SCHOOL OF PUBLIC HEALTH AND SCHOOL OF INFORMATION SCIENCE

MASTER OF SCIENCE IN HEALTH INFORMATICS

E-health Policies in the Ethiopian Policy and Strategy Documents: Content Analysis

BY

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DECLARATION

I declare that this thesis is my original work and it has not been presented for a degree in any other university. All the material sources used in this work are duly acknowledged.

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Robel Tezera

May 2013

This thesis has been submitted for examination with our approval as university advisors.

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Abbreviations and Acronyms'

AHMAC	Australian's Health Minster Advisory Council
AHMC	Australian's Health Minster Conference
CDC	Center for Disease Control and Prevention
CPOE	Computerized Provider Order Entry
CME	Continuous Medical Education
CSA	Central Statistical Agency
DSS	Decision Support System
E-health	Electronic Health
E-HMIS	Electronic Health Management Information System
EHR	Electronic Health Record
EMR	Electronic Medical Record
EU	European Union
FMoH	Federal Ministry of Health
GDP	Gross Domestic Product
GIS	Geographic Information System
Glocal	Global-Local
HEW	Health Extension Worker
HI	Health Institution
HIFIS	Health Integrated Financial Information System
HIS	Health Information System

HIT	Health Information Technology
HIV	Human Immuno-Deficiency Virus
HMIS	Health Management Information System
HRIS	Human Resource Information System
HSDP	Health Sector Development Program
HSRD	Health System Reference Database
ICT	Information and Communication Technology
IT	Information Technology
ITU	International Telecommunication Union
LAC	Latin Americans and Caribbean
LIS	Laboratory Information System
MCIT	Ministry of Communication and Information Technology
MEDSS	Mobile Executive Decision Support System
MDG	Millennium Development Goal
M-Health	Mobile Health
MNCH	Maternal Neonatal and Child Health
MoE	Ministry of Education
MoH	Minister of Health
NEHPIC	National E-health and Information Principal Committee
NEPAD	New Partnership for African Development
NGO	Non-Governmental Organization

NHC	National Health Committee
PDA	Personal Digital Assistance
RHB	Regional Health Bureau
RIS	Radiology Information System
SNNPR	Southern Nations Nationalities and Peoples Region
TUTAPE	Tulane University Technical Assistant Programs for Ethiopia
UN	United Nation
USA	United States of America
USAID	United State Aid for International Development
WLAN	Wireless Local Area Network
WHO	World Health Organization

ABSTRACTS

Background: E-health may play a major role to improve the quality, efficiency and access of health care services. However, there are also numerous factors that affect the successful deployment of E-health including political commitment, lack of collaboration, lack of standards and interoperability, and lack of funds. So, successful implementation of E-health is largely depends on clearly defined E-health policy and strategy that can address all these challenges.

Objectives: The overall objective of this thesis was "to analyze the content of E-health policies in ICT and E-health policy and strategy documents of Ethiopia".

Methods: the research method chosen for this study was Qualitative content analysis. Qualitative data were collected by using literature review and document analysis. Three E-health policy documents issued by government were included in the study. A hybrid inductive and deductive content analysis was used to provide an in depth analysis on the selected documents.

Results: After I conducted the literature review, new E-health policy frame work was developed for deductive analysis. The result show limited participation of non –governmental entities in the development of policy documents. Policy issues like human resource, infrastructure, and governance were described in detailed. Policy issues like liability, reimbursement, and private funding are not mentioned by the policy documents.

Conclusion and Recommendation: the finding suggests that, the national E-health policy should be developed based on strategic framework in order to include all the relevant E-health policy issues and to ensure successful implementation of E-health in Ethiopia.

1. INTRODUCTION

1.1. Background

Ethiopia is located in the horn of Africa with a total area of about 1.1 million square kilometers. It borders with five countries: Eritrea in north, Djibouti in the east, Sudan in the west, Kenya in the south and Somalia in the south east [1].

Ethiopia's population is estimated to be around 85 million where 85% resides in the rural part of the country. The population pyramid age is young and the annual population growth rate is 2.6% [1]. Ethiopia has a Federal government structure composed of nine regional states and two city administrations further divided into 837 administrative Woredas (districts), two "special" Zones and seven "special" Woredas. The Woredas are subdivided in to 16,253 local administrations called Kebele [1].

Ethiopia's economy largely depends on the agricultural sector which accounts for 83.4% of the labor force, 43.2% of the Gross Domestic Product (GDP) and 80% of exports. Despite numerous challenges, Ethiopia had been showing a significant economic growth over the last decade [1].

Health care system of Ethiopia is three tier systems: Primary level serving 60,000-100,000 people, General Hospital serving 1-1.5 million people and comprehensive specialized Hospital serving 3-3.5 million people. Decision making process is more decentralized to woreda level and the Federal Ministry of Health (FMOH) is more concerned to policy issues and technical support [2].

Communicable diseases and nutrition are the primary health problems of Ethiopia. About 58% of child deaths are related to malnutrition and HIV, and the major causes of maternal death are: obstructed labour, severe preeclampsia/ eclampsia, and malaria [2].

Currently FMoH is implementing Health Sector Development Program (HSDP IV) and one of the components is introducing and implementing e-Health. FMoH is implementing different

Information and Communication Technology (ICT) projects to support the health care systems and most projects are at pilot levels. The current projects which are implemented by FMoH are: Tele-Education, electronic-learning, Human Resource Information system (HRIS), Health Integrated Financial Information System (HIFIS), and SmartCare Ethiopia [3].

The World Health Organization (WHO) defined Electronic-Health (E-Health) as "cost-effective and secure use of ICT in support of health and health related fields, including health care services, health surveillance, health literature, health education, knowledge and research" [4]. E-Health is broad term and further can be classified into: Electronic Medical Record (EMR), Electronic Health Record, Health management information system (HMIS), Tel-health and Telemedicine.

The E-health is now recognized as a key enabler for delivery of quality and efficiency of health care services. It plays an important role to improve access of healthcare, to enhance quality of services, to reduce costs of care of patients and health care systems [5], to improve access to continuing professional development, and to health literature to support professionals in research [6].

ICT has pivotal role in improving service delivery, promoting easier information exchange, and assisting in decision making process [3]. Countries around the world are striving to integrate ICT with health care system to enhance the quality of health care services. The FMoH of Ethiopia has recognized the benefits of ICT as a tool to support the health sector. Different ICT projects are implemented within the country to facilitate the health care system. Some of the projects which are implemented in Ethiopia are: Geographic Information System (GIS), HMIS, and SmartCare as Hospital information system and Telemedicine [3].

The E-health is one of the pivotal components of the HSDP of the FMOH. The FMOH adopted "One Plan, One Report, One Budget" policy to enhance the quality of management and resource use as e-Health is a core component of the policy [2].

Despite the benefits and adoption of E-health, its use within or between institutions requires proper planning. There are a number of factors that affect the implementation of E-health and these factors cannot be addressed without the support of well-defined policies [5]. E-health

policy delivers direct national benefits and play an important role to achieve the intended goal, to avoid Digital Divide (also termed as health inequity), and to improve the role of E-health in the provision of health care service [5], [6].

Another important issue in E-health adoption and development is the presence of National E-health Strategy. According to WHO, "*incorporating ICT in health care system requires strategic and integrated action at national level"* [4]. Countries with E-health strategy should focus on benefits and outcomes experienced by health care providers rather than technology. It should recognize the importance of user engagement in developing and delivering successful E-health initiatives [7]. Thus it is important for policy makers and planners of E-health at federal and regional levels to develop policies and strategy that can facilitate appropriate adoption of E-health and that can also facilitate regional co-operation.

This study tries to answer the following research questions:

- To what extent have Ethiopian government developed policies and strategies for the use of ICTs in relation to the current healthcare system?
- What are the contents of E-health and E-health policies in national policy and strategy documents?
- What are the main attributes of the existing national policy and strategy documents related to E-health?

1.2. Statement of the Problem

The FMoH has recognized the benefits of ICT in health care to enhance the quality of health care services. Different E-health projects are being adopted and implemented by FMoH to support the health care system. Despite the implementation of e-Health, there are factors that need much attention for successful deployment of E-health like: political commitment, regulations [4], standards, and involvement of stakeholders [5]. Most of these issues can be addressed by well-defined E-health policy.

Absence of E-health policies at national level may lead to several problems during the cycle of E-health planning. Experience from developed countries has shown several impediments in the process of E-health planning, including lack of operational and support policies, lack of demonstrated cost benefit, organization and providers resistant, and lack clinical importance [5].

Most of the developing countries E-health system lacks E-health policy and strategy that can direct the implementation of E-health initiatives throughout the country. In order to implement e-health successfully, there should be clear and comprehensive E-health policies to address all the [4].

Most E-health Projects in Ethiopia failed at pilot level. They failed because of lack of ownership by health entities involved, they are imported from other countries and they are not developed and adopted based on the user's requirements and countries context, lack of government role in technical and financial support, and this instead comes from donors and NGOs, and fragmented and divergent projects at the same health aspects [8]. According to the WHO, countries should not simply implemented project developed in other countries or developed based on the interest of donors and NGOs [9]. All of these factors are should be addressed by well defined policy documents.

