been availed;
- Low engagement of professional associations in digital health;
- There is no endorsed data sharing policy and standard;
- There are no data privacy, and confidentiality standards/policy (in light of the booming digital health);
- Though efforts are there, there is no implemented disaster recovery strategy so far;
- The data backup systems are defective;
- There are no defined software standards;
- There is gap in terms of digital health project management skills and techniques;
- There are several electronic information systems developed, but several of them are not being used for the intended purpose;
- There are not many implemented digital health capacity building mechanisms/techniques (example, videos, online training, etc.);
- The available information dissemination portals are not sufficient to communicate achievements and important data to the public at large;
- There is no or poor electronic health records implementation at facilities;
- The contribution of academic institutions to electronic health has been very minimal.



Opportunity

- There are several remote support systems/ technologies out there to use;
- The recent invite of government for new Telecom Companies to operate in the country will expedite the implementation of HealthNet at its optimum;
- There are open source platforms globally developed and made available to use with simple customization and manageable costs;
- Presence of Open Source Communities globally to continuously enhance the functionalities of the implemented systems (example, DHIS2, ComCare);
- There are ample technology solutions out there to adopt and use; there could be an opportunity to utilize global innovations;
- There is public procurement agency pre-agreed with suppliers that might shorten the procurement process;
- There is an ongoing proclamation for electronic transition that will help facilities to exchange transactions, receive payments, and issue receipts electronically;
- The electronic transaction policy at national level is at the verge of endorsement;
- There is a body (MiNT) to consult digital standardization aspects;
- Many local universities are adopting key health sector technology solutions in pre-service training of HIT.

Threats

- Staff turnover or staff changing field and joining other sectors;
- Dependency on a single service provider for network connectivity among the health facilities and administrative units;
- Shortage of hard currency to procure the IT devices;
- No reliable source of fund so far to cover the monthly HealthNet fee;
- There are a number of facilities and organization units with no service providers service coverage with any of the options;
- Frequent interruption of Internet that can significantly affect the implementation of demanding digital health solutions;
- Low coverage of electricity;
- There is a huge demand for easy access to information across all departments, partners, NGOs, academic institutions, other governmental organizations, etc
- There is a growing mobile users community for access to digital information
- There could be unavailability of funds for the major initiatives if the tie with the donors loosen
- There is a growing demand of stakeholders engagement including donors, partners, academic institutions, and other relevant government institutions
- Every stakeholder may create own software which may end up with non-interoperable applications

3. DIGITAL HEALTH STRATEGY

Digital Health Strategy envision the overall organization and application of Information Communication and Technology for the service delivery, application development and infrastructure improvement of the health sector to improve the health delivery system. It involves the strategic objectives addressed by the Health sector transformation plan II.

3.1. Vision, mission, core values and Guiding principles

vision

To see the health systems and services transformed through digital health endeavors.

mission

To enhance an integrated digital health ecosystem of people, processes and technology that support health systems in delivering quality, equitable, timely & affordable health services

Core Values

Collaboration	Agility	Problem Solving	Transparency, Accountability, Confidentiality	Integrity
- Contributing and sharing ideas and responsibilities through team work. - Formulation of strong partnerships with stakeholders and partners to deliver a quality service. - Aspire to new ideas, ways of doing things and willingness to learn - Exploring alternatives before acting.	- Inquiring and ability to change directions when appropriate - Owning courage to try new things and accepting failures - Learning from failures and successes - Not accepting the status quo - Learning and growing continuously	- Maintaining a worldview driven by possibilities, not limitations. - Taking smart risks and foster an environment where creativity and innovation thrive	- Working transparently and obeying accountability for our actions - Communicating clearly, accurately and keeping confidentiality.	- Honesty and truthfulness in work - Doing right overcoming challenges - Putting values into practice and holding accountability

The following principles will guide and fortify the planning and implementation of the eHealth strategy to ensure effectiveness and sustainability of digital health.

Guiding Principles

- 1. Guarantee of patient information rights, integrity, and confidentiality in line with emerging public health access needs**

Highest protection of patient health information to ensure privacy and integrity. However, the protection of patient information has to be balanced with the need for the health sector to manage public health for all citizens, such as notification of emerging diseases or related outbreaks.

- | | |
|--|--|
| <p>2. Cost effective, efficient, benefit-driven and resilient solutions in a limited resources environment that lead to future growth potential</p> | <p>Digital health must be concerned not just about ICT choices, but also about the relationship of ICT choices to the benefits they bring in the health sector. It is not the technology alone that will bring these benefits; rather it is the health sector business processes that are changed by leveraging ICT which provide the business value, with the right level of organizational buy-in. Therefore, the ICT investment and implementation shall be driven by the value they provide to the healthcare system and patient care.</p> |
| <p>3. Exploitation of existing structures and use of an incremental approach</p> | <p>Implementing a national eHealth strategy requires a long-term implementation plan that builds from existing solutions in an incremental and pragmatic way while focusing in strategic areas where eHealth will bring more valuable outcomes and impacts.</p> |
| <p>4. Technology development, standardization, and convergence</p> | <p>The themes underpinning developing the technology and standards that support eHealth will be the following: Focus on usability; Convergence on fewer and more reusable; cost-effective ICT systems that are extensible, scalable, and manageable; Common standards and terminology across information systems; Involvement of local partners in development and support of information systems.</p> |
| <p>5. Collaboration and consultation with stakeholders</p> | <p>The health sector involves many diverse stakeholders. Therefore, eHealth implementation requires effective collaboration and involvement of all the stakeholders.</p> |
| <p>6. Strong leadership and governance mechanism</p> | <p>Successful implementation of the National eHealth Strategy depends on a strong leadership and governance mechanism for planning, directing, and monitoring. Although at a higher level the leadership will be provided through a steering Committee, a strong leadership and governance mechanism for individual eHealth projects is needed to ensure the expected results are met.</p> |
| <p>7. Ensuring availability of local skilled HR to ensure sustainability of the digital Health solutions</p> | <p>Development of eHealth solutions is complex and time consuming and requires experienced professionals. Therefore, the development may involve international professionals with practical experience to ensure successful implementation of the National eHealth Strategy. However, to ensure sustainability, the first priority should be given to building local capacity before building more complex eHealth solutions.</p> |
| <p>8. Ensuring business continuity</p> | <p>This principle ensures that total cost of ownership is considered in deploying eHealth solutions and a clear mechanism is in place to ensure</p> |

**mechanism for
implemented
eHealth system**

that expected service levels are met with minimum interruption and no possibility for loss of health information.

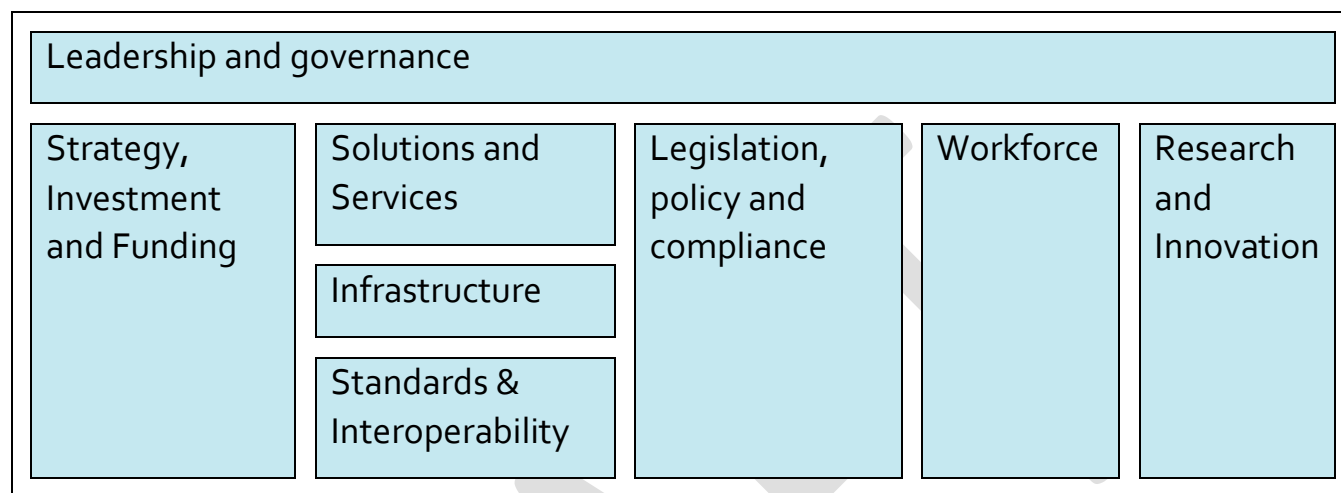
3.2. Objectives

The digital health strategy intends /aims to:

- Ensure healthy behavior through access to relevant health information, education, and communication using digital technologies.
- Improve equitable access to health services through the state-of-the-art and remotely accessible technology solutions.
- Enhance access and quality of health services through digitally enabled, client centered and community based tracking, service delivery and management of referral in the continuum of care.
- Improve availability & efficiency of health information systems that can avail high-quality data and enable health managers to plan, administer and monitor health systems effectively.
- Strengthen digital technology supported disease prevention, surveillance, detection, response, reporting, and control at all levels of the health system.
- Establish, expand and maintain a highly secure, available and compatible ICT Infrastructure that is capable of accommodating digital health initiatives.
- Improve health workforce competency and use of digital technology to enhance health service delivery
- Enhance seamless and secure information exchange across the health systems.
- Establish and implement appropriate policy and regulatory framework to ensure that data protection, privacy, access and consent is managed consistently at all levels and information can be shared appropriately.
- Enhance the leadership capacity to execute the digital health strategy initiatives that improves health system responsiveness
- Improve digital health governance for better coordination, implementation and monitoring of digital health initiatives
- Ensure a country-identified health goals and needs-driven digital health investments.
- Enhance incentivized approach to ensure strategic engagements of all relevant stakeholders in digital health initiatives.
- Enhance digital health research and innovation to improve clinical practices, decision support and program designs.
-

3.3. Digital Health Pillars /Components

The national digital health environment is made up of eight pillars or components, as adopted and customized from WHO's e-health strategy toolkit. Details about each component is described below



The above building components is grouped into Foundations and the enablers as described in the below table

Component	Roles	Description
Solutions and Services	Foundational	Provide tangible means for enabling services and solutions; access to, and exchange and management of information and content. Users include the general public, patients, providers, insurance, and others.
Infrastructure	Foundational	Form the foundations for electronic information exchange across geographical and health-sector boundaries. This includes the physical infrastructure (e.g. networks), core services and applications that underpin a national Digital Health environment.
Standards & Interoperability	Foundational	Introduce standards that enable consistent and accurate collection and exchange of health information across health systems and services.
Workforce	Enabler	Make Digital Health knowledge and skills available through internal expertise, technical cooperation or the



		private sector. Build national, regional and specialized networks for Digital Health implementation. Establish Digital Health education and training programmes for health workforce capacity building.
Legislation, policy and compliance	Enabler	• Adopt national policies and legislation in priority areas; review sectoral policies for alignment and comprehensiveness; establish regular policy reviews • Create a legal and enforcement environment to establish trust and protection for consumers and industry in eHealth practice and systems.
Leadership and governance	Enabler	• Direct and coordinate Digital Health at the national level; ensure alignment with health goals and political support; promote awareness and engage stakeholders. • Support and empower required change, implementation of recommendations and monitoring results for delivery of expected benefits.
Strategy and Investment	Enabler	• Ensure a responsive strategy and plan for the national Digital Health environment. Lead planning, with involvement of major stakeholders and sectors. • Align financing with priorities; donor, government and private sector funding identified for medium term.
Research and Innovation	Enabler	• Ensure the effectiveness and efficiency of existing digital health models and technologies, as well as to stay current and innovative with trends in the development and integration of cutting-edge technologies.

3.4. Strategic Directions

To realize the digital health vision, accomplish its mission & materialize the objectives, the following implementation strategies are identified and listed:

- *Enhance digital health solutions and services*
- *Improve health sector ICT infrastructure*
- *Enhance digital health standards & systems Interoperability*
- *Improve health workforce capacity on digital health technology*
- *Establish national digital health legislation, policy and compliance*
- *Strengthen digital health governance and leadership*
- *Establish digital health strategy, investment and funding*
- *Enhance research and innovation on digital health technology*

The above mentioned Strategic Directions (SD) are further described in the section below:

- **SD1: Enhance digital health solutions and services**

A great number of digital health solutions have been implemented, or are in the process of being implemented, across the health sector to date with limited coordination, standardization or integration. At a national level, as part of HSTP II, there is still a need to encourage the development of solutions in priority areas that will enable improved quality, safety and effectiveness of care and care decision making and solutions that can improve the efficiency of care delivery processes.

As adopted from WHO's classification of digital health intervention¹, which represents a discrete functionality of the digital technology to achieve health sector objectives and clearly stated in HSTP II, these solutions/ services are classified into four main categories based on tangible benefits to targeted user-groups as clients-oriented, health care providers-oriented, health care managers-oriented and health data services-oriented digital technologies.

This direction focuses on digital health solutions and services that provide concrete opportunities to tackle health system challenges, and thereby offer the potential to enhance the coverage and quality of health practices and services.

Digital Health Solutions for Clients

¹ <http://www.who.int/reproductivehealth/publications/mhealth/classification-digital-health-interventions/en/>



This component targets digitalization of client-provider interaction, access to health information for individuals, personal health tracking and public feedback mechanism to the health system.

Strategic Initiatives

- *SI1: Establish/Strengthen mHealth programmes/services such as Toll-free emergency, Health call centers, Appointment reminders, Treatment adherence, and Community mobilization/health promotion campaigns to enable clients access health information/ services provisioned by the health care.*

mHealth programs/services are an emerging and priority digital health program...

Major Activities/programs

- Establish a digital call center at national and regional level [with toll free, automated response and expert consultation facilities]
 - Set up/Create a messaging (text and/or voice) system supporting mHealth services and integrate them with clients' health records (such as eCHIS, eHR) at national level
 - Enhance the development and implementation of mHealth solutions that enable personal health tracking, mLearning and client financial transactions.
-
- *SI2: Strengthen Health information dissemination & feedback receiving mechanisms through Web portals, e-News, Digital Notice Board and Social Media.*
 - *Enhance the customization and use of the digital media initiatives (social media, e-News, blogs, Web Portals, etc.) that promote information exchange (dissemination and feedback) in a bid to healthy behavior at all levels.*
 - *Establish digital information board (notice board, satisfaction rating and queue management) to promote health services at national, regional and facility level*

Digital Health Solutions for Health Workers

This component targets digitalization and use of decision support systems, telemedicine, health worker-client interaction, client health records, referral coordination and health worker capacity building and laboratory & imaging management and more.

Strategic Initiatives



- *SI3: Establish/ Strengthen telehealth programmes/ services such as Teleradiology, Teledermatological, Telepathology, Telepsychiatry and Remote Patient Monitoring to assist health workers deliver remote health care services.*

This strategic initiative of telehealth programs emphasizes consultations between remote client and healthcare provider, remote monitoring of client health or diagnostic data by provider, transmission of medical data (e.g. images, notes, and videos) to healthcare providers and consultations for case management between healthcare providers.