Most previous studies tried to answers why E-health initiatives failed to deliver the intended goal. However, there are no studies which try to determine the E-health policy issues and strategy which are a key factor that affect the adoption and development of E-Health. E-health policy and strategy play an important role to facilitate the success of E-health initiatives to meet their intended goal, to standardize the adoption of EMR at all level, to enhance the role of HMIS

in availing quality information for decision-making at all level, to reduce health care cost, and to facilitate cooperation and implementation of E-health at regional and national level.

This study tried to analyze E-health policy issues and strategies in Ethiopia. The study also tried to investigate the existing policies and strategy of the country and the gap which exist within the policies and strategy. The study also focuses on policy and strategy issues regarding successful development and implementation of E-health at national level.

1.3. Objectives of the study

1.3.1. General objective

The overall objective of this thesis was "**to analyze the content of E-health policies in ICT and E-health policy and strategy documents of Ethiopia".**

1.3.2. Specific objectives

- To identify the spectrum of current E-health policy issues in Ethiopia
- To analyze the extent to which the national ICT and E-health policies and strategies developed in Ethiopia
- To explore the policies and strategies set by the Ethiopian government
- To make suggestions regarding the types of policy actions that should be taken to support E-health adoption in the healthcare system

1.4. Significance of the Study

Determining the existing national policy and strategy issues is a milestone for developing national E-health policy and strategy and as well as for successful development and implementation of E-health initiatives. The result of this finding will benefit:

FMOH: the FMoH can use the result of this research to develop or revise the policy and strategy which can be used as a guiding tool in implementation of e-Health. The findings of this research will give baseline information for policy makers and planners. Policy maker and planner can develop or revise a strategy which guide standard system development in order to reduce system failure and lose of investment

Stakeholders (NGOs, Donors): the result of this research can be used as guidelines to stakeholders to prepare local E-health policies at local and organizational level. Stakeholders can use the result of this research to make influence on development of National and local E-health policy and strategy.

Health Organizations and Providers: the result of this research serves as baseline information for organizational leader to plan their strategy in aligns to the national strategy and it also provides roadmap for interoperability between organizations. Health providers also can adopt and use E-health as their day to day activity if system is developed based on their requirement

1.5. Scope of the study

The scope of the study is limited to analyzing policy and strategy documents which are directly related to E-health policies and developed by a federal government of Ethiopia. The purpose of the study is to analyze the content of E-health policies in Ethiopian policy and strategy documents.

The intention of the paper was to identify policy and strategy issues from different literature, and to conduct document analysis based on the identified themes by the literature review. The study is not intended to develop policy or strategy.

1.6. Research outline

The thesis is organized into five chapters. The First chapter Presents, background information and rational of the research. It consist background, research questions, statement of the problem, objectives of the study, significance of the study and scope of the study. Chapter two Literature review, Includes a more detailed definition and overview of e-Health, E-health initiatives and E-health policy and strategy issues from local and global perspectives. It also includes the effects of E-health policy and strategy issues in implementation of E-health projects. The third chapter describes the methodology used to conduct this study. It includes study design, research model; selection of documents, data collection, data quality assurance and method of data analysis. Chapter four presents the finding of the research based from the captured data. Chapter six contains strength and limitation of the study. Final chapter include conclusion and recommendations based on analysis and findings.

2. Literature Review

2.1. Electronic-Health

E-health is the application of ICT in health care delivery in order to enhance the quality of health care. One of the WHO definitions of E-health is "the use, in health care sector, of digital data transmitted, stored, and retrieved electronically in support of health care, both at local site and at a distance" [9].

The scope of E-health is health in general with two major aspects, namely public health which is more concerned about promotion of health and prevention of diseases, and health care which is on individual patient and treatment of disease. The term e- represents the application of ICT in the health sector [6].

2.1.1. Components of E-Health

The domain of E-health has a wide range of components including:

2.1.1.1. Electronic Medical Record

EMR is a computerized patient tracking and caring system. EMR provides a single shared resource for the collection, storage, and use of patient data by health care providers [10]. EMR posses the following functions: clinical data repository, clinical decision support, controlled medical vocabulary, computerized provider order entry (CPOE), pharmacy and clinical document application [10]. EMR is designed to become a longitudinal patient record that employs comprehensive medical record from parturition to death

EMR contain model of the clinical process that allows it to interpret data in a way that is clinically useful [10]. EMR should possess a decision support system like:

Data Dictionary: all data and observation are stored in records, which includes fields that links or point to the dictionary files.

Orientation: provides facility to produce an array of time oriented flow sheets from the stored data.

Introspection: is a decision support tool where the computer is able to examine data and information within EMR database using predefined clinical rules.

The user of EMR system must decide on the *selectivity of data input* and how data will be entered into the medical records manually, electronically or by other processes.

It is possible to access these large volume of clinical data stored in electronic formats using *medical query languages* for the purpose of research, epidemiology and producing reports based on data analysis [10].

The EMR also provide specific clinical decision support tools include Alerting, interpretation, assisting, critiquing, diagnosing and management. The EMR posses numerous advantages for improving the healthcare services, for example, computer support prescribing has been shown to reduce serious prescribing errors by 55% and overall prescribing errors by about 38% [10].

2.1.1.2. Telemedicine

Telemedicine is a remote communication of information to facilitate health care. Telemedicine can be broadly classified into: real-time, and store and forward telemedicine [10].

Real time (synchronies) Telemedicine: there is no delay between the information being collected, transmitted and displayed.

Store-and-Forward (asynchronies) telemedicine: information is acquired and stored in some format, before being sent, for expert interpretation.

Currently developing countries have given much emphasis for telemedicine in order to overcome shortage of specialists in rural areas, but the implementation faces numerous challenges like lack of infrastructure, skilled personnel and policy and strategy.

2.1.1.3. Health Management Information System

Health Management Information System (HMIS) is used to collect, analyze, retains and retrieve and evaluate health information. Information incorporates all data by policy makers, clinicians and health service users to improve and protect population health [11].

Data delivered through the HMIS come from service delivery and administrative records kept as part of routine transactions at health facilities and management offices. In a well-performing HMIS, data should come from every health institution (HI) in the country [11].

2.1.1.4. Mobile Health

WHO defines Mobile Health (m-Health) as "provision of health services and information via mobile technologies such as mobile phones and Personal Digital Assistants (PDAs)" [9]. In developing countries m-Health is recognized as a tool to improve the quality of health care especially in maternal and child care.

According to the vital wave consults report currently the m-health application includes education/awareness, data / health record access, monitoring / medication compliance, disease/ emergency tracking, analysis, diagnosis, and consultation, and other m-Applications [12].

2.1.2. E-health in Ethiopia

The FMoH developed HSDP as a single plan (one plan, one budget, one report) which serves as a guideline for the development of sub-national plans. One of the pivotal components of HSDP is E-health [3]. In Ethiopia, E-health may play a vital role in improving the health care services; including improving health care services, enhance quality of clinical care, and provide quality information for decision making [2].

The FMoH is recognized E-health as a tool to support health care services. The FMoH and its partners have developed and implemented different ICT projects, and the following subtopics are the major ICT projects in country:

2.1.2.1. Electronic Health Management Information System (e-HMIS) in Ethiopia

FMoH and USAID implements e-HMIS as part of paper based HMIS as a pilot project in Southern Nations, Nationalities and People's Region (SNNPR). It is composed of a set of interrelated components and procedures. It designed to enter, store, analyze, aggregate and evaluate health and health related data from facility to central level [2].

E-HMIS has four modules [2]:

Health System Reference Database (HSRD) Module: it provides population denominator for various catchment area to calculate HMIS indicators. Data for the whole SNNPR has been entered into the system and is readily available for updating and use. One important utility of HSRD is that it provides the necessary data on various denominators for the calculation of HMIS indicators.

Data Entry Module: it is made up of two subcomponents; the manual entry and scanning. The scanning of facility reporting forms is especially set to reduce the time the RHB spends manually entering data by a significant margin. This solution is expected to shift this current clerical task to more advance roles such as analyzing data for decision making and working on improving data quality.

Aggregation Module: it is used to aggregates data entered via data entry module which provides woreda, zonal and regional aggregation for the month, quarter and year. The aggregation software is adding significant time savings and improvement to quality by reducing the time it takes to aggregate reports to a matter of seconds and virtually eliminating calculation errors that might occur if the task was to be done manually.

Decision Support System (DSS) Module: it is an ultimate output of every e-HMIS tool to provide access to data collected and that can be analyzed for decision-making.

The DSS is the dashboard that provides decision makers' access to data collected that can be easily analyzed for effective and timely decision making. The DSS employs simple and yet powerful charting tools such as line, bar and maps to communicate information in a way that makes the thousands and millions of records in the database represented in simple user-friendly charts.

In addition to the desktop DSS application, top level management can benefit highly from the Mobile Executive Decision Support System (MEDSS). The MEDSS will be installed on Android mobile devices supporting decision making to the highest standards.

2.1.2.2. SmartCare in Ethiopia

The FMOH of Ethiopia is developing the SmartCare software in partnership with CDC and TUTAPE (Tulane University's Technical Assistance Program for Ethiopia).

SmartCare is an internationally distributed electronic medical records tool that was developed by the government of Zambia [13]. It is currently widely used in Zambia, Ethiopia and South Africa. SmartCare gained recognition as the Electronic Health System Application for Ethiopia following a presentation and live demo of the customized SmartCare EMR. The presentation was to the FMOH officials including Ministers, State Minister, Department/Agency Heads, Regional Health Bureau Heads, and other relevant stake holders [13].

The Conceptual Framework of SmartCare draws the connection between the correct implementation of the SmartCare system and the improved health status of Ethiopians. This portable electronic patient health record is designed to allow service providers to access historical patient data regardless of health facilities used in the past or types of services sought [13]. SmartCare implementation is limited to few hospitals around Addis Ababa and Dire Dawa and the FMoH is facing numerous challenges to scale up the system to nationwide.

The deployment of SmartCare includes building/strengthening ICT infrastructure (Hardware, Software, & Networking components) and the Installation and Training of SmartCare software application at the Health Facilities.

In order to make data available at real-time to all points of service within the Health Facility, SmartCare is installed in a centralized mode (client/server). This mode operates on an online communication infrastructure within the Health Facility. The Wireless Local Area Network (WLAN) demonstrated as the appropriate technology for building the online communications infrastructure. The major advantage of WLAN includes easy, fast, and affordable networking solution for Health Facilities.

SmartCare is installed and introduced in phases. The initial installation/introduction phase starts at the hospital level in the medical record Room and the triage room where the bulk of data encoding takes place followed by other clinics including outpatient, inpatient, MNCH, laboratory, pharmacy, ART, VCT and TB.

SmartCare is used by Clinicians, the Health Facility Heads, Data Entry Clerks, & the HMIS officers. Patient information is encoded in SmartCare by either Clinicians or Data Entry Clerks depending on their allowed role security which defines the module, they get access to. Data

could be encoded and/or viewed either while the Patient is within the health facility or after the patent has left.

2.1.2.3. M-Health Project in Ethiopia

The FMoH and its partners have developed m-Health project to support Maternal, Neonatal and Child Health care (MNCH). FMoH identified m-Health as a key enabler to improve the MNCH services and to reduce child and maternal mortality rate (MDG 4 and 5) [14].

The m-Health project focused on Health Extension Workers (HEWs) and MDG 4 and 5. It is implemented as pilot project in 5 health posts in SNNPR. The m-Health facilitates effective communication between HEWs and pregnant mothers and between HEWs and Health posts [14].

The vital wave consulting 2011 report on m-health in Ethiopia identified five information and communication need of HEWs that could be addressed by mobile technologies: referral, data exchange, supply chain management, training and educations and consulting [12].

Other than m-Health project which is implemented by FMoH and its partner, there are also m-Health projects which are developed by NGOs like WHO and Clinton Foundation. These projects also developed to support the MNCH services focusing on HEWs and MDG 4 and 5. M-Health in Ethiopia is now face two major challenges: fragmentation and duplication of projects.

2.1.2.4. Telemedicine project: Pan-African Telemedicine

The Pan-African Telemedicine is part of Pan- African e-Network. It consist of two projects: Tele-medicine centre (equipped with servers, PCs, UPS, medical equipment) in Black Lion Hospital, and Nekemte Hospital Tele-medicine centre in, Nekemte town [15].

The Tele-Medicine network provides connectivity of Telemedicine set-up of CARE Hospital, Hyderabad with two Tele-medicine centers in Ethiopia, which enables the Indian medical specialists to provide on-line medical consultation to the doctors in the telemedicine centers in Ethiopia [15].

Telemedicine system consists of customized medical software for patient demographics and workflow for Tele-advice with PACS server and DICOM Server with computer hardware, medical diagnostic instruments which are DICOM compatible and connected to the network. The

medical record/history of the patients can be captured and stored in the DICOM format in the server and sent to the specialist doctors in India, who in turn study and provide diagnosis and treatment during live Tele-interactions with the doctor at the patient-ends in Ethiopia. The facility caters normally for transmission of patient's medical images, records, output from medical devices, and sound files, besides live two-way audio and video. With the help of these EMR, a specialist doctor would advise a doctor or a paramedic at the patient's end on-line, saving critical time and resources. Initially the telemedicine is planned to provide services of medical consultation and treatment in the areas like cardiology, radiology, neurology, pathology, and gynecology [15].

Tele-Medicine facility at CARE hospital Hyderabad enables Doctor to patient and Doctor to Doctor interaction for various treatments by transmitting digitized form of X-Rays, ECG, Ultrasound and other test reports from Hospitals in Ethiopia. This facility enables patient to consult with doctor even from remote areas in Africa [15].

In addition, to facilitate continuous learning in the Medical Sciences, doctors in Ethiopia can get it through the Continuing Medical Education (CME) program available through this project. Here Doctors at Addis Ababa can interact with specialist doctors to discuss case study and can enhance their knowledge in the respective field.

There was also another project on telemedicine which is The Ethiopian Telemedicine pilot project connects the central referral hospital to 10 rural sites. In this project It is supposed to practice Teleradiology and teledermatology by using Tikur Anbessa, Gonder and Jimma university hospitals as specialty centers for Radiology consultation, and ALERT hospital for dermatologic consultation [16]

2.2. E-health policy issues

E-health policy has been defined as "a set of statements, directives, regulations, laws and judicial interpretations that direct and manage the life cycle of e-health" [17]. Using this definition, Scott identified and described four categories of policy maturity for any jurisdiction. These are, beginning with strongest:

- **Stage 1** – *Regulations and laws governing E-health activity*. This represents well-established development of policy, with it being formally embedded into the administration of the jurisdiction.
- **Stage 2** – *Statements, directives, guidelines defining and delimiting E-health activity.* This shows clear evidence of formal written material that governs at least some E-health activity.
- **Stage 3** – *Evidence of pro-active consideration of E-health activity.* This is an important stage, and might be where a jurisdiction establishes mechanisms and / or funding programs to move E-health initiatives forward.
- **Stage 4** – *Broad suggestions of intended direction encompassing E-health activity*. This is the weakest, yet probably most common 'policy statement' for any jurisdiction [18].

Scott also defined E-health policy issues as "*point or matter of discussion, debate, or dispute that may promote or inhibit inter-jurisdictional e-health*" [18]. The idea of E-health policy is still not mature but more than 50% of world countries have E-health policy. The early adopters includes: Australia, Canada, China, Croatia, Denmark, Finland, Iran, Malaysia, Malta, New Zealand, Russia, Tanzania, United Kingdom and United States [19].

E-health policy has numerous benefits like ensuring ownership and shared responsibility for successful implementation; provide coordination and collaboration between stakeholders, providing a framework for E-health implementation by all stakeholders in collaborations with other sectors [20].

The World Health Organization strongly recommends the need for a strategic and integrated action at national level to enhance the sustainability of E-health projects. The evidence based integrated strategy would maximize the efficiency and efficacy of E-health implementation [4]. Government policy at the national level can have a dramatic effect on the diffusion of ICT. It is government that creates the policy environment that will foster technology use and encourage national and international investment in ICT infrastructure, development and a skilled force [19].

Afari, [21] indicates that for countries to experience any successful implementation of E-health projects, the right policies and strategies must be in place. A review which was conducted in different countries (like USA, Ethiopia, and Canada…) E-Health and ICT policy documents

identify that, there is lack of proper policy and strategy for E-health [22]. Scott, [19] also indicate that, "*E-health must be integrated into domestic and global health care system at both practical and policy levels*".

Studies show that one of the major problems in E-health implementation is lack of defined policy and strategy. Research conducted in Canada shows that, the reason to limited successful of Canada E-health plan is lack of comprehensive and well developed national policy to guide investment and adoption of E-health initiatives. The study recommends "*Canada E-health plan needs to be driven more by policy related to expected benefits for patients and providers than by technological solutions"* [23]. The Australia health ministry also highlights the need for E-health strategy and policy because of risk in duplicating or creating E-health solution that cannot be scaled across the continuum of health care [24].
Another research result which is conducted in commonwealth puts lack of policy and strategic plans in most member states and lack of information and communication technology (ICT) policy which integrated into health and E-health policies as major E-health issues and challenges in commonwealth [25].

Numerous researches and documents highlighted that E-health projects implementation should be based on national policy [26], [27]. The information telecommunication union (ITU) toolkit for developing E-health recommends that, E-health implementation efforts must be based on: national priorities and medium to long term action plan to attain the priorities [26].

According to WHO and ITU, Development and operation of E-health environments should be supported by E-health components like legislation, policy and compliances. Table 2.1 provides the description of these components [27].