Major Activities/programs

- Enhance and scaleup teleradiology service/program in public hospitals
 - Establish teledermatology service/program in public hospitals
 - Establish telepathology service/program in public hospitals
 - Establish telepsychiatry service/program in public hospitals
 - Establish Remote Patient Monitoring service/program at public hospitals.
- *SI4: Establish/Strengthen mHealth programmes/services such as Clinical Decision Support Systems, Electronic Patient Information/Patient Records, mLearning, Mobile telehealth, Emergency Management Systems and Access to information, resources, databases and tools) to enable health workers access health information and facilitate health care provisioning.*

Major Activities/programs

- Develop and implement mobile applications that serve as decision support systems and job aids for the health care providers.
 - Enhance the development and implementation of mobile apps for health workers that enable patient health tracking, intercommunication among providers, resources access and learning.
 -
- *SI5: Establish Electronic Health Records (EHR) to provide decision support to healthcare professionals in respect of the rendering of healthcare services to an individual patient and accommodate data exchange.*

Major Activities/programs

- Develop and implement EHR-core, a component of EHR which contains clinical information benefiting patients and clinicians.



- Integrate disparate systems (stand alone digital health solutions like eAPTs, ePrescription, eLIS, billing system, eReferral system, MFR, DHIS2, eCHIS and etc.) with EHR-core systems based on maturity and priority.
- Develop and implement EHR-Extended by extending EHR-Core to be a comprehensive EHR solution.
- Establish a shared repository function of the EHR system.
- *SI6: Enhance/ Strengthen Electronic Community Health Information System (eCHIS)*

Major Activities/programs

- Enhance the design and development of existing and new eCHIS modules based on the selected programs
- Scale up the implementation of eCHIS modules at all health posts.
- Optimize eCHIS by adding tailored features.
- Integrate eCHIS with other relevant systems (like MFR and DHIS2).
-
- *SI7: Establish eLearning systems for the health workforce on Continuing Professionals Development (CPD) programme for pre-service and in-service training and education.*

Major Activities/programs

- Conduct a landscape analysis of different eLearning and Knowledge Management platforms and develop/customize for different programs.
- Implement eLearning and knowledge management systems using online and tele education methods for continuous professional development programmes
- *SI8: Establish electronic Laboratory Information System (eLIS)*

Major Activities/programs

- Develop/customize *Laboratory Information System (eLIS)*.
- Implement eLIS at all public health facilities, Regional Labs and health institutions where applicable.
- Optimize features of eLIS
- Integrate eLIS with other relevant systems (like EHR and MFR).
- *SI9: Establish Electronic Auditable Pharmaceutical Transaction System (eAPTS)*

Major Activities/programs

- Enhance the design and development eAPTS system
- Implement eAPTS at all public hospitals and health centers.
- Optimize features of eAPTS



- Integrate eAPTS with other relevant systems(like eLMIS, EHR, eMPL and MFR).
- *SI10:Establish ePrescription System*

Major Activities/programs

- Develop ePrescription system
- Implement ePrescription at all pharmaceutical wings of public hospitals and health centers.
- Optimize features of ePrescription
- Integrate ePrescription system with other relevant systems(like eAPTS, EHR and MFR).
- *SI11:Enhance/ Strengthen Electronic Referral Information System (eRefIS)*

Major Activities/programs

- Strengthen the design and the development of *eRefIS*.
- Implement *Electronic Referral Management System* at all public hospitals and health centers.
- Optimize features of *Electronic Referral Management System*
- Integrate *Electronic Referral Management System* with other relevant systems(like MPI, EHR and MFR).
-

Digital Health Solutions for health system Managers

This component targets digitalization and use of human resource management, supply chain management, public health event notification, health financing, facility management, equipment and asset management and more.

Strategic Initiatives

- *SI12:Strengthen an electronic Health Management Information System (eHMIS) to plan, monitor and support evidence based healthcare and decision making.*

Major Activities/programs

- Enhance/Upgrade DHIS2 and optimize its features (such as inclusion of Ethiopian Calendar in the Global DHIS2 Core, inclusion of android version, enhancement of data quality and data analysis features, etc.)
- Integrate DHIS2 with other systems (like MFR, eCHIS, multi-sectoral nutrition, ePHEM and others).
- Develop and implement a platform for Multi-sectoral Woreda Transformation data entry and performance management.
- Develop and implement planning and project management system



- Explore, accommodate and implement the need for further enhancement or change on the existing eHMIS platform.

- *Sl13: Enhance Electronic Logistics Management Information Systems (eLMIS)*

Major Activities/programs

- Strengthen Electronic Logistic Management Information systems(eLMIS)
- Develop and implement Electronic Medical Equipment Management System (eMEMS)
- Integrate eLMIS and eMEMS with other systems(like DHIS2 and MFR)
-

- *Sl14: Enhance electronic Human Resource Information System (eHRIS) for HRH administration, development and health professional licensing.*

Major Activities/programs

- Develop/customize an integrated human resource information system handling HR administration, development and health professional licensing.
- Implement integrated human resource information system(iHRIS) at all public health institutions (MoH, RHBs, ZHDs, Woreda Health Offices, hospitals, health centers, health science colleges, training institutions and agencies)
- Customize and implement a National Health Works Account (NHWA).
- Integrate iHRIS with *other systems(like DHIS2, NHWA, EHR, eCHIS ,MFR).*

- *Sl15: Enhance electronic Regulatory Information Systems (eRegIS)*

Major Activities/programs

- Establish/Enhance a regulatory information system to regulate importing, registration and licensing [source: EFDA, i-Import, i-Regisr, i-License]
-

- *Sl16: Enhance electronic financial management system to ensure effective collection, allocation and use of health financial resources at all levels in accordance with health plan priorities.*

Major Activities/programs

- Develop/Customize electronic financial management system(eFMS) supporting collection, allocation and administration of health financial resources.
- Develop and implement electronic Health Insurance Management System (eHIMS)
- *Establish Electronic Reimbursement and Procurement Management System*
- *Integrate eFMS with IFMIS and other systems for budgeting and financing*



- *SI17: Develop/Enhance the electronic Health Insurance Management System (eHIMS)*
 - Develop and implement electronic Health Insurance Management System (eHIMS)
- *SI18: Establish Electronic Public Health Emergency Monitoring System (ePHEMS) to enable disease prevention, surveillance, detection, response, reporting, and control.*

Major Activities/programs

- Develop and implement an eSurveillance system for PHEM supporting both aggregate and case based surveillance.
 - Develop and implement Early Warning System (EWS) that collects information on epidemic-prone diseases in order to trigger prompt public health interventions.
 - Integrate the eSurveillance and EWS with other systems (like MFR, eHMIS-DHIS2)
- *SI19: Establish Electronic Emergency Medical Service(eEMS) Management System to administer medical emergency responses.*

Major Activities/programs

- Develop/customize Ambulance Dispatching System(ADS)
 - Establish Emergency call center
 - implement eEMS
 - integrate eEMS with eRefIS, EHR, MFR.
- *SI20: Establish an Enterprise Resource Planning(ERP) system that can integrate major processes into single system*
This initiative targets the customization of promoting paper free service provisioning environment & enhance helpdesk system to handle operational support for clients service requests; promote paper free service provisioning environment & enhance helpdesk system to handle operational support for clients service requests.

Major Activities/programs

- Customize and Implement Fleet management system,
- Customize and Implement Project Management System
- Customize and Implement eAdministration system (like Document Management System)
- Customize and Implement eService system(both for internal and external)
- Customize and Implement eSurvey system
- Customize and Implement Help Desk system

- Customize and Implement planning system

Digital Health Solutions for data services

- *SI21: Establish/Enhance comprehensive health facility, provider, client, clinical coding and other registries with complete and current information that meets stakeholders needs.*

Major Activities/programs

- Enhance the development and implementation of Mater Facility Registry(MFR) at WHO, ZHD, RHB and MoH
- Enhance the development and implementation of National Health Data Dictionary (NHDD)
- Develop and implement Master Patient Index (MPI) at national level
- Enhance the development and implementation Master Provider List (MPL) at national level
- Enhance the development and implementation Master Drug List (MDL) at national level
- Develop and implement GIS repository for location mapping
- Develop and implement Shared Health Record(SHR) at national level
- *SI22: Establish a data warehouse to foster and support research, analytics and more highly informed decision making by health system managers and other stakeholders on health sector resources.*

Major Activities/programs

- Develop and implement data warehouse at national levels in alignment with the national digital health platform
- Integrate Data Warehouse with other digital health solutions as required.

● SD2: Improve health sector ICT infrastructure

According to Digital health platform handbook² ICT infrastructure comprises an integrated set of common and reusable components in support of a diverse set of digital health applications and systems. Lots of efforts have been exerted to build ICT infrastructure (rehabilitating datacenter, building disaster recovery site and installing local area networks within the facilities and VPN that interconnects facilities & to the ministry datacenter) that can run implemented solutions in the sector. However, from time to time the demand in digital health technology is increasing and digital health solutions range from wearable health monitors or fitness trackers to embedded sensors in furniture, buildings, and household objects, such as scales, appliances, and medication dispensers. Furthermore, due to the Internet of things (IOT) technology it is must to face issues like 'big data', AI and big data analytics that

² Digital Health Platform Handbook: Building a Digital Information Infrastructure (Infostructure) for Health: <https://ehna.acfee.org/c67802a7d4b3dc8914700842bf6776402b8d343c.pdf>

demands the enhancement of ICT infrastructure in favor of supporting the booming digital health activities.

This strategic direction emphasizes on establishing, maintaining and strengthening secure local ICT infrastructure and looking for appropriate cloud hosting options that run digital solutions and services.

- *Sl23: Strengthen digital health ecosystem security of devices, systems, data, users and communication mediums from physical and remote threats by implementing cyber security measures and information security mechanisms.*

Major Activities/programs

- Implement cyber security measures to protect networks, computers, systems and data from unauthorized electronic access (internal and external threat)
- Implement information security mechanisms to ensure confidentiality, availability and integrity of data and systems.
- *Establish physical and logical security enforcement mechanisms.*
-
- *Sl24. Strengthen the deployment and expansion of ICT computing infrastructure to serve the digital health activities being implemented.*

Major Activities/programs

- Deploy computing infrastructure such as computers, tablets, servers, network hardware, power backups etc. as appropriate at all levels of the health structure
- Install, configure and avail computing infrastructure.
- *Sl25. Enhance the availability, cooling,, scalability, security, capacity and space etc. of new and existing data centers and implement appropriate hosting mechanisms to support digital health activities.*
 - Establish robust data centers and disaster recovery sites at different locations to deploy/host the digital health technologies.
 - Explore potential hosting options (local/cloud) and implement the appropriate ones.
 - Improve availability, cooling, scalability, security, capacity and space etc. of data centers and disaster recovery sites.
- *Sl26. Enhance the network connectivity (LAN & WAN) within the health sector by strengthening its coverage and capacity to improve the availability, communication and information sharing at all levels of the health system.*

Major Activities/programs

- Establish local area network within the health institutions (facilities, administration offices and agencies)

- Expand the VPN (HealthNet) to all health facilities , administration offices and agencies.
- Improve/upgrade VPN connectivity and/or Internet connectivity of facilities and administrations offices.
- *SI27. Improve Operational Support and Maintenance of ICT Infrastructure and digital health solutions.*

Major Activities/programs

- Establish a digital help desk system equipped with technical manpower, logistics and tools at National, Regional, Zonal and Woreda levels.
- Provide maintenance and support services on digital health solutions, hardware and Network infrastructure through an established helpdesk system at all implementation levels.

● **SD3: Enhance digital health standards & systems Interoperability**

According to National Center for Biotechnology Information (NCBI)³, the term data standards in the context of health care encompasses methods, protocols, terminologies, and specifications for the collection, exchange, storage, and retrieval of information associated with health care applications, including medical records, medications, radiological images, payment and reimbursement, medical devices and monitoring systems, and administrative processes. Standardizing health care data involves: definition of data elements, data interchange formats, terminologies and knowledge representation.

MOH is undergoing the natural growing pains as it relates to implementing data exchange standardization practices. On the one hand, the MOH is attempting to formalize its governance processes in selecting, customizing, and/or developing various terminology and messaging standards. This requires broad organizational buy-in, institutional subject matter expertise, and leadership commitment to enforce standards adoption. On the other hand, there is growing momentum today around the implementation and use of various IT applications throughout the country, such as eCHIS, DHIS2, and EMRs. Without guidance, these many systems will collect, store, and transmit information in idiosyncratic ways as they are developed, creating longer term interoperability challenges. Some of these application developers are currently (or will soon be) seeking guidance about how to design and adopt standards within their systems.

In light of this and in a bid of realizing the bigger architecture with interoperable systems, MoH will take incremental steps towards ecosystem wide implementation of messaging and terminology standards – to come up with mature, stable and interoperable health information systems. Ethiopia's NHDD will be expected to consist of a comprehensive list of locally developed terminology sets for all priority health domains, mapped to international reference terminologies – such as ICD, LOINC, SNOMED, CEIL and others. Depending upon global experiences and other domestically adopted parameters, few messaging standards (like HL7, FHIR, etc.) or combination of them will be used for

³ Patient Safety: Achieving a New Standard for Care:
<https://www.ncbi.nlm.nih.gov/books/NBK216088/>

systems interoperability. The likes of Master Facility Registry (MFR) will serve as the single source of truth for facility, and so for data exchange among systems.

- *Sl28: Establish digital health standards for data, application, security and technology for information exchange and protection..*

Major Activities/ Programmes

- Establish syntactic and terminology data standards for health data exchange.
 - Establish standards and guidelines for digital health solutions & services (such as EHR, eCHIS, eHMIS,..) that can guide the minimum requirements needed to be fulfilled.
 - Establish security standards and guidelines for data access, storage, processing, information exchange, and sharing.
 - Implement interoperability solutions for data exchange among digital health applications and other external applications
- *Sl29: Develop and Implement interoperability solutions for data exchange among digital health solutions and other external systems*
 - Develop interoperability requirement documents for the different interoperable systems
 - Strengthen interoperability across different systems within health and other sectors using/implementing suitable information exchange tools (implementing Digital Health Platform).
 - Develop and Implement interoperability solutions for Prioritized applications
 - *Sl30: Enhance Enterprise Health Architecture (EHA) for data exchange among new and existing health solutions*

Major Activities/ Programmes

- Enhance the enterprise Health Architecture (EHA) like defining standards , identifying components, mapping, governance, etc.. and institutionalize it for use in all digital health initiatives.
- Enhance the content and use of the Digital Health Atlas (DHA).
- **SD4: Improve health workforce capacity on digital health technology**

Digital health capacity or skills are very crucial for the successful implementations of digital health solutions. Similarly, shortage or absence of digitally skilled workforce affects the digital health solutions, services, infrastructure and governance & leadership. According to ITU Digital Health platform Handbook ⁴ digital health human capital development (Workforce capacity building) will

⁴ Digital Health Platform Handbook: Building a Digital Information Infrastructure (Infostructure) for Health: <https://ehna.acfee.org/c67802a7d4b3dc8914700842bf6776402b8d343c.pdf>



address the existing workforce, which will use new tools and approaches, while cultivating new squads of information health workers. As a result, the workforce provides the information needed for evidence-based reporting, planning and action at all levels.

As the health workforce capacity building investment is a driver of economic growth and efficient use of digital health, investments in digital health and workforce capacity building need to be constructed effectively to achieve economic growth and building a healthy society.

Hence improve health workforce capacity on digital health technology aims to execute the following initiatives:

- *SI31: Strengthen the ICT health education and training programmes at post-secondary educational institutions such as Universities, vocational training institutions and professional bodies by embedding digital health into their curricula and increase the number of skilled, nationally available digital health practitioners.*

Major Activities/programs

- Explore the education and training curricula of post-secondary educational institutions
 - Prepare and endorse the digital health technology contents and perspectives to the curricula
 - Establish eLearning and knowledge management platforms for continuous professional development.
- *SI32: Enhance the ICT Knowledge of health workforce*

Major Activities/programs

- Assess the ICT knowledge and skill gaps of health workforce
 - Design/develop Training based on the assessment
 - Provide training for all health workforce using suitable platform
- *SI33: Enhance the ICT workforce capacity development of the health sector.*

Major Activities/programs



- Explore the existing ICT health workforce allocation and propose the required skilled professionals and structure supporting the digital health initiatives
- Assess the knowledge and skill gaps of ICT workforce
- Design/develop Training based on the assessment
- Provide training for all ICT workforce using suitable platform

○ **SD5: Establish national digital health legislation, policy and compliance**

To maintain and strengthen trust between consumers and the health system, digital health must support and improve the safe, effective, efficient, equitable and timely delivery of care. Hence a national approach for the establishment of appropriate policy and regulatory framework is required to ensure that data protection, privacy, access and consent is managed consistently at all levels and information can be shared appropriately across the health sector and beyond. There is also a need to establish a national compliance function that allows vendors and care providers to ensure that digital health solutions that are developed or purchased are compliant with national digital health standards and can be integrated and scaled up across the health sector.

At a national level, the legal directorate of MoH has prepared a draft legal document that also incorporated code of conduct on record retention, confidentiality, privacy, sharing and security of clients' personal data during service provisioning. A national health policy is also in place although it has not included digital health policy issues. There is also a draft level yet un approved ICT policy prepared by HITD directorate.

This strategic objective aims to:

- *SI34: Establish a consistent national legislative framework on client's data security (like data protection, privacy, confidentiality, access rights, sharing rights for data, informed consent for data use and secure transmission of client data).*

Major Activities/programs

- Review and enrich the existing national health services proclamation document with due emphasis on clients' data security.
- Implement and abide to clients' data security measures as per the health service proclamation document.
-
- *SI35: Establish a national digital health policy by adopting local and international experiences.*

Major Activities/programs



- *Incorporate the digital health components into the national health policy or develop a separate digital health policy, guideline, and SOPs.*
- *Implement and abide by the digital health policy measures.*
- *SI36: Establish and execute compliance mechanisms and functions for digital health technologies.*

Major Activities/programs

- *Establish a national compliance framework to test and certify that digital health technology comply with national digital health standards, rules and protocols.*
- *Conduct a continuous assessment and certify the digital health technologies for their compliance to the standards set in the health sector.*

○ **SD6: Strengthen digital health governance and leadership**

Strong and enduring leadership and governance is crucial for coordination, improved visibility, control and engagement of stakeholders, aligns digital health investments with national health priorities, provides guidance, and enforces compliance with digital health guidelines and standards.

Reviewing and strengthening functioning digital government structure to oversee the overall digital health initiatives and working on capacity building for leadership is useful for tracking, accountability and steering of the strategy to ensure the health sector meets the expected outcomes.

Hence this strategic direction aims to address:

- *SI37: Ensure the effective leadership, coordination, execution and oversight of the national digital health initiative through the establishment of appropriate national digital health governance structures and mechanisms.*

Major Activities/programs

- *Establish a national digital health governance structure to direct, implement, enforce, monitor, and evaluate the governance functions such as strategy, execution, investment, standards development, solutions compliance and regulation.*
- *Establish a governance mechanism such as regulatory, managerial and technical working groups at different levels with membership of multiple stakeholders (like Steering committees, NAGs, CTTs, TWGs, etc).*



- *Define, direct, execute, enforce, monitor and evaluate the digital health ecosystem through the established governance structure and function, steering committees, regulatory body, advisory groups, managerial and technical working groups.*
- *Enhance leadership capacity to execute the digital health strategy initiatives.*

○ **SD7: Establish digital health strategy, investment and Funding**

The goal of strategic investment and funding is to move from the traditional funder-driven relationship that is characterized by fragmented pilots and siloed, program-specific information-technology systems – toward a future shaped by investments in health strategies led and managed at the country level, in which MOH and its local partners can operate, expand, and sustain independently over time. This strategic shift in approach signals the call for a self-reliant and a digitally enabled country.

The health strategic investment and funding assumes that digital health interventions should be: framed by country-identified health goals and needs; integrated as appropriate relative to the use environment; aligned with the principles of Primary Health Care (comprehensive preventive, promotive, curative, rehabilitative services and palliative care); and, designed to strengthen health institutions by overcoming persistent bottlenecks to health information and the delivery of care that, in turn, can support improved measurable health outcomes [1].

Adopting globally accepted directions, MOH will align its investments in the areas of: country level digital health capacity development (including leadership and governance); national digital-health strategies and costed implementation roadmaps; national digital-health architectures and systems interoperability; and, global goods – that include content and software tools (which frequently are open-source, context sensitive, promoting cost-savings and sustainability).

MOH's investors and strategic partners are expected to invest in the following key areas, among others:

- The creation and evolution of MOH's national digital-health strategy, policies, and regulatory framework. Strategies include components, such as architecture, standards, investment frameworks, and privacy protection, and detailed operational and monitoring plans.
- Systems at a level appropriate to a country's progress along the digital-health maturity continuum.
- Sustainable country capacity for digital-health leadership, governance, implementation, oversight, global good adoption, and resource pooling/coordination.
- Scalable, sustainable, accessible, interoperable, and evidence-based digital-health global goods that meet national priorities.



- Diverse stakeholder information-sharing and peer-learning networks at the country and regional levels to foster the coordination and alignment of implementation activities.
- Align financing with priorities; donor, government and private sector funding identified for medium term.

Any digital health investment will be carried out in compliance to the broader legal framework for investment that is put in the User Guide for Investment in Health Sector (Ethiopia's MOH, 2019) – that include - legal and juridical system and institutional framework. Necessary prioritizations of the areas of investment will be seen based on the changing requirements, the availability and focus of investors, and new evidence generated in the area.

[1] USAID (2019): Accelerating the Journey to Self-Reliance through Strategic Investments in Digital Technologies: A Digital-Health Vision for Action

SI38: Ensure a responsive strategy and plan for the national digital health environment with involvement of major stakeholders and sectors.

Major Activities/programs

- Create a diverse stakeholder information-sharing and peer-learning network/platform at national and regional levels to foster coordination and alignment of implementation activities.
- Build capacities of a range of stakeholders to take informed decisions to support digital health investments.
- Involve strategic stakeholders in the planning, implementation and performance review of digital health initiatives, including private sectors.
- Coordinate and align resources to create synergy, save costs and avoid duplication of efforts.
- Establish and promote stakeholder accountability to justify the financial investment on digital health.
- Select and engage digital health champions to help take advantage of and promote digital health initiatives.

SI39: Stimulate and align investments with national digital health strategies and priorities.

Major Activities/programs

- Conduct digital health maturity assessment to guide and prioritize national investment in digital health.
- Create and update the digital health investment strategies, policies and regulatory frameworks based on evidence in identifying and implementing scalable, sustainable, accessible, interoperable, and evidence-based digital health global goods that meet country priorities.
- Track investments, progress, learnings and successes in digital health systems in a transparent manner.
- Conduct a return-on-investment and value realization analyses to generate evidence on digital health.
- Design & implement an incentive mechanism to catalyse appropriate digital health initiatives uptake at all levels.

SI4o: Ensure funding for operating, maintaining, and supporting digital health initiatives for sustainable country ownership.

Major Activities/programs

- Assess/Review the available digital health funds and identify the gaps/pain points to devise improved funding.
- Advocate for and ensure the inclusion of digital health within the health institutions' budget (like MOH's directorates, agencies, regions, ...) .
- Mobilize and secure funding for digital health foundational activities and align stakeholders' digital health investments with the strategy.

○ **SD8: Enhance research and innovation on digital health technology**

On top of and beyond the routine monitoring and evaluation of the digital health endeavors, this strategic objective aims to build the evidence base demonstrating the effectiveness and efficiency of existing digital health models and technologies, as well as to stay current and innovative with trends in the development and integration of cutting-edge technologies. Digital health interventions should be supported by suitable research in all aspects, from conception to development and deployment of new models, services and products. Likewise, this objective includes the need to monitor and report global developments and trends in digital technologies used in health systems, public health and data science. This should include analyzing their implications for the achievement of the health-related sustainable development goals.

Among other benefits, MOH and its partners will benefit from well-designed research and innovations that could promote the ethical and appropriate use of digital technologies, to bridge the Digital Divide

and ensure no one is left behind. The tailored researches are expected to promote ways to protect people against the misuse of information, cyber-attacks, fraud, extortion, fake news, racism and other human-rights violations. They will also stimulate the adoption of health technology assessment methods that support and encourage effective innovation.

The overarching digital health research priorities for Ethiopia include implementation model effectiveness studies; feasibility studies; return-on-investment studies; equity and rights analyses; Big Data Analyses; Predictive Models; Data Access versus confidentiality wrestlings; Artificial Intelligence; Business Analytics; Internet of Things, etc.

SI4.1: Foster digital health researches to guide and support decision-making, policy, and practice.

Major Activities/programs

- Conduct operational and implementation research on digital health to improve health service delivery and outcomes.
- Conduct gap analysis studies and propose inclusive and equitable digital health capacity building training for the health workforce to narrow down the impact of Digital Divide.
- Collaborate with research and training institutions for information-sharing, peer-learning and improvement of digital health technologies.
- Create platforms and panels to facilitate the translation of research evidence and information into policy and practice.

SI4.2: Enhance the adoption of emerging digital technologies and establish innovation centers to promote digital health innovations in the health sector.

Major Activities/programs

- Assess and adopt new and innovative cutting-edge digital health technologies (like AI, block chain, Big Data, wearables, Internet of Things, etc.) for use in the health sector.
- Establish academies for training, research and innovation (such as DHIS2 academy, EMR Academy, OpenHIE Academy, etc.).
- Establish/Enhance the national and regional Digital Health Innovation Centers.
- Establish and mobilize a dedicated taskforce for digital health innovation.

3.5. Targets

In line with the digital health initiatives, which are categorically listed under eight strategic directions, the following targets are identified below.

- **Enhance Digital Health solutions and services**

- Digital call centers established and functional in all regions and at national level
- Functional messaging system available at national level and the messaging systems is integrated with at least two national digital systems.
- At least five mHealth programs implemented for clients services at all levels
- Multiple digital media initiatives customized and implemented at all applicable levels
- Implemented digital information boards appropriate for different health institutions
- All prominent telehealth programs (teleradiology, telepsychiatry, teledermatology and telepathology) implemented in all public hospitals and at least 40% of public facilities(Hospitals, HC and HP) uses Remote Patient Monitoring (RPM) service
- At least six mHealth programs implemented for all health workers in health facilities
- EHR implemented in 100% hospitals and 80% of health centers that have electricity coverage and at Least eight digital health systems integrated with EHR-core
- All eCHIS targeted modules developed & implemented in 100% of health posts and at-least two digital systems integrated with eCHIS
- Implemented eLearning and knowledge management platforms at national level for all CPD program
- eLIS implemented in 100% hospitals, Regional Labs and health institutions, and 80% health centers that have electricity coverage and at Least two digital systems integrated with eLIS
- eAPTS implemented in 100% hospitals and 90% health centers that have electricity coverage and at-least four digital systems integrated with eAPTS
- ePrescription system implemented in 100% public hospitals & pharmacies and 90% health centers pharmacies that have electricity coverage and at-least three digital systems and integrated with ePrescription
- eRefIS system implemented in 100% public hospitals and 90% health centers that have electricity coverage and at-least three digital systems integrated with eRefIS
- At least Ethiopian Calendar (in the DHIS2 Core), Multisectoral Nutrition dataset, Woreda Transformation Dashboard, WHO Data Quality App, Scorecard, Action Tracker are incorporated in DHIS2 and at-least four digital health systems integrated with DHIS2
- eLMIS implemented in 90% public health facilities and 100% health administrative units and institutions and at-least two digital systems integrated with eLMIS
- iHRIS implemented in 90% public health facilities and 100% health administrative units and institutions, at-least five digital systems integrated with iHRIS and iHRIS is able to provide indicators needed for NHWA implementation at a national level
- eRegIS implemented at MOH, EFDA and administration hubs/ offices of EFDA in all regions, zones and woredas

- eFMS and ePMS implemented at MOH and all regions, zones and woredas health administrative offices and eFMS integrated with at least IFMIS
- ePMS implemented at MOH and all regions, zones and woredas health administrative offices and ePMS integrated with at least IFMIS and eFMS
- eHIMS implemented in 90% public health facilities and 100% health administrative units
- ePHEMS implemented in 90% public health facilities and 100% health administrative units and institutions
- All vulnerable woredas (epidemic, food insecurity, drought, etc.) implemented EWS and EWS integrated with at least PHEM, eHMIS and MFR
- eEMS implemented at national level and in all regions, at-least one emergency call center established per region and eEMS integrated with at least eRefIS, EHR, MFR
- 90 % of National and Regional health administration offices and institutions implement ERP
- MFR implemented in all regions, zones and woredas.
- All health facilities and admin units use their respective NHDD domains
- MPI implemented in All health facilities
- MPL implemented at national, regional and facility levels - and made accessible to the public.
- MDL used by all health facilities, health admin units, agencies, suppliers and vendors
- GIS Repository fully implemented at national level
- SHR implemented and made accessible to all relevant information systems
- The national data warehouse implemented with incorporation of all priority health domains and integrated data warehouse with the likes of eCHIS, MFR DHIS2, LMIS, and population-based systems
- Improve health sector ICT infrastructure
 - 99.9% of Health systems and infrastructure are secured from cyber attack and 99% of security breaches are controlled
 - All health facilities and health administration offices fulfilled with all necessary ICT equipments/ computing infrastructures
 - Data centers and disaster recovery sites established at national level and in all regions.
 - Power backup established to all data centers and disasters recovery sites
 - At least one identified potential cloud hosting option
 - All Services and systems available (up and running) 99.99% of the time
 - All public health institutions implemented LAN
 - All public health institutions interconnected with VPN (HealthNet) and accessed internet services
 - Established help desk at national, all regions, and all zones/woredas and active support provided to the respective sites by all established digital helpdesks
- **Enhance digital health standards & systems Interoperability**