Table 2.1.: Examples of common E-health legislation, policy and compliance components. WHO and ITU E-health strategy toolkit (2012)

Component	Description	Example
Legislation	National legislation, policy and regulatory components that govern how health information is stored, accessed and shared across geographical and health sector boundaries	• Unique health identifier regimes • Privacy, protection, storage and retention of personal health information • Consumer protection including in the online environment • Access and consent to personal health information use an disclosure, including secondary use • Audit and complaint procedures (e.g. such as those required for suspected breaches of privacy) • Licensing regimes which may be needed to ensure that private operators of components of a national E-health environment meet required standards for privacy, integrity and security
Policy	Broader public policy required to support the development of a national E-health environment	• Health sector policy (e.g. reform, improved access to and use of health information) • Non-health sector policy (e.g. broader industry and economic development, utilization of existing e-Government infrastructure) • Policies to stimulate and manage innovation, risk, evaluation of feasibility and utility of services
E-health policy	Policies specifically governing E-health services, including privacy of health related data held in digitize format, its use and sharing for	• Policies on medical jurisdiction, liability for E-health services (e.g. telemedicine), safety, data integrity and quality of care • Policies for reimbursement for E-health services (e.g. telemedicine), both public and private • Policies for managing Internet health information quality, sales of medicines and regulated health products • Policies to demonstrate E-health outcomes and clinical

	research and the public interest	effectiveness
Compliance	Components required to support the development of E-health products and which are compatible with national E-health environments	• Development of national E-health standards and other interoperability requirements • Compliance, conformance and accreditation of E-health products and services

Source: WHO and ITU. National E-Health Strategy Toolkit, Part 1: E-Health Vision. WHO Press, 2012

Developing international E-health policies can be a big challenge. E-health expectations and requirements differ in developed world when compared to developing world. The major concern of developed countries for example is to provide homecare's for aged population by implementing e-card services. The developing countries, on the other hand, are more concerned on overcoming extreme shortage of professionals, especially in rural areas. Therefore, one which is acceptable in developed world, in terms of data quality and security, patient confidentiality and privacy, may be impediments to the E-health policy of developing countries. Even the E-health policy and strategy focusing issues differ between countries context. However developed countries are striving for Global E-health policy and a good example is E-health road map of Europe [25].

There are various E-health policy issues that need attention, including organization structural framework, product liability and jurisdiction, licensing [29], confidentiality, privacy, security [30], standard and interoperability [31].

2.2.1. Global E-health Policy

To make Global E-health effective, E-health must become fully integrated into the existing national, international and global health related structures, in both process and policy sense.

E-health solutions have become more national and even global- referred to as inter-jurisdictional E-health activity. However the need for broad policy to facilitate unfettered inter-jurisdiction activity has not got much attention [20].

There are several commonly identified policy problems for E-health they are privacy, confidentiality, security, licensure, liability and re-imbursement. There is E-health policy document in many countries, but it is often more related or focused on ICT rather than specifically e-Health. For example, almost all of Africans policy document refers to ICT policy and not specifically to e-health. So to foster the development of e-health, countries should develop a clear supportive E-health specific policy [20].

According to Scott, [19] there are two basic policy options for global e-Health:

- *Continued ad hoc development followed* by policy realignment: This is the status quo. It maintains the confusion and prevents streamlined global E-health and will require year of retrospective policy re-alignment to bring many disparate approach together.
- *Progressive and collaborative complimentary development:* A better approach is to permit the benefits of global e-health, E-health to be realized sooner, would do initiate a process to guide global E-health policy development. The goal would be to identify common principles that can be agreed with relative ease, and then to use these to encourage development of domestic policy that is in line with global E-health principles.

The potential impact of global E-health is undeniable. Therefore there is a need for concerted development of "Glocal" E-health principles and complementary domestic policy.

Given the inherently inter-jurisdictional nature of e-health, common solutions to E-health policy issues must be sought across jurisdictions, rather than each jurisdiction considering and responding to issues independently [28].

2.2.2. E-health policy Analysis Frameworks

There are different proposed E-health policy analysis frameworks by different researchers. Only five of them were discussed below.

E-health ERA Framework

In 2007 the E-health ERA team and partners developed E-health policy analysis frameworks. The framework was developed to guide the analysis of existing E-health policies in Europe. It tried to understand the basic characteristics of E-health in relation to existing European countries policy documents. Totally it has 8 major policy areas [32]. Table 2.2 includes all the policy areas described by the Framework.

Table 2.2.: E-health ERA Policy analysis Framework

E-health Policy Areas
FACTS AND FEATURES OF HEALTH SYSTEMS AND GEN. POP
STRATEGIC E-health PLANS/POLICY MEASURES
• **National-regional E-health policy documents**
• **Main actors shaping regional-national E-health policy documents**
• **Other key players involved in drafting E-health policy and working in roadmap "implementation chain"**
• **Main strategic targets of national or regional E-health roadmaps**
SOCIAL CARE
INTERNATIONAL COLLABORATIONS
DISSEMINATION AND COORDINATION ACTIVITIES
INVESTMENT AND REIMBURSEMENT FRAMEWORK
E-health INFRASTRUCTURE
• **Physical networks**
• **Legal and regulatory framework**
• **Education and training on ICT**
E-health DEPLOYMENT STATUS
• **Electronic patient record**
• **E-Prescription**
• **Patient and Professional identifiers**
• **Health cards**
• **Health portals**

Source: Hamalainen et al. The European E-Health Policy, and Deployment Situation by the End of 2006 Deliverable 2.2 of the E-Health ERA Project. E-Health ERA; 2007 Nov

Harmonization of E-health initiatives in Africa

Harmonization of E-health initiatives in Africa policy frame work was developed in 2009. The documents were intended to serve as a guide for African countries for the development of comprehensive policies and strategies to facilitate the deployment of E-health in African counties

[33]. The document was developed by African unions and its partners and contains 9 key policy areas. Table 2.3 provides all the nine policy area of the E-health policy framework

Table 2.3.: Harmonization of E-health initiatives in Africa E-health policy frameworks

Policy Areas
Leaderships and Coordination
Infrastructure and Interoperability
Human Resources
Licensure, Liability and Reimbursements
Pro-poor services
Security, Privacy, Confidentiality of Data services
Information quality
Funding
Monitoring and Evaluation

Source: African Union. Draft policy for harmonization of E-health initiatives in Africa. 2010.

HTU 'Glocal' E-health policy Grid

HTU 'Glocal' is developed by Scot et al. [30] in 2004. The E-health policy frame work analysis was developed to identifies and have better understanding of all E-health policy arising issues [30]. The E-health policy framework by Scot et al. contains nine policy themes and eight policy levels. Table 2.4 includes each policy themes and policy levels.

Table 2.4.: HTU 'Glocal' E-health policy Grid

POLICY THEMES
PROFESSIONAL
OPERATIONAL
INSTITUTIONAL
ETHICAL
LEGAL
CULTURAL

COMMERCIAL
COMMUNICATION
INTEROPERABILITY
POLICY LEVELS
PATIENT
COMMUNITY
PROGRAM
ORGANISATION
REGION
PROVINCE
NATIONAL
GLOBAL

Source: Richard E.et al. Access and authorization in a Glocal e Health Policy context, International Journal of Medical Informatics, Elsevier 2004;**73**, 259—266

HTU - Tel-health and E-health policy consideration for Alberta

This tel-health and E-health policy framework was developed by Scott RE et al, [34] for Alberta health and wellness. The document was published in 2004. The document was developed to identify and describe the spectrum of tel-health and E-health policy issues, and offering a recommended 'priority list' of policy issues for Alberta [34]. Table 2.5 describes all the variables included in the frame work

Table 2.5.: Tel-health and E-health policy related themes for Alberta Health and Wellness

Policy Themes
Data Stewardship
• Privacy protection
• Data security
• Documentation
• Information quality
Operational

• Risk management
• Liability
• Referral patterns
• Ownership
• Human resources
• , Reimbursement
• Evaluation
• Business case
• Funding
Inter-jurisdictional
• Inter-jurisdictional billing
• Locus of consultation
• Integration

Source: Scott RE et al. Tele health and E-health Policy consideration for Alberta. Alberta Health and Wellness. August 2004

E-health preparedness Grid

E-health preparedness grid was developed by Wickramasinghe et al, [35] in 2005. The aim of the frameworks was to asses' countries capability and readiness towards deployment of E-health solutions [35]. The framework includes four main pre-requisites and four main impacts. It also describes the influence of the pre-requisite and impacts on the achievements of E-health objectives. Table 2.6 describes all elements included in the E-health preparedness grid.

Table 2.6.: E-health preparedness Grid

Policy Themes
ICT ARCHITECTURE/INFRASTRUCTURE
STANDARIZATION POLICIES, PROTOCOLS AND PROCEDURES
USER ACCESS AND ACCESSIBILITY POLICIES AND INFRASTRUCTURE
GOVERNMENTAL REGULATIONS AND ROLES

Source: Wickramasinghe et al. A Framework for Assessing E-health Preparedness. Int J E-Health 2005

2.2.3. E-health policy Matrix

Policy is not the sole purview of politicians. Both public and private sectors make E-health related policy. Each approach determines the context in which E-health applications are developed and deployed [34].