- Terminology standards prepared for 10 digital health domains (HMIS indicators, NCOD, HMIS data elements, Registers, tallies, health cards; Drugs and immunization list, CHIS folders and cards, procedures and Lab tests, Billing codes)
- 90% of digital health applications established messaging standards
- All available digital health applications established minimum standards/ guidelines for their implementation
- At Least 10 inter system interoperability is established (MFR with six priority applications; eCHIS-eHMIS/DHIS2, iHRIS- eHMIS/ DHIS2, EMR-; DHIS2/LMIS eHMIS/DHIS2, LMIS-eHMIS/DHIS2)
- 100 % Updated and institutionalized EHA
- 100% Digital Health applications updated in Digital Health Atlas
- **Improve health workforce capacity on digital health technology**
 - All curricula updated for training and education programs of post-secondary education in digital health and all programs have endorsed digital health contents/ documents based on the curricula
 - 3 (baseline, mid-term and end-line) assessments done on ICT competency for health workforce and developed training programs/courses based on identified gaps
 - 90% of identified workforce trained
 - Proposed ICT health workforce structure for all health offices and health facilities
 - 3 (baseline, mid-term and end-line) assessments done on ICT competency for ICT workforce and developed training programs/courses based on identified gaps
 - All of the identified ICT workforce trained
- **Establish national digital health legislation, policy and compliance**
 - Emphasis give/ inclusion of/ to the clients' data security aspects in the National Health Service Proclamation
 - All health facilities and health office implemented clients' data security measures within health service proclamation document
 - Developed national digital health Policy, separately or as part of national health policy
 - All health facilities and health office implemented digital health policy
 - Established national compliance framework for the digital health strategy in light of the National Digital Strategy
 - At least one assessment conducted every two years at national and regional levels
- **Strengthen digital health governance and leadership**
 - Established governance structure at all levels
 - Established governance mechanisms like Steering Committee, NAG, Digitization TWG, CTT
 - All concerned leaders trained on digital health governance and leadership

- 100% effective governance structure at level
- **Establish digital health strategy, investment and funding**
 - Two national multi-sectoral digital health information-sharing and peer-learning forums per year
 - All regions organized at least one multi-sectoral digital health information-sharing and peer-learning forum every year
 - At least one capacity building forum organized per year
 - All strategic partners participated in annual planning, mid-term review and annual reviews
 - Established up-to-date stakeholders investment mapping
 - Financial monitoring mechanisms established and used
 - Avoiled digital health champions at national and regional levels using appropriate selection criteria
 - Digital health maturity assessment conducted at least one per annum
 - Established digital health investment strategies, policies and regulatory frameworks at national level
 - Established investment tracking mechanisms/tools
 - Return-on-investment analysis for all digital health initiatives is conducted
 - Established incentive mechanisms for digital health at all levels
 - Digital health funding assessment conducted at least one per annum
 - Digital health initiatives' budget is ensured at each health institution
- **Enhance research and innovation on digital health technology**
 - At least three Conducted and implemented researches in top priority areas
 - Research output discussion forums established
 - At least 1 gap analysis study conducted for all health institutions each year
 - 90 % of the existing training & research institutions are collaborated
 - At least one innovative digital health technology is adopted per annum
 - At least ten established academies
 - Established innovation centers in all regions
 - Established dedicated task forces at each innovation center

4.0. IMPLEMENTATION ARRANGEMENTS

The implementation arrangement of the digital health strategy aims to come up with different arrangements/platforms and governance mechanisms that facilitate and are used as a drive to attain

the digital health goals. The following major implementation arrangements have been identified in this regard.

4.1. Digital Health Delivery Mechanisms/Platforms

4.1.1 Connected Woreda Strategy

The connected woreda is found to be one of the mechanisms to get the digital health strategy implemented. It is about connecting woreda-level health institutions and people with better information in order to improve health system performance and ultimately outcomes. It is the program/platform to realize digital health implementation and sustainability at the woreda level, involving patients, health workers, administrators, and decision makers. This could interlink communities and health posts, to clinics and hospitals, to administrative offices at all levels, all the way up to the Ministry and its directorates. The platform ensures the availability of ICT infrastructures including computer networks, within and among the health facilities and health offices for sharing of data and information use at all levels. The platform also mandates the availability of the necessary ICT workforce along with the desired skills, and methods for monitoring and evaluation among others. The availability of these conducive environments facilitates the implementation of the digital health strategy.

4.1.2 Capacity Building and Mentorship program

The presence of established capacity building and mentorship programs (CBMP), a partnership with six universities (Addis Ababa University, Haramaya University, Hawassa University, Jimma University, Mekelle University, and University of Gondar), creates favorable conditions for the implementation of digitization health initiatives. The enhancement of existing partnership and further creation of partnership with other relevant universities is needed to ensure proper implementation of digital health initiatives. The program in its specifics accelerates the digitization process by creating awareness, promoting digital health research, and building the capacity of the health workforce on digital health. As part of the CBMP, these universities can play a vital role in training, implementation, monitoring of the digital health strategy.

4.1.3 Digital Health Incubation Centers

MOH has established a national digital health innovation and learning center at St. Peter's Comprehensive Hospital to create collaborative problem solving, innovation and customization, experiment/testing, learning/academy space, and think-tank arena related to different digital health systems. The Center is working towards leading the realization of innovation in data-driven healthcare by building and implementing interoperable health information systems that are owned and led by the government. It also is aspired to serve as a national Digital Health Help-Desk hub with call center facilities. On top of ensuring full functionality of the established Center, similar knowledge incubation and problem solving centers will be established at national and regional levels to promote replication of global goods and to come up with a context-sensitive digital health solutions for the health sector.

Close collaboration with universities, strategic partners and research centers will be a pivotal part of the effort to fully utilize this platform.

4.1.4 National and Regional Help Desks

The vast number of digital health initiatives which are already implemented, under implementation and to-be-implemented need a structured way of support and follow up. One way of materializing this need is through the establishment of help desks at national and sub national (Regional, Zonal & Woreda) levels. The Help-Desks will have skilled manpower (technical personnel), platform (call centers and issue tracking systems) and logistics (materials/ tools and toolkits) so as to effectively support the implementation of digital health initiatives. The establishment and functionality of help desk at national and sub-national level will be a real opportunity for communication among stakeholders, execution, monitoring, mentorship and ensuring sustainability of the implemented digital health initiatives.

4.1.5 Multisectoral Collaboration

It is clearly understandable that a multi-sectoral approach to every effort and national plans for development, including health is necessary. While the implementation of the envisaged digital health initiative calls for the multi-level engagement of government institutions from national level all the way to health service delivery sites, it also essentially includes multi-sectoral collaboration with other community groups, strategic partners, funding agencies and individuals to bring the required health outcomes. In light of this, this strategy promotes close collaboration with stakeholders like MiNT (example, to adopt the national ICT related policy, standards, frameworks and guidelines), Immigration, Nationality and Vital Events Agency (INVEA) (for example, to get information on Vital Statistics and national ID), CSA (example, to get first-hand population-based survey data), ethio telecom (for strengthening of healthNet connectivity), INSA (for co-engagement in cyber security related activities) and the like.

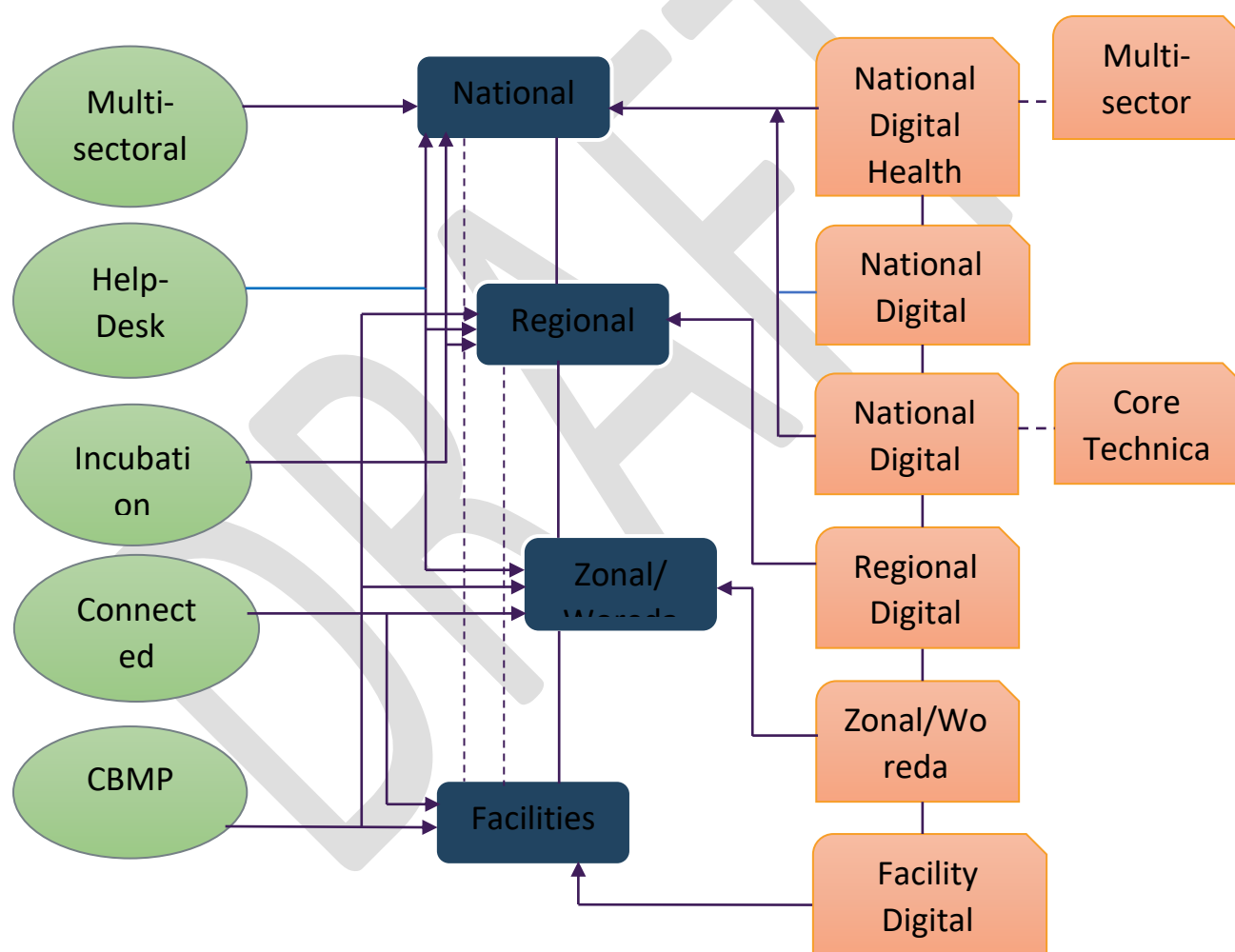
4.1.6 Private Sector Engagement

There is an immense potential in the private sector to strengthen digital health. However, there has been a lack of proactive, deliberate and well-planned engagement of the sector in crucial digital health initiatives. In this strategic plan period, the health sector will commit to enhance the private-public partnership (PPP), particularly in digital health infrastructure (example, Health-Net functionality, LAN installations and the like) and services/products (example, software solutions that are customized for the context). That has got two major advantages, at least: First, it will significantly mitigate the burden of the health sector, allowing the government sector to focus on strategic leadership and coordination, and at the same time ensure a better service delivery at each level. The other is, it will attract as many young health information technologists as required to the health sector - that again will advance digital

health professionalism and job creation. Likewise, substantial engagement of relevant private stakeholders in the planning, implementation and performance review of digital health initiatives will also be emphasized.

4.2. Organizational arrangements and governance

In order to fully implement the digital strategy at all levels, a formal channel and organization arrangements are required. In this section the anticipated organisational arrangements and governance structure to be employed during the implementation of the envisaged digital health strategy is shown in organogram below:



5.0. IMPLEMENTATION PLAN

The envisaged digital health interventions are broken down into concrete activities that would be executed within a given time frame. In this section the initiatives and the detailed activities are described along with the execution period as short term (1-3 Years), medium term(4-7 years) and long term(8-10 years).

Table 3: Implementation plan

SD1. Enhance digital health solutions and services				
SN	Initiative	Short term (1 - 3 years) 2020 - 2022	Medium-term (4 - 7 years) 2023 - 2026	Long term (8 - 10 years) 2027 - 2029
Slo 1	<i>Establish/Strengthen mHealth programmes/services such as Toll-free emergency, Health call centers, Appointment reminders, Treatment adherence, and Community mobilization/health promotion campaigns to enable clients access health information/ services provisioned by the health care.</i>	Establish digital call centers at national and regional level		
		Establish messaging systems supporting mHealth services		
		develop and implement mHealth solutions for clients		
		Integrate messaging system with clients' health records		
Slo 2	<i>Strengthen Health information dissemination & feedback receiving mechanisms through Web portals, e-News, Digital Notice Board and Social Media.</i>	Customize and Implement digital medias interventions		
		Enhance features and promote use of the digital medias		
		Establish digital information board at national, regional and facility level		
Slo 3	<i>Establish/ Strengthen telehealth programmes/ services such as Teleradiology, Teledermatological, Telepathology, Telepsychiatry and Remote Patient Monitoring to assist health workers deliver remote health care services.</i>	Implement telehealth programmes(Teleradiology, Teledermatology,Telepathology and Telepsychiatry) in :		
		25% of Public Hospitals	75% of Public Hospitals	100% of Public Hospitals
		Establish Remote Patient Monitoring service/program at applicable:		
		10% of public health facilities	30% of public health facilities	40% of public health facilities



Slo 4	Establish/Strengthen mHealth programmes/services such as Clinical Decision Support Systems, Electronic Patient Information/Patient Records, mLearning, Mobile telehealth, Emergency Management Systems and Access to information, resources, databases and tools) to enable health workers access health information and facilitate health care provisioning	Develop and implement mobile applications for the health care providers at least		
		3 mHealth programs	5 mHealth programs	6 mHealth programs
Slo 5	Establish Electronic Health Records (EHR) to provide decision support to healthcare professionals in respect of the rendering of healthcare services to an individual patient and accommodate data exchange.	Develop/customize EHR System:		
		Develop core-EHR/EMR	Develop EHR-Extended	
			Establish a shared repository function of the EHR system.	
		implement EHR in public hospitals and health centers		
		in 25% hospitals and 5% health centers	in 80% hospitals and 60% health centers	in 100% public hospitals and 80% health centers
		Upgrade existing EHR to Comprehensive EHR		
Slo 6	Enhance/ Strengthen Electronic Community Health Information System (eCHIS)	Develop all eCHIS modules for Agrarian, Urban and pastoralist settings		
		Implement eCHIS at PHCU(health posts with referrals-health centers)		
		60% PHCU	100% PHCU	
		Optimize eCHIS by adding tailored features and release new upgrade versions		
Slo 7	Establish eLearning and knowledge management systems for the health workforce on Continuing Professionals Development (CPD) programme for pre-service and in-service training and education	Conduct a landscape analysis on existing eLearning and knowledge management platforms		
		Develop/customize d eLearning and knowledge management platforms		