At country level E-health policy was used for two matrixes:

Organizational/local: this is the level where policies are required to manage E-health programs within a single institution or multiple institutions [34].

National level: policies are made to guide E-health initiatives between regions [5].

2.3. E-health Strategy

Evidence shows that integrated E-health strategies can improve productivity, reduces costs and improve service quality of the health sector in the long run [40]. Research conducted in Canada Infoways strongly recommends that E-health should be supported by comprehensive strategy that defined a national approach to the infrastructure and standard of HIT that will allow for interoperability [23].

According to ITU "*successful E-health services require more than just technology: committed policy makers who promote national strategies and facilitate capacity building are essentials for the E-health system to work in practice*" [36]. E-health applications must be part of a comprehensive national health strategy that based on current and future health and healthcare issues:

- Identifies opportunities and challenges for the health sector in general and E-health in particular
- Sets up priorities and determines the best means to achieve them in a sustainable manner
- Includes capacity building and promotion activities
- Considers national and regional differences in priorities and needs
- Is integral part of national development projects [36].

Other than this, there are also other principles for national E-health strategies like: achieving interoperability among systems and reducing the cost of devices through economies of scale, and

this can be achieved by developing and adopting global international standards. Security is another key area for the evolution and adoption of E-health services that needs to be addressed in national E-health strategies

The WHO developed National E-health strategy toolkit which is aimed to guide the formulation and development of country e-Heath strategy. The toolkit describes the development of strategy by three parts which was built progressively [27]:

Part I: develops a national E-health vision that responds to health and development goals. It explains why a national approach to E-health is needed, what a national E-health plan will need to achieve, and how it will be done.

Part II: lays out an E-health action plan that reflects country priorities and the E-health context. It structures activities over the medium term, while building a foundation for the long term.

Part III: establishes a plan to monitor implementation and manage associated risks. It shows the progress and the results of implementation and helps in securing long-term support and investment.

2.4. E-health strategy in other countries

Countries should develop a strategic document that aligns with policy to successfully implements E-health projects. The following subtopics discuss the two sample E-health strategy documents: Australia E-health strategy, and South Africa E-health strategy. These two countries are taken as an exemplary because of their success in acquisition, deployment and Adoption of E-health solutions

Australian E-health strategy

Vision: E-health will enable a safer, higher quality, more equitable and sustainable health system for all Australians by transforming the way information is used to plan, manage and deliver health care services [19].

The National E-health strategy provides a framework and plan for national coordination and collaboration to further develop E-health in Australia. The response to the Strategy will be coordinated through the Australian Health Ministers Conference (AHMC). The AHMC will be

supported by its advisory committees, in particular the Australian Health Ministers' Advisory Council (AHMAC) and the National E-health and Information Principal Committee (NEHIPC) [24].

There are seven principles that underpin and inform the proposed strategy and approach: National infrastructure, Stakeholder engagement, Incremental approach, Recognizing different starting points, Leverage , Balancing alignment and independence, Relevant skills [24].

South Africa E-health Strategy

Vision: enabling a long and healthy life for all South Africans [37]

The E-health strategy for public health sector provides the road map for achieving well-functioning national health information system. The MoH and National Health Council (NHC) will be responsible for implementation and evaluation of the strategy [37].

The basic principles of the strategy are: Get the basics right, incremental approach, Advocate the benefits, and evaluate E-health initiatives, national coordination, leverage partnership, security, confidentiality and patient privacy [37]. The national E-health strategy consists of 10 strategic priorities:

Strategic Priority 1: Strategy and Leadership

Strategic Priority 2: Stakeholder Engagement

Strategic Priority 3: Standards and Interoperability

Strategic Priority 4: Governance and Regulation

Strategic Priority 5: Investment, Affordability and Sustainability

Strategic Priority 6: Benefits Realization

Strategic Priority 7: Capacity and Workforce

Strategic Priority 8: E-health Foundations

Strategic Priority 9: Applications and Tools to support Healthcare Delivery

Strategic Priority 10: Monitoring and Evaluation of the E-health Strategy

2.5. E-health policy and strategy in Ethiopia

The HSDP mentions E-health as one of the components to facilitate the health care system [3]. The Ethiopian government also developed ICT policy and E-health strategy documents for implementation of E-health initiatives but there is no separate E-health policy document. The new partnership for African development (NEPAD) Health strategy (2003) also fails to mention E-health as components of health care system [19]. According to WHO the ministry of health should play a pivotal role on building consensus on policy and developing strategic document which can guide the implementation of ICT projects for health [1].

According to WHO guideline, Ethiopian E-health context can be described as Experimentation and early adoption: ICT and enabling environment for E-health are both in early stages [19]. Thus, the national policy in this case should focus on improving access and quality of health care services by using E-health and strategy should focus in development of E-health in priorities of system and services.

3. Methodology

3.1. Study Area

The study was conducted in Addis Ababa, Ethiopia from March to April/2013. Ethiopia is located in the horn of Africa with total area of around 1.1 million square kilometers. It borders with five countries: Eritrea in north, Djibouti in the east, Sudan in the west, Kenya in the south and Somalia in the south east [2]

According to CSA, Ethiopia's population is estimated to be around 85 million where 85% resides in the rural part of Ethiopia. The population pyramid is young and the annual population growth rate is 2.6% [2].

The Federal Democratic Republic of Ethiopia has nine Regional States: Tigray, Afar, Amhara, Oromia, Somali, Southern Nation Nationalities and Peoples Region (SNNPR), Benishangul-Gumuz, Gambella, Harari; and two city Administrations: Dire Dawa and Addis Ababa. The regional states and city administrations are further subdivided into 817 administrative Woredas/districts (decentralized administrative unit) and into about 16,253 Kebeles (Smallest Administrative Units)

3.2. Study Design

The research method chosen for this study is qualitative content analysis. Content Analysis as research method is a systemic and objective means of describing and quantifying phenomena. It is also known as method of analyzing documents, concerned with meaning, intentions, consequences and context. Despite this, a hybrid method that incorporated both data-driven inductive approach and deductive application of variables, based on the analysis of E-health and policy related framework is used in this study.

A qualitative content analysis was conducted on Ethiopian policy and strategy documents, to analyze the content of E-health and E-health policies. National policy and strategy documents related to E-health are sought and analyzed. Literature review was conducted to identify E-health and policy related framework for deductive analyze (see figure 3.1.)

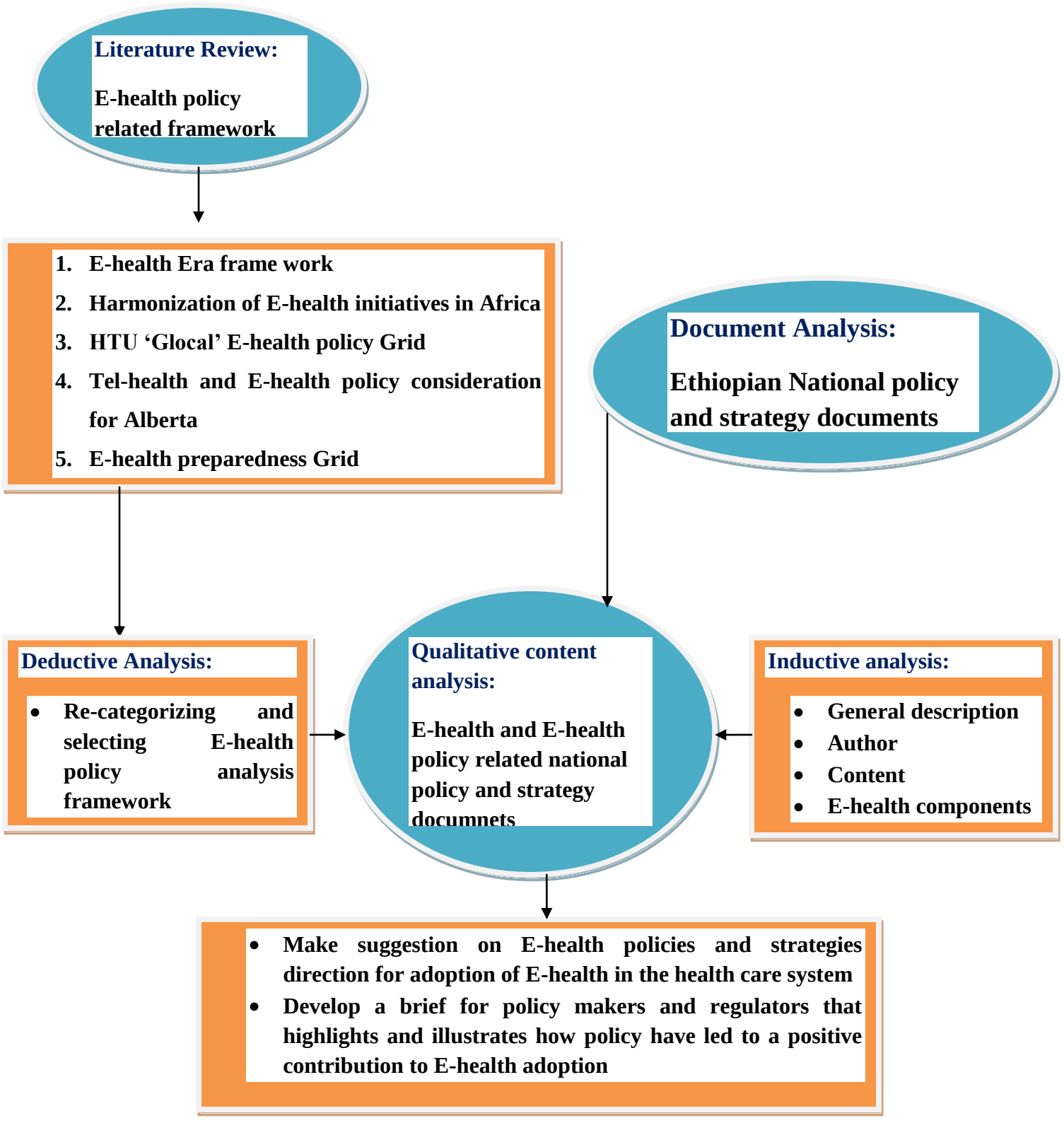

Fig 3.1.: Research Model: Conceptual Framework

The methodology selected for this study involves:

1. Review of relevant literature to identify E-health and policy related framework
2. Selecting E-health policies relevant to Ethiopian health care systems and Re-categorizing E-health policy analysis framework. To select issues which are most relevant, two approaches were conducted:
   2.1. Conceptualization the issues in relation to the need of the current and planned E-health activities in Ethiopia (see chapter 2 and Annex IV)
   2.2. Frequency of issues identified: Selecting policy issues which are common in each E-health policy frameworks
3. The collection and review of existing national policy and strategy documents
4. Analysis of the data collected, formulation of conclusion and development of recommendation

3.3. Identification of National policy and strategy documents

Systemic review and direct contact was conducted to identify and obtain national policy and strategy documents which are related to E-health and E-health policies.

3.3.1. *Inclusion Criteria*

Policy and strategy documents issued by the National Government were sought.

3.3.2. *Exclusion Criteria*

Documents applicable to sector other than health or lacking the statements of goals and strategies for the use of ICTs in the health sector

3.4. Method of Data Collection

Qualitative Data were collected by using Literature Review and Document analysis. Literature review was conducted to provide framework for deductive analysis of policy and strategy documents. Document analysis was conducted on policy and strategy documents issued by National Government.

Data coding is documented in word documents. For PDF documents, an electronic copy was stored in password-protected computer and in an external memory device.

Literature Review

Unstructured internet based focused literature review is conducted to identify the current E-health policy and strategy issues. A focused Literature review is conducted to identify E-health and E-health policy related framework for deductive analysis. The main search engine used for on-line searches of the world-wide-web (www) was Google (a Meta search engine).

Document Analysis

National Policy and Strategy documents were analyzed in regard to the content of E-health and E-health policy. The documents which were analyzed include national policy and strategy documents issued by governments, and related to E-health and E-health policies. Documents are obtained directly from the concerned government organ both on hardcopy and softcopy. The policy documents which were analyzed are listed as follow:

- The ICT policy and strategy of Ethiopia [38].
- Ethiopian National E-health strategy document (2012-2015) [39].
- National Health information System roads Map (2012-2019) [40].

3.5. Data Quality Assurance

Data quality was maintained by designing the proper data analyzing instruments. Relevant data are collected from reliable source. Standards are maintained in data collection, data coding and analysis.

3.6. Methods of Data Analysis

Data were transcribed into a word processor document for Microsoft Office Word 2007 (Microsoft Corporation). The result was analyzed by content analysis.

Data coding procedure

Step 1: Initial reading of the text and preparation for data analysis

Each policy and strategy documents were first read to obtain a better understanding of the documents

Step 2: Coding

Inductive Analysis

The summarized documents were first inductively analyzed and coded in word for general arising attributes. Coding of inductive Analysis contains the following steps:

Initial read through text data ⟶ Identify specific segments of information ⟶ Label the segments of information to create categories ⟶ Reduce overlap and redundancy among the categories ⟶ Create a model incorporating most

The labels used for coding were: *general description; authors, contents; and E-health components.*

Deductive Analysis

After identifying five e-Health-related frameworks, the variables included in each one were reviewed. In result, five frameworks were ultimately considered (all frameworks are discussed in chapter 2):

1. E-health Era frame work
2. Harmonization of E-health initiatives in Africa
3. HTU 'Glocal' E-health policy Grid
4. Tel-health and E-health policy consideration for Alberta
5. E-health preparedness Grid

From the arising attributes Re-categorized E-health policy analysis framework is developed for deductive analysis.

Step 3: Categorization and Abstraction

To ensure consistent interpretation of the variables in the proposed guiding framework, E-health policy summary was selected and the framework was refined based on relevant literature

4. Result and Discussion

4.1. E-health policy issues

Focused literature search were conducted to identify the spectrum of E-health policy issues.

4.1.1. Focused Literature search and Review

Internet based focused literature search was performed (see chapter 3). Overall the result of the searches yielded relatively few applicable publications articles and reports. From the articles and reports five E-health policy related frameworks were identified for review:

After identifying five E-health related frameworks information included in each frameworks were reviewed (for detailed discussion see Chapter 2)

4.1.2. E-health Policies Identified

A total of 60 E-health policy related issues were identified from the searches and reviews of the literatures. These are listed alphabetically in Table 4.1.

Table 4.1.: E-health Policy Related Issues identified from literature (Alphabetically Listing)

S.No.	Policy Issues	S.No.	Policy Issue	S.No.	Policy issues
1.	Access	21.	Funding (private)	41.	Privacy protection
2.	Accountability	22.	Funding (public)	42.	Privileging
3.	Accreditation	23.	Governance	43.	Professional-patient relationships
4.	Building ICT infrastructure	24.	Human Resources	44.	Pro-poor services
5.	Business case	25.	Information quality	45.	Readiness
6.	Certification	26.	Integration	46.	Reciprocal billing
7.	Change Management	27.	Inter-jurisdictional billing	47.	Referral patterns
8.	Competence	28.	Inter-Ministry trade	48.	Registration

9.	Confidentiality	29.	Interoperability	49.	Regulatory Framework
10.	Consent	30.	Inter-professional relationships	50.	Regulatory support and clarification
11.	Control	31.	Leadership	51.	Reimbursement
12.	Credential	32.	Legal	52.	Responsibilities
13.	Data Stewardship (records)	33.	Liability	53.	Risk management
14.	Data Security (encryption)	34.	Licensure	54.	Roles
15.	Development of networks	35.	Malpractice	55.	Scope of practice
16.	Documentation	36.	Monitoring	56.	Standards
17.	Due diligence	37.	Organization of medical services	57.	Social Care
18.	Ethics	38.	Ownership	58.	Sustainability
19.	Evaluation	39.	Phased Infrastructure	59.	Technological reliability
20.	Focal point of consultation	40.	Planning and coordination	60.	Training

Source: Scott RE et al; 2004. [34]; Hamalainen P et al; 2007 [32] and African Union, 2010 [33].

4.1.3. Categorizing the E-health policy issues

To better understand the list of E-health policy issues, the variables from the frameworks generated by Harmonization of E-health initiatives in Africa, HTU 'Glocal' policy Grid and Tel-health and E-health policy consideration for Alberta, were then used as a guide to group the data into categories.

Based on the theme emerging from the data and the variables established by the frameworks a new list of themes was created by Re-categorizing. As a result, the final list of schemes identified eight policy themes (see figure 4.2.)