		Implement eLearning and knowledge management systems		
Slo 8	Establish/enhance electronic Laboratory Information System (eLIS)	Develop/customize the Laboratory Information System (eLIS).		
		Implement eLIS at all public health facilities, Regional Labs and health institutes		
		60% Hosp., 40% Health centers and all Public Health institutions Labs	100% Hosp., 80% Health centers	
		Optimize features and release versions of eLIS		
Slo 9	Establish Electronic Auditable Pharmaceutical Transaction System (eAPTS)	Develop eAPTS system		
		Implement eAPTS at all public hospitals and health centers.		
		70% Hosp., 60% Health centers	100% Hosp., 90% Health centers	
		Optimize features and release versions of eAPTS		
Slo 10	Establish ePrescription System	Develop ePrescription system		
		Implement ePrescription at all pharmaceutical wings of public hospitals, health centers, public pharmacies, and Private pharmacies		
		70% pharmaceutical wings of public hospitals and 70% health centers, and 70% public pharmacies	100% pharmaceutical wings of public hospitals and 90% health centers, and 100% public pharmacies	10% of Private pharmacies in major cities
		Optimize features and release versions of ePrescription system		



Sl1 1	Enhance/ Strengthen Electronic Referral Information System (eRefIS)	Develop eRefIS system		
		Implement Electronic Referral Management System at all public hospitals and health centers.		
		50% public hospitals and 40% health centers.	100% public hospitals and 90% health centers.	
		Optimize features and release versions of Electronic Referral Information System (eRefIS)		
Sl1 2	Strengthen an electronic Health Management Information System (eHMIS) to plan, monitor and support evidence based healthcare and decision making.	Develop additional apps and Ethiopian calendar inculcation in Global DHIS2 Master		
		Develop and implement a platform for Multi-sectoral Woreda Transformation data entry and performance management.		
		Explore, accommodate and implement the need for further enhancement or change on the existing eHMIS platform.		
		Enhance/upgrade DHIS2		
		Develop and implement planning and project management system		
Sl1 3	Enhance Electronic Logistics Management Information Systems (eLMIS)	Enhance/develop Electronic Logistic Management Information systems(eLMIS)		
		Implement the eLMIS system		
		70% public health facilities and 60% health administrative units and institutions	90% public health facilities and 100% health administrative units and institutions	



		Develop and Electronic Medical Equipment Management System (eMEMS)		
		Implement eMEMS		
		50% of public hospitals, all Health offices and EPSA	100% of public hospitals and health offices	
SI1 4	Enhance electronic Human Resource Information System (eHRIS) for HRH administration, development and health professional licensing.	Develop all iHRIS modules for HR Admin, Development and Licensing		
		Implement iHRIS in public health facilities, health administrative units, and institutions		
		in 50% public health facilities and 85% health administrative units and institutions	in 90% public health facilities and 100% health administrative units and institutions	
		Enhance/upgrade/support iHRIS by adding features		
		Enhance iHRIS to generate National Health Works Account (NHWa) reports and indicators and support the implementation of NHWA at national level		
SI1 5	Enhance electronic Regulatory Information Systems (eRegIS)	Establish/Enhance a regulatory information system to regulate health facilities service quality assurance and suppliers' licensing and supervision		
		Enhance/upgrade/support eRegIS by adding features		
SI1 6	Enhance electronic financial management system to ensure effective collection, allocation and use of health financial resources at all levels	Develop/Customize and implement electronic financial management system(eFMS) supporting collection, allocation and administration of health financial resources at national		



	<i>in accordance with health plan priorities</i>	and regional health administrative units		
		At national and regional health admin	on 100% administrative offices	
		Develop and Implement Procurement Management System at national and all health administrative units		
		At national and regional health admin	on 100% administrative offices	
Sl1 7	<i>Develop/Enhance the electronic Health Insurance Management System (eHIMS)</i>	Enhance/Develop electronic Health Insurance Management System (eHIMS)		
		Implement (eHIMS)		
		50% public health facilities and 90% health administrative units	90% public health facilities and 100% health administrative units	
Sl1 8	Establish Electronic Public Health Emergency Monitoring System (ePHEMS) to enable disease prevention, surveillance, detection, response, reporting, and control.	Develop a eSurveillance system for PHEM		
		Implement ePHEMS		
		60% public health facilities and 80% health administrative units and institutions	90% public health facilities and 100% health administrative units and institutions	
		Develop Early Warning System (EWS)		
		Implement EWS at national and regional levels		
Sl1 9	<i>Establish Electronic Emergency Medical Service (eEMS) Management System</i>	Develop/Customize Ambulance		

	<i>to administer medical emergency responses.</i>	Dispatching System (ADS)		
		Establish Emergency call center at national and regional level		
		National and 5 regions	Other remaining regions	
		Implement eEMS at National and 5 regions and 50% Ambulances	Implement eEMS at remaining regions and 100% of health facilities having Ambulance	
SI2 0	<i>Establish an Enterprise Resource Planning(ERP) system that can integrate major processes into single system</i>	Develop/customize and ERP system that integrates Fleet Management, project management, eAdministration/eS service, Help desk, eSurvey, Planning, Document management)		
		Implement the ERP system at national and regional levels at:		
		20% (National and Regional health offices)	80% (National and Regional health offices)	100% (National and Regional health offices)
SI2 1	<i>Establish/Enhance comprehensive health facility, provider, client, clinical coding and other registries with complete and current information that meets stakeholders needs.</i>	Implement MFR at all regions, zones and wordas health offices	Enhance/ Upgrade MFR by adding features and functionalities	
		Enhance (Upgrade & implement) National Health Data Dictionary (NHDD) at all health facilities and offices	Enhance/ Upgrade NHDD by adding features and functionalities	
		Develop and implement Master Patient Index (MPI) at national level	Enhance and upgrade Master Patient Index (MPI)	
		develop and implement Master	Enhance and upgrade Master Provider List (MPL)	



		Provider List (MPL) at national level	
		Develop and implement Master Drug List (MDL) at national level	Enhance and upgrade Master Drug List (MDL)
		Develop and implement GIS repository for location mapping	Enhance and upgrade GIS repository for location mapping
		Develop and implement Shared Health Record (SHR) at national level	Enhance and upgrade Shared Health Record (SHR)
SI2 2	Establish a data warehouse to foster and support research, analytics and more highly informed decision making by health system managers and other stakeholders on health sector resources.	Develop and implement data warehouse at national levels	
		for 5 priority health domains	for 10 priority health domains
			for >15 priority health domains
SI2 3	Strengthen digital health ecosystem security of devices, systems, data, users and communication mediums from physical and remote threats by implementing cyber security measures and information security mechanisms.	Design and Implement cyber security measures at national level	Implement and enforce cyber security measures at national level
		Design and Implement information security mechanisms	Implement and enforce information security mechanisms
		Establish physical and logical security enforcement mechanisms	
SI2 4	Strengthen the deployment and expansion of ICT computing infrastructure to serve the digital health activities being implemented.	Deploy computing infrastructures and power backups at all health administration and public health facilities	
		Install, configure and avail computing infrastructure	
	SD2: Improve health sector ICT infrastructure		
SI2 5	Enhance the availability, cooling, scalability, security, capacity and space etc. of new and existing data	Establish robust data centers and disaster recovery at national and RHBs	



	centers and implement appropriate hosting mechanisms to support digital health activities.	Establish backup power options to all data centers and disaster recovery sites	
		Improve availability, cooling, scalability, security, capacity and space etc. of data centers and disaster recovery sites.	
SI2 6	Enhance the network connectivity (LAN & WAN) within the health sector by strengthening its coverage and capacity to improve the availability, communication and information sharing at all levels of the health system.	Establish local area network within the health institutions (facilities, administration offices and agencies)	
		60% Hosp and HC, administration offices and agencies	90% Hosp and HC, administration offices and agencies
		100% Hosp and HC, administration offices and agencies	
		Expand the VPN (HealthNet) to all health facilities, administration offices and agencies.	
		60% Hosp and HC, administration offices and agencies	90% Hosp and HC, administration offices and agencies
		100% Hosp and HC, administration offices and agencies	
		Improve/upgrade VPN connectivity and/or Internet connectivity of facilities and administrations offices.	
SI2 7	Improve Operational Support and Maintenance of ICT Infrastructure and digital health solutions.		
SD3: Enhance digital health standards & systems Interoperability			
SI2 8	Establish digital health standards for data, application, security and technology for information exchange and protection.	Establish syntactic and terminology data standards for health data exchange.	
		10 digital health domains and 40% of digital health applications established messaging standards	90% of digital health applications established messaging standards
		Establish standards and/or guidelines for all digital health solutions & services	



		Establish security standards and guidelines for data access, storage, processing, information exchange, sharing and hosting.	
SI29	Enhance enterprise Health Architecture (eHA) for data exchange among new and existing health solutions	Enhance the enterprise Health Architecture (eHA) like defining standards, identifying components, mapping, governance, etc..	
		Institutionalize the eHA for use in all digital health initiatives.	
		Enhance the content and use of the Digital Health Atlas (DHA).	
SI32	Develop and implement interoperability solutions for data exchange among different digital health solutions	Develop interoperability requirement documents for the different interoperable systems	
		Develop and Implement interoperability solutions for	
		MFR with six priority applications; eCHIS-DHIS2; iHRIS-DHIS2; EMR-DHIS2, LMIS, NHDD; LMIS-DHIS2,...	
SD4: Improve health workforce capacity on digital health technology			
SI33	Strengthen the ICT health education and training programmes at post-secondary educational institutions such as Universities, vocational training institutions and professional bodies by embedding digital health into their curricula and increase the number of skilled, nationally available digital health practitioners.	Explore the education and training curricula of post-secondary educational institutions for all programs	
		Update existing or develop new curriculum and endorse	



SI3 4	Enhance the ICT Knowledge of health workforce	Assess the ICT knowledge and skill gaps of health workforce		
		Design/develop Training based on the assessment		
		Provide training for all identified health workforce using suitable platform		
		40% of workforce trained	70% of workforce trained	90% of workforce trained
SI3 5	Enhance the ICT workforce capacity development of the health sector	Prepare ICT Structure Document		
		Assess the knowledge and skill gaps of ICT workforce		
		Design/develop Training based on the assessment		
		Provide training for all ICT workforce using suitable platform		
		40% of ICT workforce trained	70% of ICT workforce trained	90% of ICT workforce trained
	SD5: Establish national digital health legislation, policy and compliance			
SI3 6	Establish a consistent national legislative framework on client's data security (like data protection, privacy, confidentiality, access rights, sharing rights for data, informed consent for data use and secure transmission of client data).	Review and enrich the existing national health services proclamation document with due emphasis on clients' data security.		
		Implement and abide by clients' data security measures as per the health service proclamation document in all health institutions.		
SI3 7	Establish a national digital health policy by adopting local and international experiences.	Incorporate the digital health components into the national health policy or develop a separate digital health policy		
		Implement and abide by the digital health policy measures.		
		Update the digital health policy		



SI3 8	Establish and execute compliance mechanisms and functions for digital health technologies	Establish a national compliance framework to test and certify that digital health technology comply with national digital health standards, rules and protocols.		
		Conduct targeted or scheduled assessment and certify the digital health technologies		
	SD6 : Strengthen digital health governance and leadership			
SI3 9	Ensure the effective leadership, coordination, execution and oversight of the national digital health initiative through the establishment of appropriate national digital health governance structures and mechanisms.	Ensure or establish a national digital health governance structure		
		Establish a governance mechanism such as regulatory, managerial and technical working groups		
		Provide training for leaders to improve their digital health governance and leadership skills		
		Define, direct, execute, enforce, monitor and evaluate the digital health ecosystem		
	SD7: Establish digital health strategy, investment and funding			
SI4 0	Ensure a responsive strategy and plan for the national digital health environment with involvement of major stakeholders and sectors.	Establish/ Conduct diverse stakeholder digital health platform(Forums and collaboration framework,) at national and regional levels		
		Provide/organize capacity building forums for stakeholders to take informed decisions to support digital health investments.		
		Involve strategic stakeholders in the planning, implementation and performance review of digital health initiatives, including private sectors.		
		Coordinate and align resources to create synergy, save costs and avoid duplication of efforts.		
		Establish monitoring and evaluation mechanisms of stakeholders on digital health interventions		



		Review and update the monitoring mechanisms on digital health investments
		Select and engage digital health champions to help take advantage of and promote digital health initiatives.
SI4 1	Stimulate and align investments with national digital health strategies and priorities.	Conduct digital health maturity assessment every year
		Create and update the digital health investment strategies, policies and regulatory frameworks at national
		Track digital health investment focus in digital health systems
		Conduct a return-on-investment and value realization analyses to generate evidence on digital health.
		Design & implement an incentive mechanism to catalyze appropriate digital health initiatives uptake at all levels.
SI4 2	Ensure funding for operating, maintaining, and supporting digital health initiatives for sustainable country ownership.	Assess/Review the available digital health funds and identify the gaps/pain on yearly basis
		Advocate for and ensure the inclusion of digital health within the health institutions' budget
		Mobilize and secure funding for digital health foundational activities and align stakeholders' digital health investments with the strategy
SD8: Enhance research and innovation on digital health technology		
SI4 3	Foster digital health researches to guide and support decision-making, policy and practice.	Conduct operational and implementation research on digital health
		Establish Research output discussion forums and panels
		Conduct gap analysis studies on digital divide and propose capacity building mechanisms
		Collaborate with research and training institutions for information-sharing, peer-learning and improvement of digital health
SI4 4	Enhance the adoption of emerging digital technologies and establish innovation centers to promote digital health innovations in the health sector.	Assess and adopt new and innovative cutting-edge digital health technologies
		Establish at least one academy per year for training, research and innovation
		Establish/Enhance the national and at least one regional Digital Health Innovation Centers per year



		Establish and mobilize a dedicated taskforce for digital health innovation centers
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6.0. DIGITAL HEALTH COSTING & BUDGETING

Costing of Digital Health Strategy is computed using OneHealth Tool (OHT). Although the strategy consists of Forty two (42) strategic initiatives, OHT can handle a maximum of 30 at a time. Hence we have tried to compute the cost all by managing them in two files. The cost estimate of the digital health activities are based on pre-set assumptions. The assumptions of costing includes consultant fees (local and international) as applicable, items/infrastructure, software, training, workshop and software customization processes.

This costing needs further refinement of work to get the actual budget for each initiative.

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Table 4: Costing and budgeting

S.N	Strategic Initiatives	Short Term			Medium Term				Long Term			Total
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
Slo1	Establish/Strengthen mHealth programmes/services	2,305,110	2,305,110	2,275,110	2,299,110	2,284,110	2,284,110	2,284,110	2,284,110	2,284,110	2,284,110	22,889,100
Slo2	Strengthen Health information dissemination & feedback receiving mechanisms	7,904,737	10,370,477	16,409,137	11,958,720	11,958,720	11,958,720	11,958,720	11,958,720	11,958,720	11,958,720	118,395,391
Slo3	Establish/ Strengthen telehealth programmes/ services	13,920,695	13,416,545	12,900,345	12,864,995	12,578,995	12,578,995	12,578,995	12,578,995	12,578,995	12,578,995	128,576,550
Slo4	Establish/Strengthen mHealth programmes/services	1,470,180	1,470,180	1,470,180	1,470,180	1,470,180	1,470,180	1,470,180	1,470,180	1,470,180	1,470,180	14,701,800
Slo5	Establish Electronic Health Records (EHR)	193,780	197,580	316,160	360,740	207,820	207,820	207,820	207,820	207,820	207,820	2,315,180

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Slo6	Enhance/ Strengthen Electronic Community Health Information System (eCHIS)	569,400	239,050	35,050	33,700	33,700	33,700	33,700	33,700	33,700	33,700	1,079,400
Slo7	Establish eLearning and Knowledge Management systems for the health workforce on Continuing Professionals Development (CPD) programme	1,257,900	1,257,900	1,257,900	1,257,900	1,257,900	1,257,900	1,257,900	1,257,900	1,257,900	1,257,900	12,579,000
Slo8	Establish/enhance electronic Laboratory Information System (eLIS)	70,377,050	70,347,050	70,377,050	70,325,050	70,355,050	70,303,050	70,333,050	70,303,050	70,289,050	70,259,050	703,268,500
Slo9	Establish Electronic Auditable Pharmaceutical Transaction System (eAPTS)	7,796,510	7,854,110	7,796,510	7,796,510	7,854,110	7,796,510	7,796,510	7,854,110	7,796,510	7,796,510	78,137,900
Sl10	Establish ePrescription System	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	5,847,100

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Sl11	Enhance/ Strengthen Electronic Referral Information System (eRefIS)	509,830	349,010	131,840	121,840	121,840	121,840	121,840	121,840	121,840	121,840	1,843,560
Sl12	Strengthen an electronic Health Management Information System (eHMIS)	960,893	960,893	960,893	960,893	960,893	960,893	960,893	960,893	960,893	960,893	9,608,930
Sl13	Enhance Electronic Logistics Management Information Systems (eLMIS)	346,330	346,330	346,330	346,330	346,330	346,330	346,330	346,330	346,330	346,330	3,463,300
Sl14	Enhance electronic Human Resource Information System (eHRIS)	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	5,847,100
Sl15	Enhance electronic Regulatory Information Systems (eRegIS)	711,420	711,420	711,420	711,420	711,420	711,420	711,420	711,420	711,420	711,420	7,114,200
Sl16	Enhance electronic financial management system	15,131,917	14,172,201	13,958,013	11,065,146	11,313,106	0	0	0	0	0	65,640,383

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Sl17	Develop/Enhance the electronic Health Insurance Management System (eHIMS)	304,340	304,340	304,340	304,340	304,340	304,340	304,340	304,340	304,340	304,340	3,043,400
Sl18	Establish Electronic Public Health Emergency Monitoring System (ePHEMS)	5,961,620	5,924,620	5,924,620	5,924,620	5,924,620	5,961,620	5,924,620	5,924,620	5,924,620	5,924,620	59,320,200
Sl19	Establish Electronic Emergency Medical Service (eEMS) Management System	56,750	56,750	56,750	56,750	56,750	56,750	56,750	56,750	56,750	56,750	567,500
Sl20	Establish an Enterprise Resource Planning(ERP) system	2,674,000	3,166,667	3,368,000	3,803,667	3,731,667	3,731,667	3,731,667	3,731,667	3,731,667	3,731,667	35,402,336
Sl21	Establish/Enhance comprehensive health facility, provider, client, clinical coding and other registries	148,667	138,333	160,000	135,000	130,000	130,000	130,000	130,000	130,000	130,000	1,362,000

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Sl22	Establish a data warehouse to foster and support research, analytics and more highly informed decision making	1,295,899	1,348,275	1,265,155	1,140,746	1,298,235	1,298,235	1,298,235	1,298,235	0	0	10,243,015
Sl23	Strengthen digital health ecosystem security of devices, systems, data, users and communication mediums from physical and remote threats	0	401,340	0	0	401,340	401,340	401,340	401,340	142,800	0	2,149,500
Sl24	Strengthen the deployment and expansion of ICT computing infrastructure	5,696,400	7,866,400	10,036,400	12,206,400	14,376,400	16,546,400	18,716,400	20,886,400	23,056,400	25,226,400	154,614,000
Sl25	Enhance the availability, cooling, scalability, security, capacity and space etc. of data centers and avail alternate power sources	642,420	642,420	642,420	642,420	642,420	642,420	642,420	642,420	642,420	642,420	6,424,200

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Sl26	Enhance the network connectivity (LAN & WAN) within the health sector	1,581,020	1,581,020	1,581,020	1,581,020	1,581,020	1,581,020	1,581,020	1,581,020	1,581,020	1,581,020	15,810,200
Sl27	Improve Operational Support and Maintenance of ICT Infrastructure and digital health solutions.	741,980	741,980	741,980	741,980	741,980	741,980	741,980	741,980	741,980	741,980	7,419,800
Sl28	Establish digital health standards for data, application, security and technology	857,160	857,160	857,160	857,160	857,160	857,160	857,160	857,160	857,160	857,160	8,571,600
Sl29	Develop and Implement interoperability solutions	65,750	65,750	65,750	65,750	65,750	65,750	65,750	65,750	65,750	65,750	657,500
Sl30	Enhance Enterprise Health Architecture (EHA)	711,420	711,420	711,420	711,420	711,420	711,420	711,420	711,420	711,420	711,420	7,114,200
Sl31	Strengthen the ICT health education and training programmes at post-secondary	741,980	741,980	741,980	741,980	741,980	741,980	741,980	741,980	741,980	741,980	7,419,800

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	educational institutions											
Sl32	Enhance the ICT Knowledge of health workforce	857,160	857,160	857,160	857,160	857,160	857,160	857,160	857,160	857,160	857,160	8,571,600
Sl33	Enhance the ICT workforce capacity development of the health sector	65,750	65,750	65,750	65,750	65,750	65,750	65,750	65,750	65,750	65,750	657,500
Sl34	Establish a consistent national legislative framework on client's data security	346,330	346,330	346,330	346,330	346,330	346,330	346,330	346,330	346,330	346,330	3,463,300
Sl35	Establish a national digital health policy	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	5,847,100
Sl36	Establish and execute compliance mechanisms and functions for digital health technologies	711,420	711,420	711,420	711,420	711,420	711,420	711,420	711,420	711,420	711,420	7,114,200

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Sl37	Ensure the effective leadership, coordination, execution and oversight of the national digital health initiative	148,667	148,667	148,667	148,667	148,667	148,667	148,667	148,667	148,667	148,667	1,486,670
Sl38	Ensure a responsive strategy and plan for the national digital health environment	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	5,847,100
Sl39	Stimulate and align investments with national digital health strategies and priorities.	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	584,710	5,847,100
Sl40	Ensure funding for operating, maintaining, and supporting digital health initiatives	131,840	131,840	131,840	131,840	131,840	131,840	131,840	131,840	131,840	131,840	1,318,400
Sl41	Foster digital health researches to guide and support decision-making, policy and practice.	65,750	65,750	65,750	65,750	65,750	65,750	65,750	65,750	65,750	65,750	657,500

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Sl42	Enhance the adoption of emerging digital technologies and establish innovation centers	304,340	304,340	304,340	304,340	304,340	304,340	304,340	304,340	304,340	304,340	3,043,400
	Total	150,489,965	154,101,118	160,957,740	156,040,594	158,574,063	149,358,357	151,521,357	153,718,957	154,260,582	156,257,782	1,545,280,515

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7.0. DIGITAL HEALTH STRATEGY MONITORING & EVALUATION (M&E)

The progress of implementation of the planned digital health initiatives will be continuously monitored and systematically and objectively assessed. In line with this, indicators and targets are defined as illustrated in the following table.

Table 5. Monitoring and evaluation

<i>SD1: Enhance digital health solutions and services</i>				
SI no	Strategic Initiatives	Major Activities	Indicator	Targets
SI01	<i>Establish/Strengthen mHealth programmes/services such as Toll-free emergency, Health call centers, Appointment reminders, Treatment adherence, and Community mobilization/health promotion campaigns to enable clients access health information/ services provisioned by the health care.</i>	1.1 Establish a digital call center at national and regional level [with toll free, automated response and expert consultation facilities]	Proportion of functional Digital call centers	Digital call centers established and functional in all regions and at national level
		1.2 Set up/Create a messaging (text and/or voice) system supporting mHealth services and integrate them with clients' health records (such as eCHIS, eHR) at national and regional levels	- Availability of established messaging systems for mHealth services - Number of integrated digital systems with the messaging systems	- Functional messaging system available at national level - Messaging systems integrated with at least two national digital systems.
		1.3 Enhance the development and implementation of mHealth solutions that enable personal health tracking, mLearning and client financial transactions.	Number of implemented mHealth programs for client services	At least five mHealth programs implemented for clients services at all levels
SI02	<i>Strengthen Health information dissemination & feedback receiving mechanisms through Web portals, e-News, Digital Notice Board and Social Media.</i>	2.1 Enhance the customization and use of the digital media initiatives (social media, e-News, blogs, Web Portals, etc.) that promote information exchange (dissemination and	Number of digital media initiatives customized and implemented	Multiple digital media initiatives customized and implemented at all applicable levels

		feedback) in a bid to healthy behavior at all levels.		
		2.2 Establish digital information board (notice board, satisfaction rating and queue management) to promote health services at national, regional and facility level	Availability of digital information boards at health institutions	Implemented digital information boards appropriate for different health institutions
Sl3	<i>Establish/ Strengthen telehealth programmes/ services such as Teleradiology, Teledermatological, Telepathology, Telepsychiatry and Remote Patient Monitoring to assist health workers deliver remote health care services.</i>	3.1. Enhance and scaleup teleradiology service/program in public hospitals	Proportion of public hospitals implementing at least one telehealth service	All prominent telehealth programs implemented in all public hospitals
		3.2. Establish teledermatology service/program in public hospitals		
		3.3. Establish telepathology service/program in public hospitals		
		3.4. Establish telepsychiatry service/program in public hospitals		
		3.5. Establish Remote Patient Monitoring service/program at applicable public health facilities.	Proportion of health facilities implemented Remote Patient Monitoring service/program	At least 40% of public facilities(Hospitals, HC and HP)
Sl4	<i>Establish/Strengthen mHealth programmes/services such as Clinical Decision Support</i>	4.1 Develop and implement mobile applications that serve as decision support systems and job aids for the health care providers.	Number of implemented mHealth programs for health workers	At least six mHealth programs implemented for all



	<i>Systems, Electronic Patient Information/Patient Records, mLearning, Mobile telehealth, Emergency Management Systems and Access to information, resources, databases and tools) to enable health workers access health information and facilitate health care provisioning.</i>	4.2 Enhance the development and implementation of mobile apps for health workers that enable patient health tracking, intercommunication among providers, resources access and learning.		health workers in health facilities
SI5	<i>Establish Electronic Health Records (EHR) to provide decision support to healthcare professionals in respect of the rendering of healthcare services to an individual patient and accommodate data exchange.</i>	5.1. Develop and implement EHR-core, a component of EHR which contains clinical information benefiting patients and clinicians. 5.2. Integrate disparate systems (stand alone digital health solutions like eAPTs, ePrescription, eLIS, billing system, eReferral system, MFR, DHIS2, eCHIS and etc.) with EHR-core systems based on maturity and priority. 5.3. Develop and implement EHR-Extended by extending EHR-Core to be a comprehensive EHR solution. 5.4. Establish a shared repository function of the EHR system.	- Proportion of hospitals and health centers implementing EHR - Number of integrated digital systems with EHR-Core	- EHR implemented in 100% hospitals and 80% health centers that have electricity coverage - At Least eight digital systems integrated with EHR-Core

SI6	<i>Enhance/ Strengthen Electronic Community Health Information System (eCHIS)</i>	6.1. Enhance the design and development of existing and new eCHIS modules based on the selected programs	Proportion of health posts implementing comprehensive eCHIS	All eCHIS targeted modules developed & implemented in 100% of health posts
		6.2. Scale up the implementation of eCHIS modules at all health posts.		
		6.3. Optimize eCHIS by adding tailored features.		
		6.4. Integrate eCHIS with other relevant systems (like MFR and DHIS2).	Number of integrated digital systems with eCHIS	At Least two digital systems integrated with eCHIS
SI7	<i>Establish eLearning and Knowledge Management systems for the health workforce on Continuing Professionals Development (CPD) programme for pre-service and in-service training and education.</i>	7.1. Conduct a landscape analysis of different eLearning and Knowledge Management platforms and develop/customize for different programs.	Number of eLearning platforms developed	Implemented eLearning program at national level for all CPD program
		7.2. Implement eLearning and knowledge management systems using online and tele education methods for continuous professional development programmes	Availability of eLearning and knowledge management platforms supporting all programs	Established eLearning and knowledge management platforms supporting all programs
SI8	<i>Establish/enhance electronic Laboratory Information System (eLIS)</i>	8.1 Develop/customize the Laboratory Information System (eLIS).	- Proportion of hospitals, health centers, Regional Labs and health institutes implementing eLIS - Number of integrated digital systems with eLIS	eLIS implemented in 100% hospitals, Regional Labs and health institutions, and 80% health centers that have electricity coverage
		8.2 Implement eLIS at all public health facilities, Regional Labs and health institutes .		
		8.3 Optimize features of eLIS		

		8.4 Integrate eLIS with other relevant systems (like EHR and MFR).		At Least two digital systems integrated with eLIS
Sl9	<i>Establish Electronic Auditable Pharmaceutical Transaction System (eAPTS)</i>	9.1. Enhance the design and development eAPTS system	- Proportion of hospitals and health centers implementing <i>eAPTS</i> - Number of integrated digital systems with <i>eAPTS</i>	- eAPTS implemented in 100% hospitals and 90% health centers that have electricity coverage - At Least four digital systems integrated with eAPTS
		9.2. Implement eAPTS at all public hospitals and health centers.		
		9.3. Optimize features of eAPTS		
		9.4. Integrate eAPTS with other relevant systems (like eLMIS, EHR, eMPL and MFR).		
Sl10	<i>Establish ePrescription System</i>	10.1. Develop ePrescription system	- Proportion of public hospitals and health centers pharmacies implementing <i>ePrescription system</i> - Number of integrated digital systems with <i>ePrescription System</i>	- ePrescription system implemented in 100% public hospitals & pharmacies and 90% health centers pharmacies that have electricity coverage - At Least three digital systems integrated with ePrescription
		10.2. Implement ePrescription at all pharmaceutical wings of public hospitals and health centers.		
		10.3. Optimize features of ePrescription		
		10.4. Integrate ePrescription system with other relevant systems (like eAPTS, EHR and MFR).		
Sl11	<i>Enhance/ Strengthen Electronic Referral Information System (eRefIS)</i>	11.1. Strengthen the design and the development of <i>eRefIS</i> .	- Proportion of public hospitals and health centers pharmacies implementing <i>eRefIS</i> - Number of integrated digital systems with <i>eRefIS</i>	eRefIS system implemented in 100% public hospitals and 90% health centers that have electricity coverage
		11.2. Implement <i>Electronic Referral Management System</i> at all public hospitals and health centers.		