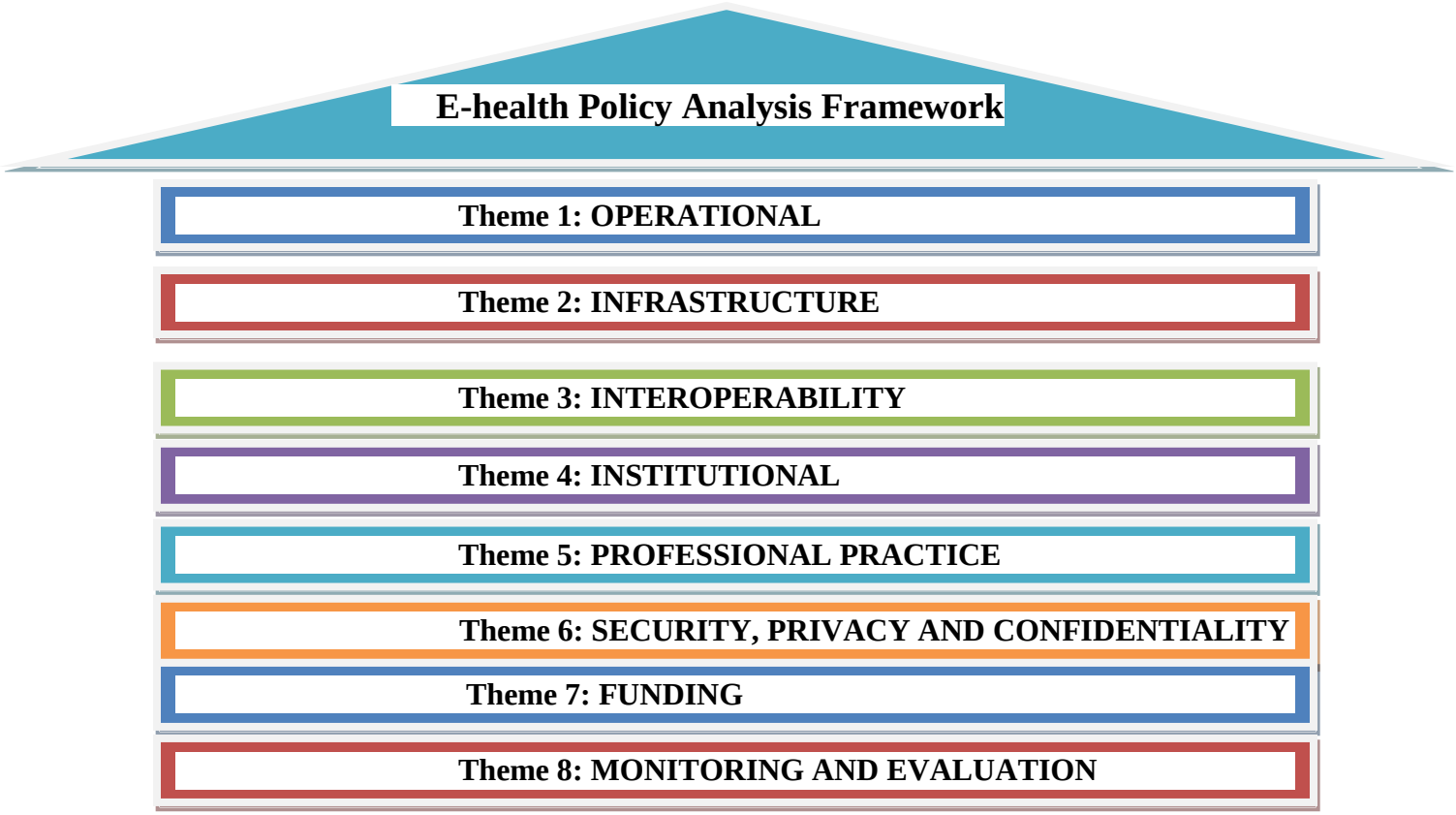

Figure 4.1.: E-health policy analysis frameworks themes, April 2005, Addis Ababa

4.2. Major E-health policy issues for Ethiopia

In order to conduct deductive analysis on E-health related policy documents, E-health policies which are relevant for the current E-health system of Ethiopia should be selected. As a result, from identified E-health policy issues those that are most relevant to Ethiopian health care system are selected.

To select issues which are most relevant two approaches were conducted:

1. Conceptualization the issues in relation to the need of the current and planned E-health activities in Ethiopia (see chapter 2 and Annex IV)
2. Frequency of issues identified: Selecting policy issues which are common in each policy frameworks

As a result, 25 specific issues were selected that could guide the adoption and implementation of E-health in Ethiopia.

In total, the re-categorized E-health policy analysis framework contains 8 themes and 25 subthemes which were used for deductive analysis. The subthemes are described here under and Table 4.2 shows the complete list of themes and subthemes.

Table 4.2.: Re-Categorized E-health related policy analysis framework themes and subthemes of most relevant to the current health care system of Ethiopia, May 2005, Addis Ababa

Policy Themes and Subthemes
OPERATIONAL
• **Collaboration**
• **Data Stewardship**
• **Governance**
• **Human Resource**
• **Information quality**
• **Liability**
• **Ownership**
• **Reimbursement**
INFRASTRUCTURE
• **Building ICT Infrastructure**
• **Development of Network**
INTEROPERABILITY
• **Standards**
• **Interoperability**
INSTITUTIONAL
• **Competence**
• **Credential**

• **Readiness**
• **Training**
PROFESSIONAL PRACTICE
• **Inter-professional relationship**
• **Licensure**
SECURITY, PRIVACY AND CONFIDENTIALITY
• **Data Security**
• **Privacy protection**
• **Confidentiality**
FUNDING
• **Private**
• **Public**
MONITORING AND EVALUATION
• **Evaluation**
• **Documentation**

Operational

This theme contains the following subthemes:

- Collaboration: include inter-sectoral, non-governmental and private collaboration at local, national, regional, and global level for the achievement of E-health in the country [41].
- Data stewardship: refers to Establishment of formalized processes to ensure trusted and reliable accountability of information assets (data) [5].

- Governance: refers to creating enabling environments to E-health solutions by formulating policies and guidelines. It also includes establishing transparency and accountability in the E-health system [41].
- Human resource: includes provision training of health informatics training at all level and proper distribution of human resources
- Information quality: includes maintains integrated and quality of information to ensure that the quality of information is not compromised to the level that it risks the provision of safe care to the patient [6].
- Liability: includes how medical malpractice liability and accountability handled, in case of any outward incidents [5].
- Ownership: defining sense of accountability and provide continuous technical support [4].
- Reimbursement: deals with the decision for the compensation (e.g. payment, incentives) of health care professionals when providing E-health services [42]

Infrastructure

- Building ICT infrastructure: deals with the acquisition and deployment of appropriate technology (ICT infrastructure). It also includes controlling cost of technology and capacity building [5], [41].
- Network developments: refer to allow greater penetration of telecommunication to reach the remotest area. It also deals with providing universal and unlimited access to internet [30].

Interoperability

- Interoperability, The ability of one system to work with or "talk to" another, enables communication and exchange of data between different IT systems, software applications and networks in various setting [33].
- E-health interoperability at the systems level can be defined as the ability of two or more information systems to exchange both computer interpretable data and human interpretable information and knowledge [43].
- Standards: is any meaningful statement depends upon sets of semantic and syntactic rules [43]. It includes communication standards, network standards, equipment standards, health

data standards, and clinical contents standards. It allows interoperability and integration of HIS [6].

Institutional

This main theme contains the following subthemes:

- Competence: refers to assessing and certifying the skill of health care professional that practices E-health solutions [5].
- Readiness: deals with building an effective Change management for the implementation of E-health solutions [5].
- Training: includes provision of support and continuous on-job training

Professional practice

This main theme contains the following subthemes:

- Inter-professional relationship: refers to the collaboration of health care professionals with each other. It includes sharing of skill and knowledge between different professionals regarding E-health solutions [5].
- Licensure: refers to the granting of a permission or license to practice a profession within the E-health related scope of practice [33].

Security, Privacy and Confidentiality

- Security: is about the protection of personal health information from unauthorized access, use or disclosure. It includes the protection of information, network, software and hardware against attack and unauthorized access [41].
- Privacy: is the claim of individuals to determine for themselves when, how, and to what extent information about them is communicated to others [44]
- Confidentiality: is non-disclosure of private or secret information with which one is entrusted. Legally, this requirement applies to Health care professionals and others who have access to information about patients, and continues after patient's death [44].

Funding

- Public funding: deals on governmental financial provision and support for E-health solutions at all level [41].
- Private funding: refers to provision and support of financial resources by private sectors, non-governmental organizations, International bodies, banks and other non-governmental sectors [41].

Monitoring and Evaluation

- Evaluation: deals on assessing the efficiency and effectiveness of E-health solutions based on the established indicators
- Documentations: include the measure undertaken to obtain E-health related information and data.

4.3. Synthesis and analysis of Ethiopian ICT policy and E-health Strategy documents

Three E-health related policy documents were analyzed inductively and deductively. These documents are:

- The ICT policy and strategy of Ethiopia (ICT Policy)
- Ethiopian National E-health strategy document (2012-2015) (E-health Strategy)
- National Health information System roads Map of Ethiopia (2012-2019) (National HIS Roadmap)

4.3.1. Published E-health related policy documents

The earliest published document is the ICT policy documents in 2009. Both the Ethiopian National E-health strategy and National Health Information System Roadmap of Ethiopia are published in 2012.

Table 4.3.: Synthesis of E-health related policy documents of Ethiopia, April 2005, Addis Ababa

Documents	Year of publication	Document length	Document Authors
National ICT policy of Ethiopia	2009	26 pages	MCIT
Ethiopian National E-health Strategy (First Draft)	2012	29 pages	MoH
National HIS Roadmap of Ethiopia	2012	67 pages	MoH

There is a little variability in the length of the document. The ICT policy contains 26 pages and the National E-health strategy and the National HIS Roadmap contains 29 and 67 pages respectively. See Table 4.3 for general description.