		11.3. Optimize features of <i>Electronic Referral Management System</i>		At Least three digital systems integrated with eRefIS
		11.4. Integrate <i>Electronic Referral Management System</i> with other relevant systems (like MPI, EHR and MFR).		
Sl1 2	<i>Strengthen an electronic Health Management Information System (eHMIS) to plan, monitor and support evidence based healthcare and decision making.</i>	12.1. Enhance/Upgrade DHIS2 and optimize its features (such as inclusion of Ethiopian Calendar in the Global DHIS2 Core, inclusion of android version, enhancement of data quality and data analysis features, etc.)	Number of vertical programs and features developed and included in DHIS2	At least Ethiopian Calendar (in the DHIS2 Core), Multisectoral Nutrition dataset, Woreda Transformation Dashboard, WHO Data Quality App, Scorecard, Action Tracker are incorporated in DHIS2
		12.2. Integrate DHIS2 with other systems (like MFR, eCHIS, multi-sectoral nutrition, ePHEM and others).		At Least four digital systems integrated with DHIS2
		12.3. Develop and implement a platform for Multi-sectoral Woreda Transformation data entry and performance management.		
		12.4. Explore, accommodate and implement the need for further enhancement or change on the existing eHMIS platform.	Availability of survey for assessment on best eHMIS platform selection.	Survey is conducted and decision made on the best platform according to the evidences generated

Sl1 3	<i>Enhance Electronic Logistics Management Information Systems (eLMIS)</i>	13.1. Strengthen Electronic Logistic Management Information systems(eLMIS)	- Proportion of public health admin units, institutions and facilities implementing <i>eLMIS</i> - Number of integrated digital systems with <i>eLMIS</i>	- eLMIS implemented in 90% public health facilities and 100% health administrative units and institutions - At Least two digital systems integrated with eLMIS
		13.2. Develop and implement Electronic Medical Equipment Management System (<i>eMEMS</i>)		
		13.3. Integrate eLMIS and eMEMS with other systems(like DHIS2 and MFR)		
Sl1 4	<i>Enhance electronic Human Resource Information System (eHRIS) for HRH administration, development and health professional licensing.</i>	14.1. Develop/customize an integrated human resource information system handling HR administration, development and health professional licensing.	- Proportion of public health admin units, institutions and facilities implementing iHRIS - Number of indicators for which data has been captured - Number of integrated digital systems with iHRIS	- iHRIS implemented in 90% public health facilities and 100% health administrative units and institutions - NHWA available and is able to capture data in all 78 indicators at national level - At Least five digital systems integrated with iHRIS
		14.2. Implement integrated human resource information system(iHRIS) at all public health institutions (MoH, RHBs, ZHDs, Woreda Health Offices, hospitals, health centers, health science colleges, training institutions and agencies)		
		14.3. Customize and implement a National Health Works Account (NHWA).		
		14.4. Integrate iHRIS with <i>other systems(like DHIS2, NHWA, EHR, eCHIS, MFR)</i> .		
Sl1 5	<i>Enhance electronic Regulatory Information Systems (eRegIS)</i>	15.1. Establish/Enhance a regulatory information system to regulate health facilities service quality	Proportion of EFDA & MOH's admin units (National, Regions, Zones and	MOH, EFDA and all regions, zones and woredas

		assurance and suppliers' licensing and supervision	Woredas) implemented Regulatory Information System	implemented eRegIS.
Sl1 6	<i>Enhance electronic financial management system to ensure effective collection, allocation and use of health financial resources at all levels in accordance with health plan priorities</i>	16.1. Develop/Customize electronic financial management system(eFMS) supporting collection, allocation and administration of health financial resources.	Proportion of MOH's admin units (National, Regions, Zones and Woredas) implemented eFMS	MOH and all regions, zones and woredas implemented eFMS.
		16.2. Establish Electronic Procurement Management System(ePMS)	Proportion of MOH's admin units (National, Regions, Zones and Woredas) implemented ePMS	MOH and all regions, zones and woredas implemented ePMS
		16.3. Integrate eFMS with IFMIS and other systems for budgeting and financing	Number of integrated digital systems with eFMS	eFMS integrated with at least IFMIS
Sl1 7	Develop/Enhance the electronic Health Insurance Management System (eHIMS)	17.1. Develop and implement electronic Health Insurance Management System (eHIMS)	Proportion of public health admin units and facilities implementing eHIMS	eHIMS implemented in 90% public health facilities and 100% health administrative units
Sl1 8	<i>Establish Electronic Public Health Emergency Monitoring System (ePHEMS) to enable disease prevention, surveillance, detection, response, reporting, and control.</i>	18. Develop and implement an eSurveillance system for PHEM supporting both aggregate and case based surveillance.	Proportion of public health admin units, institutions and facilities implementing ePHEMS	ePHEMS implemented in 90% public health facilities and 100% health administrative units and institutions
		18.1. Develop and implement Early Warning System (EWS) that collects information on epidemic-prone diseases in order to trigger prompt public health interventions.	Number of Woredas implementing Early Warning System (EWS)	All vulnerable woredas (epidemic, food insecurity, drought, etc.) implemented EWS

		18.2. Integrate the eSurveillance and EWS with other systems (like MFR, eHMIS-DHIS2)	Number of integrated digital systems with EWS	EWS integrated with at least PHEM, eHMIS and MFR
Sl1 9	<i>Establish Electronic Emergency Medical Service (eEMS) Management System to administer medical emergency responses.</i>	19. Develop/Customize Ambulance Dispatching System (ADS)	Number of regions implemented Ambulance Dispatching System (ADS)	eEMS developed and made functional at national level and in all regions
		18.1. Establish Emergency call center	Number of emergency call center established	At least one emergency call centers established per region
		18.2. implement eEMS	Number of regions implemented eEMS	eEMS regions implemented eEMS
		18.3. integrate eEMS with eRefIS, EHR, MFR.	Number of integrated digital systems with eEMS	eEMS integrated with at least eRefIS, EHR, MFR.
Sl2 0	Establish an Enterprise Resource Planning(ERP) system that can integrate major processes into single system	20.1. Develop/Customize and implement an ERP system that integrates fleet management, Project Management, eService, planning and Document management	Proportion of Health administration offices implemented at least one module of ERP System	90 % of National and Regional health administration offices and institutions implement ERP
Sl 21	<i>Establish/Enhance comprehensive health facility, provider, client, clinical coding and other registries with complete and</i>	21.1. Enhance the development and implementation of Master Facility Registry (MFR) at WHO, ZHD, RHB and MoH	Number of woreda health offices implemented MFR	MFR implemented in all regions, zones and woredas of the country.

	<i>current information that meets stakeholders needs.</i>	21.2. Enhance the development and implementation of National Health Data Dictionary (NHDD)	- Number of health facilities and health admin units using NHDD - Number of priority health domains included in the NHDD	All health facilities and admin units used their respective NHDD domains
		21.3. Develop and implement Master Patient Index (MPI) at national level	Number of health facilities implemented MPI	MPI implemented in All health facilities
		21.4. Enhance the development and implementation of Master Provider List (MPL) at national level	Number of health admin units and facilities implemented MPL	MPL implemented at national, regional and facility levels - and made accessible to the public.
		21.5. Enhance the development and implementation of Master Drug List (MDL) at national level	Number of health admin units and facilities implemented Master Drug list(MDL)	MDL used by all health facilities, health admin units, agencies, suppliers and vendors
		21.6. Develop and implement GIS repository for location mapping	Level of implementation of the GIS Repository at national level (%)	GIS Repository fully implemented
		21.7. Develop and implement Shared Health Record (SHR) at national level	Level of implementation of the Shared Health Record (SHR)	SHR implemented and made accessible to all relevant information systems
SI 22	Establish a data warehouse to foster and support research, analytics	22.1. Develop and implement data warehouse at national levels in	Number of health domains incorporated in the national data warehouse	The national data warehouse implemented with

	<i>and more highly informed decision making by health system managers and other stakeholders on health sector resources.</i>	alignment with the national digital health platform		incorporation of all priority health domains
		22.2. Integrate Data Warehouse with other digital health solutions as required.	Number of systems integrated with National Data warehouse	Integrate Data warehouse with the likes of eCHIS, MFR DHIS2, LMIS, and population-based systems
SD2: Improve health sector ICT infrastructure				
Sl2 3	Strengthen digital health ecosystem security of devices, systems, data, users and communication mediums from physical and remote threats by implementing cyber security measures and information security mechanisms.	23.1. Implement cyber security measures to protect networks, computers, systems and data from unauthorized electronic access (internal and external threat)	Percentage of Cyber Security measures implemented for digital health solutions and infrastructures	99.9% of Health systems and infrastructure are secured from cyber attack
		24.1. Implement information security mechanisms to ensure confidentiality, availability and integrity of data and systems.	Number of information security mechanisms implemented	The health information systems and data security maintained all the time
		23. Establish physical and logical security enforcement mechanisms.	Level of physical and logical security enforced	99% of security breaches are controlled
Sl2 4	<i>Strengthen the deployment and expansion of ICT computing infrastructure to serve the digital health</i>	25.1. Deploy computing infrastructures such as computers, tablets, servers, network hardware, power backups(UPS, solar) etc. as appropriate at all public health administration and public health facilities	Proportion of health facilities and administration units fulfilled with minimum ICT Equipments requirements set by MOH	All health facilities and health administration offices fulfilled ICT Equipments

	<i>activities being implemented.</i>	25.2. Install, configure and avail computing infrastructure.	Proportion of health facilities and administration offices installed and configured with appropriate computing infrastructure	All health facilities and administration offices installed appropriate computing infrastructure
SI2 5	Enhance the availability, cooling, scalability, security, capacity and space etc. of data centers and avail alternate power sources	26.1. Establish robust data centers and disaster recovery sites at different locations to deploy/host the digital health technologies.	Number of national and regional established data centers and disaster recovery sites	Data centers and disaster recovery sites established at national level and in all regions.
		26.2. Establish backup power options to all data centers and disaster recovery sites	Proportion of the data centers and disasters recovery sites with backup power options	Power backup established to all data centers and disasters recovery sites
		26.3. Explore potential hosting options (local/cloud) and implement the appropriate ones.	Number of identified potential cloud hosting options	At least one identified potential cloud hosting option
		26.4. Improve availability, cooling, scalability, security, capacity and space etc. of data centers and disaster recovery sites.	Proportion of the data centers and disasters recovery sites with services and systems available 99.99% of the time	All Services and systems available (up and running) 99.99% of the time.
SI2 6	Enhance the network connectivity (LAN & WAN) within the health sector by strengthening its coverage and capacity to improve the availability, communication	27.1. 26.1. Establish local area network within the health institutions (facilities, administration offices and agencies)	Proportion of public health facilities, administration offices and Agencies established Local Area Network(LAN)	All public health institutions implemented LAN
		27.2. Expand the VPN (HealthNet) to all health facilities, administration offices and agencies.	Proportion of public health facilities, administration offices and Agencies interconnected with appropriate VPN (HealthNet)	All public health institutions interconnected with VPN (HealthNet)

	and information sharing at all levels of the health system.	27.3. Improve/upgrade VPN connectivity and/or Internet connectivity of facilities and administrations offices.	Proportion of public health facilities, administration offices and Agencies accessing Internet services	All public health institutions accessed the Internet services
Sl2 7	Improve Operational Support and Maintenance of ICT Infrastructure and digital health solutions.	27.1. Establish a digital help desk system equipped with technical manpower, logistics and tools at National, Regional, Zonal and Woreda levels.	Number of digital help desk systems established at National, Regional and Zonal/Woreda level	Established help desk at national, all regions, and all zones/woredas
		27.2. Provide maintenance and support services on digital health solutions, hardware and Network infrastructure through an established helpdesk system at all implementation levels.	Proportion of functional digital helpdesks actively supporting their catchments	Active support provided to the respective sites by all established digital helpdesks
SD3: Enhance digital health standards & systems Interoperability				
Sl2 8	Establish digital health standards for data, application, security and technology for information exchange and protection.	28.1. Establish syntactic and terminology data standards for health data exchange.	• Proportion of health domains for which terminology standards are prepared • Proportion of digital health applications that have messaging standards	• 10 digital health domains(HMIS indicators, NCOD, HMIS data elements, Registers, tallies, health cards; Drugs and immunization list,CHIS folders and cards, procedures and Lab tests,Billing codes) • 90% of digital health



				applications established messaging standards
		28.2. Establish standards and guidelines for digital health solutions & services (such as EHR, eCHIS, eHMIS,..) that can guide the minimum requirements needed to be fulfilled (including security).	Proportion of digital health applications that have minimum standards/guidelines	All available digital health applications established minimum standards/guidelines for their implementation
		28.3. Establish security standards and guidelines for data access, storage, processing, information exchange, sharing and hosting		
SI2 9	Develop and Implement interoperability solutions for data exchange among digital health solutions and other external systems	29.1 Develop interoperability requirement documents for the different interoperable systems	Number of implemented interoperability	At Least 10 interoperability internal (MFR with six priority applications; eCHIS-eHMIS/DHIS2, iHRIS-eHMIS/ DHIS2, EMR-;DHIS2/LMIS eHMIS/DHIS2, LMIS-eHMIS/DHIS2)
		29.2. Develop and Implement interoperability solutions for Prioritized applications		

				established interoperability and relevant external applications
Sl3 o	<i>Enhance Enterprise Health Architecture (EHA) for data exchange among new and existing health solutions</i>	30.1. Enhance the enterprise Health Architecture (EHA) like defining standards , identifying components, mapping, governance, etc.. and institutionalize it for use in all digital health initiatives.	Proportion of updated EHA components	100 % Updated and institutionalized EHA
		30.2. Enhance the content and use of the Digital Health Atlas (DHA).	Proportion of Digital Health applications updated in Digital Health Atlas	100% Digital Health applications updated in Digital Health Atlas
SD4: Improve health workforce capacity on digital health technology				
Sl3 1	<i>Strengthen the ICT health education and training programmes at post-secondary educational institutions such as Universities, vocational training institutions and professional bodies by embedding digital health into their curricula and increase the number of skilled, nationally available digital health practitioners.</i>	31.1. Explore the education and training curricula of post-secondary educational institutions	Number of digital health Curricula developed for short- and long-term education at each level	All curricula updated for training and education programs of post-secondary Education in digital health
		31.2. Prepare and endorse the digital health technology contents and perspectives to the curricula	Proportion of endorsed digital health contents/documents per the curricula	All programs have endorsed digital health contents/ documents based on the curricula.

Sl3 2	Enhance the ICT Knowledge of health workforce	32.1. Assess the ICT knowledge and skill gaps of health workforce	Percentage competency of health workforce for ICT	3 (baseline, mid-term and end-line)assessments done on ICT competency for health workforce
		32.2. Design/develop Training based on the assessment	Availability of training programs/courses designed based on identified gaps	Developed training programs/courses based on identified gaps
		32.3. Provide training for all health workforce using suitable platform	Proportion of trained workforce based on the identified gap	90% of identified workforce trained.
Sl3 3	Enhance the ICT workforce capacity development of the health sector .	33.1. Explore the existing ICT health workforce allocation and propose the required skilled professionals and structure supporting the digital health initiatives	Availability of ICT health workforce structure	Proposed ICT health workforce structure for all health offices and health facilities
		33.2. Assess the knowledge and skill gaps of ICT workforce	Percentage competency of ICT workforce	3 (baseline, mid-term and end-line)assessments done on ICT competency for ICT workforce
		33.3. Design/develop Training based on the assessment	Availability of training programs/courses designed based on identified gaps	Developed training programs/courses based on identified gaps
		33.4. Provide training for all ICT workforce using suitable platform	Proportion of trained ICT workforce based on the identified gap	All of the identified ICT workforce trained
SD5: Establish national digital health legislation, policy and compliance				

Sl3 4	<i>Establish a consistent national legislative framework on client's data security (like data protection, privacy, confidentiality, access rights, sharing rights for data, informed consent for data use and secure transmission of client data).</i>	34.1. Review and enrich the existing national health services proclamation document with due emphasis on clients' data security.	Inclusion of the clients' data security aspects in the National Health Service Proclamation	Given due emphasis to the clients' data security aspects in the National Health Service Proclamation
		34.2. Implement and abide by clients' data security measures as per the health service proclamation document.	Proportion of health facilities and health offices implemented the clients' data security measures	All health facilities and health office implemented clients' data security measures within health service proclamation document
Sl3 5	<i>Establish a national digital health policy by adopting local and international experiences.</i>	35.1. Incorporate the digital health components into the national health policy or develop a separate digital health policy	Availability of the national digital health policy	Developed national digital health Policy, separately or as part of national health policy
		35.2. Implement and abide by the digital health policy measures.	Proportion of health facilities and health offices implemented the digital health policy	All health facilities and health office implemented digital health policy
Sl3 6	<i>Establish and execute compliance mechanisms and functions for digital health technologies.</i>	36.1. Establish a national compliance framework to test and certify that digital health technology comply with national digital health standards, rules and protocols.	Alignment/Compliance of the digital health strategy with the national digital strategy	Established national compliance framework for the digital health strategy in light of the National Digital Strategy.
		36.2. Conduct a continuous assessment and certify the digital health technologies for their compliance to the standards set in the health sector.	Number of assessments made for digital health technologies compliance to the set standards	At least one assessment conducted every two years at national and regional levels

SD6 : Strengthen digital health governance and leadership

Sl3 7	Ensure the effective leadership, coordination, execution and oversight of the national digital health initiative through the establishment of appropriate national digital health governance structures and mechanisms.	37.1. Ensure the establishment of a national digital health governance structure to direct, implement, enforce, monitor, and evaluate the governance functions such as strategy, execution, investment, standards development, solutions compliance and regulation.	Availability of established governance structure at each level	Established governance structure at all levels
		37.2. Establish a governance mechanism such as regulatory, managerial and technical working groups at different levels with membership of multiple stakeholders (like Steering committees, NAGs, CTTs, TWGs, etc).	Availability of established governance mechanisms	Established governance mechanisms like Steering Committee, NAG, Digitization TWG, CTT..
		37.3. Enhance leadership capacity to execute the digital health strategy initiatives.	Proportion of concerned leaders trained on digital health governance and leadership	All concerned leaders trained on digital health governance and leadership
		37.4. Define, direct, execute, enforce, monitor and evaluate the digital health ecosystem through the established governance structure and functions	The level of effectiveness of governance structure	100% effective governance structure at level
SD7: Establish digital health strategy, investment and funding				
Sl3 8	Ensure a responsive strategy and plan for the national digital health environment with involvement of major stakeholders and sectors.	38.1. Create a diverse stakeholder information-sharing and peer-learning network/platform at national and regional levels to foster coordination and alignment of implementation activities.	Number of national multi-sectoral digital health information-sharing and peer-learning forums organized Number of regions organized multi-sectoral digital health information-sharing and peer-learning forum every year	Two national multi-sectoral digital health information-sharing and peer-learning forums per year

				All regions organized at least one multi-sectoral digital health information-sharing and peer-learning forum every year
		38.2. Build capacity of a range of stakeholders to take informed decisions to support digital health investments.	Number of capacity building forums organized with participation of stakeholders	At least one capacity building forum organized
		38.3. Involve strategic stakeholders in the planning, implementation and performance review of digital health initiatives, including private sectors.	Proportion of strategic partners and stakeholders participated in the digital health sector planning/review	All strategic partners participated in annual planning, mid-term review and annual reviews
		38.4. Coordinate and align resources to create synergy, save costs and avoid duplication of efforts.	Availability of stakeholders' investment/management mapping matrix	Established uptodate stakeholders investment mapping
		38.5. Establish monitoring mechanisms of stakeholders digital health investment.	Availability of monitoring mechanisms for digital health investment	Financial monitoring mechanisms established and used
		38.6. Select and engage digital health champions to help take advantage of and promote digital health initiatives.	Availability of digital health champions at national and regional levels	Availed digital health champions at national and regional levels using appropriate selection criteria
Sl3 9	<i>Stimulate and align investments with national</i>	39.1. Conduct digital health maturity assessment to guide and prioritize national investment in digital health	Availability of conducted digital health maturity assessment every year	Digital health maturity assessment conducted at least one per annum

	<i>digital health strategies and priorities.</i>	39.2. Create and update the digital health investment strategies, policies and regulatory frameworks based on evidence in identifying and implementing scalable, sustainable, accessible, interoperable, and evidence-based digital health global goods that meet country priorities.	Availability of updated digital health investment strategies, policies and regulatory frameworks	Established digital health investment strategies, policies and regulatory frameworks at national level
		39.3. Track investments, progress, learnings and successes in digital health systems in a transparent manner.	Availability of investment tracking mechanisms	Established investment tracking mechanisms/tools
		39.4. Conduct a return-on-investment and value realization analyses to generate evidence on digital health.	Existence of return-on-investment analysis for digital health initiatives	Return-on-investment analysis for all digital health initiatives is conducted
		39.5. Design & implement an incentive mechanism to catalyze appropriate digital health initiatives uptake at all levels.	Availability of incentive mechanisms for digital health initiatives	Established incentive mechanisms for digital health at all levels
SI4 o	<i>Ensure funding for operating, maintaining, and supporting digital health initiatives for sustainable country ownership.</i>	40.1. Assess/Review the available digital health funds and identify the gaps/pain points to devise improved funding.	Availability of digital health funding assessment conducted	Digital health funding assessment conducted at least one per annum
		40.2. Advocate for and ensure the inclusion of digital health within the health institutions' budget (like MOH's directorates, agencies, regions, ...).	Number of health institutions allocated proper budgets for digital health initiatives.	Digital health initiatives' budget is ensured at each health institution
		40.3. Mobilize and secure funding for digital health foundational activities and align stakeholders' digital health investments with the strategy.		

SD8: Enhance research and innovation on digital health technology				
SI4 1	Foster digital health researches to guide and support decision-making, policy and practice.	41.1. Conduct operational and implementation research on digital health to improve health service delivery and outcomes.	Number of researches conducted on the digital health initiatives.	At least three Conducted and implemented researches in top priority areas
		41.2. Create platforms and panels to facilitate the translation of research evidence and information into policy and practice.	Existence of forums under taken.	Research output discussion forums established
		41.3. Conduct gap analysis studies and propose inclusive and equitable digital health capacity building training for the health workforce to narrow down the impact of Digital Divide	Number of gap analysis studies conducted	At least 1 gap analysis study conducted for all health institutions each year
		41.4. Collaborate with research and training institutions for information-sharing, peer-learning and improvement of digital health technologies.	proportion of training & research institutions collaborated	90 % of the existing training & research institutions are collaborated
SI4 2	Enhance the adoption of emerging digital technologies and establish innovation centers to promote digital health innovations in the health sector.	42.1. Assess and adopt new and innovative cutting-edge digital health technologies (like AI, block chain, Big Data, wearables, Internet of Things, etc.) for use in the health sector.	Number of innovative digital health technologies adopted for use in the health sector	At least one innovative digital health technology is adopted per annum.
		42.2. Establish academies for training, research and innovation (such as	Number of established academies	At least ten established academies

		DHIS2 academy, EMR Academy, OpenHIE Academy, etc.).		
		42.3. Establish/Enhance the national and regional Digital Health Innovation Centers.	Number of Digital Health Innovation Centers established	Established innovation centers in all regions.
		42.4. Establish and mobilize a dedicated taskforce for digital health innovation centers.	Availability of dedicated taskforce for each digital health innovation center	Established dedicated task forces at each innovation center

8.0. RISKS AND MITIGATION

Risks are an integral part of ICT related projects in general and digital health strategies in particular. Identifying these risks at the early stage prematurely and putting the risk mitigation strategy into place is very important to usher the risks before becoming a problem and hindering the implementation of the strategy. The risk identification and mitigation will be attended to in all of the lifecycle of the implementation of the digital health strategy.

Risks	Mitigation
Loose commitment/engagement of stakeholders	Establish engagement strategy/governance mechanism and monitor/rate the engagement level of each stakeholders and act accordingly.
Lack of management support and attention	Get approval/endorsement of the strategy; Include in annual and operational plans; Provide timely updates on the progress; Establish uninterrupted communication mechanisms.
Donors and implementing stakeholders competing interests	Establish donors and implement stakeholders mapping and strong coordination mechanisms.
Shortage of skilled ICT workforce/insufficient staffing	Conduct assessment; Perform proper staffing; Provide relevant capacity building activities.
Failure to adequately translate strategy to specific actions	Prepare detailed guidelines for execution. Provide adequate training on the strategy and work on socialization with all relevant stakeholders.
Failure to appropriately adapt the strategy when conditions change	Continuously revisite and familiarize the strategy based on the local and global dynamics.
Legal and ethical breaches	Ensure the availability of proper policy and regulation in place.

ANNEXES

Annex I. Summary of electronic Health systems, Infrastructure, Governance and status

Table 6: Summary of existing systems

Category	Electronic Health Information System	Description	Implementation level		Year of implementation	% Completed		Remark
			Target	Actual		Development	Implementation	
Institution Based systems	eHMIS/ DHIS2	The digital platform of the Health Management Information Systems(HMIS) reported by all facilities	All Health offices and facilities	All Health offices and facilities	eHMIS - 2008-2017 DHIS2 2017-2019	99%(DHIS2)	95%(DHIS2)	eHMIS is no longer in use. DHIS2 is scaled up on almost all facilities and by now it is stable



eHRIS	Allows HR activities and processes to occur electronically	All health office, Hospital , Health center	All health office and few Hospitals	eHRIS- Since 2010 iHRIS - 2020	10%(iHRIS)	0%(iHRIS)	It is partially used. The iHRIS is customized
HRIS Licensing	To collect, store and manage health professionals' licenses	National and Regional Health Bureaus	National and very few RHBs	Since 2017	90%	10%	
Fleet Management System	Administrative approach that allows MOH to electronically organize and coordinate work vehicles with the aim to improve efficiency, reduce costs, and provide compliance with government regulations	National	National	Since 2014	85%	0%	Now it is not functional



	Medical Equipment Management System	To record, analyze and provide report on the medical equipment at facilities	Health offices, Hospital and HC	None	2020	90%	0%	The development is completed and on piloting
	Emergency and Referral Information System	To manage the services provided by the health facilities, bed management and handling referral system, and emergency management across the facilities	Hospitals, Health centers	5 Addis Ababa Hospitals	2019	90%	1%	Not fully functional
	Digital Library System	To collect items electronically and avail for access	National	National	2018	50%	0%	Not Functional
Point of Service	EMR	The digital version of the traditional paper-based medical record for an individual	Health offices, Hospital, and	Few Hospitals and Health centers mainly as a patient registration tool	Since 2007	80%	1%	Redesign is required



Systems			health center					
	Smartcare ART	To track HIV Positives, Case Based Reporting, Retest and Index case testing	Health offices, Hospital, and health center	It is implemented at ART service providing public facilities	Redesigned in 2019	99%	50%	
	eAPTS	Keeps track of types of medicines arrived for patients, types of therapeutic category, types of programs served, stocks at hand, consumed, wasted and emergency stocks so as to control and monitor the services and supplies	Health offices, Hospital, and health center	It is ready for piloting and not implemented yet	2020	90%	0%	



	eCHIS	To automate the family folder, RMNCH, Communicable Diseases, NCDs and NTD, Nutrition and reporting functionality	Health offices and health facilities	Implemented at 1,200 agrarian health posts	Since 2018	50%	2%	
	PACS and RIS	Is a medical imaging technology which provides economical storage and convenient access to images from multiple the facilities	hospitals	Implemented at 19 Hospitals	Since 2019	Off the shelves	1%	
Shared Services	MFR	To have accurate and regularly updated facility data which is essential for effective planning, coordination, and delivery of health services	Health offices	Implemented at Regional Health bureaus	Since 2017	95%	5%	



	NHDD	A collaborative terminology and HMIS indicator management, standardization, mapping, and dictionary harmonization	National , centraliz ed	Centralized(Nati onal) and few pilot hospitals	Since 2017	98%	90%	
Cross cutting systems	eHealth Architecture and Interoperability	A conceptual model that depicts the information systems, data sources, and integrations to help achieve its strategic goals	National	National	Since 2017	80%	5%	
	Data Warehousing and Business Intelligence	is a system used for reporting and data analysis, and is considered a core component of business intelligence. DWs are central repositories of integrated data from one or more disparate sources	National	On design stage, and not implemented	Since 2019	0%	0%	Requirement gathering is completed. Design



	National Residency Matching	An exam platform to electronically conduct and mark exams including postgraduate programs for medical professionals, certification of health professionals, etc.	National	Nationally, accessed from exam hubs at mainly major universities in most regions	On annual basis	100%	100%	
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	IFMIS	is an integrated Public Financial Management system being implemented by Federal Government of Ethiopia (FGE) through the Ministry of Finance and Economic cooperation to improve Public Financial Management System and Property Administration; enhance greater accountability, timely financial and property information and transparency across Federal Ministries, Agencies, Regions, City administration, Zones and Woredas	National	Implemented at MOH and Agencies	Since 203	100%(MOFEC)	100%	
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	Online Ticketing Registration System	A service management suite that comprises ticketing, workflow automation and notification, along with a wide range of customizable features. It is already customized to MOH needs	National , Regional	National	2020	90%	0%	
Infrastructure	Healthnet	To interconnect facilities with a mesh network with ADSL, 3G modem or other tailored method with the aim of access to centralized information system or share data among the hubs	Health offices, Hospital , Health center	National, Regional, Several som Woreda and some facilities	Since 2017	NA	60%	
	Internal Networking	To interconnect the various units of a health facility to simplify data sharing and access among the units	Health offices, Hospital , Health center	Started in in few facilities	2019	NA	1%	