4.3.2. Documents Author/participants

All the retrieved documents are issue by Government. The ICT policy is issued by Ministry of Communication and Information Technology (MCIT). Both The National E-health Strategy and the National HIS Roadmap is issued by MoH.

In all documents, other stakeholders (governmental or non-governmental) were also involved in the development process of the policy documents (see Table 4.4).

Table 4.4.: E-health policy Documents Authors/Participants

Participants	Policy and Strategy Documents		
	National ICT policy	National E-health Strategies	National HIS Roadmap
Governments			
MoH	√	√	√
MoE	-	-	
MCIT	√	-	-
Others	-	√	√
Academic Institution	√	-	-
Health Institutions	-	√	-
International Organization	√	√	√
NGOs	√	√	√

4.3.3. Content of the policy and strategy documents

All the documents, except the National HIS roadmap clearly puts their vision and mission. The National HIS Roadmap only included vision without a mission statement. The ICT policy included all the major policy contents like goals, objectives and guiding principles, strategies and action plan. Similar to the ICT policy the E-health strategies also included all the major policy contents, except objectives (see Table 4.5.). The National HIS road maps included objectives, strategies. Guiding principles is not included in the HIS Roadmap documents

Table 4.5.: Ethiopian E-health policy and strategy documents content

Contents	Policy documents		
	National ICT policy	**National E-health Strategies**	**National HIS Roadmap**
Mission	√	√	-
Vision	√	√	√
Goals	√	√	-
Objectives	√	-	√
Guiding Principles	√	√	-
Strategies	√	√	√
Action Plan	√	√	√

4.3.4. E-health Components

All of the documents provided comprehensives information about available and planned E-health solution. Only HMIS is included in all documents. The ICT policy and E-health strategy documents also included information to deploy EMR and Telemedicine. Both Laboratory Information System (LIS) and m-health are addressed by the E-health strategy and National HIS roadmap documents. For EHR, it is only excluded by the E-health strategy. Radiology Information System is only found on the National HIS roadmap and e-Prescription is also mentioned only by the ICT policy (see Table 4.6. and Annex IV).

Table 4.6.: E-health components in Ethiopian E-health related policy and strategic documents, April 2005, Addis Ababa

E-health solutions	Ethiopian policy Documents		
	National ICT policy	**National E-health Strategies**	**National HIS Roadmap**
HMIS	√	√	√
EMR	√	√	-
HER	√	-	√
LIS	-	√	√
RIS	-	-	√
E-Prescription	√	-	-
Telemedicine	√	√	-
M-health	-	√	√
Others	√	√	√

4.3.5.Deductive analysis of Ethiopian ICT policy and E-health Strategy documents

Based on the Re-categorized E-health policy analysis frame work on section 4.2 (see table 4.2.), the three documents which are mentioned in the above section were analyzed deductively. For each of the themes the terms were analyzed as shown below. (See table 4.7 for summarized coding of document based on the framework)

4.3.5.1. Operational

This is the area where all policy documents provided detailed description with respect to Human Resource development. Human resource was put as major (key) policy area both on The ICT Policy and the National E-health strategy. With respect to governance all documents mentioned how to establish and distribute governance, and policy guidelines and only the ICT policy discussed how to align the policy and guidelines with other strategies and action plans. All three documents emphasized about collaboration with other sectors and key stakeholders but there were no clear strategies on how to make the collaboration. Only the National HIS Roadmap mentioned about information quality and data stewardship. Finally all documents failed to provide comprehensive statements on ownership, liability and reimbursements

4.3.5.2. Infrastructure

All the documents talk about the need for building ICT infrastructure, but only the ICT policy and the e-heath strategies provided a comprehensive statement. ICT infrastructure was highlighted as major strategic area both on the ICT policy and E-health strategies. However the E-health strategy failed to provide detailed strategies regarding the acquisition and deployment of ICT infrastructure. Only the ICT policy includes a detailed plan. Regarding Network development, only the ICT policy provided information and detailed action plan.

4.3.5.3. Interoperability

All the documents mentioned the need for developing and implementing mechanisms to ensure interoperability, but only the E-health strategies includes interoperability as major strategic area and provided a comprehensives information. However none of the documents covered the overall aspects of interoperability. The National HIS Road map and E-health strategies

emphasized on semantic interoperability (communication meaning like data contents and terminologies) and the ICT policy focused more on technical interoperability (neutralizes effect of distance like hardware, software and networks). The National HIS Roadmap mentioned the need to make all routine HIS interoperable, but failed to provide a detailed framework. For standards, all documents provided description in aligning with interoperability. The E-health strategy also defined some standards for data exchanges. However all documents do not provided additional strategies and action plan to define, adapt and utilize standards.

4.3.5.4. Institutional

In the Institutional themes, Most of the sub-themes were not addressed at all by any of these policy documents except for trainings to health care professionals. Both the National HIS Roadmap and E-health strategies mentioned a need for ICT skill training for Health care professionals. They also included the way to implement E-health solutions for training and continuing educations. Only the E-health strategy talks about the awareness and educations of stakeholders towards the benefits of E-health solution. Finally all documents do not provided information regarding Credential and competences.

4.3.5.5. Professional Practice

Professional theme is another area which is not mentioned or addressed by all policy documents. Only the ICT policy mentioned how to improve the licensure procedure in order to improve the quality of ICT services. However the ICT policy does not included the detailed plan to follow for licensure procedures. Both the E-health strategy and the National HIS Roadmap failed to provide comprehensive information about the licensure. Inter professional relationship; it was not mentioned in all policy documents at all.

4.3.5.6. Security, Privacy and confidentiality

Security is another key policy area in the ICT policy. The ICT policy provided comprehensive statements and detailed plan on how to manage security risks and unlawful practices. The E-health strategies mentioned security without clear description and it is not even mentioned by the National HIS Roadmap. Regarding privacy both ICT policy and the E-health strategy provided information without detailed description. Confidentiality is only mentioned by the E-health strategy and even the ICT policy failed to mention it at all. All subthemes under these categories

are not mentioned in the National HIS Roadmap documents. The E-health strategy considers security, privacy, and confidentiality as detail action line activities under the Infrastructure strategic area.

4.3.5.7. Funding

The E-health strategy and the National HIS roadmaps mentioned a little about the public funding mechanisms. All the documents except the E-health strategy did not address the private funding issues. The E-health strategy tried to include detailed information on public funding. However, the private funding is not considered in alignment with the public funding.

4.3.5.8. Monitoring and Evaluation

All the subthemes under Monitoring and Evaluations were addressed by all policy documents of Ethiopia. The ICT policy and E-health strategy provided detailed information on how to evaluate the existing initiatives with measurable indicators. The National HIS roadmap also provided detail information both on evaluation and documentation. However, all documents do not provide a master plan to monitor and evaluates available E-health solutions.

Table 4.7.: Coding of Policy Documents based on the Policy subthemes on Re-categorized E-health policy analysis framework. Addis Ababa, 2005

Policy Themes	Subthemes	Content addressed by Policy documents		
		ICT Policy	National E-Health Strategy	National HIS Roadmap
Operational	Collaboration	Some	Some	Some
	Data Stewardship	Not mentioned	Not mentioned	Some
	Governance	Adequate	Adequate	Adequate
	Human Resource	Adequate	Adequate	Adequate
	Information quality	Not mentioned	Not mentioned	Some
	Liability	Not mentioned	Not mentioned	Not mentioned
	Ownership	Not mentioned	Not mentioned	Not mentioned
	Reimbursement	Not mentioned	Not mentioned	Not mentioned
Infrastructure	Building ICT Infrastructure	Adequate	Adequate	Not mentioned
	Development of Network	Adequate	Not mentioned	Not mentioned
Interoperability	Standards	Some	Some	Not mentioned
	Interoperability	Some	Some	Some
Institutional	Competence	Not mentioned	Not mentioned	Not mentioned
	Credential	Not mentioned	Not mentioned	Not mentioned
	Readiness	Not mentioned	Some	Not mentioned
	Training	Adequate	Adequate	Some
Professional	Inter-professional relationship	Not mentioned	Not mentioned	Not mentioned
	Licensure	Some	Not mentioned	Not mentioned
Security, Privacy and Confidentiality	Data Security	Adequate	Some	Not mentioned
	Privacy protection	Some	Some	Not mentioned
	Confidentiality	Not mentioned	Some	Not mentioned
Funding	Private	Some	Some	Some
	Public	Not mentioned	Some	Not mentioned
	Evaluation	Adequate	Adequate	Adequate
	Documentation	Adequate	Adequate	Adequate

Key: **Not mentioned** = subthemes not mentioned at all

Some = acknowledgement of subthemes with information about what is going to be done

Adequate = detail description of subthemes with information about what, who and how is going to address the issues

4.4. Discussion

As discussed in chapter one the main objective of this document was “to analyze the content of E-health policies in ICT and E-health policy and strategy documents of Ethiopia”. The study also proposed E-health policy analysis framework which can serve as a guide for better understanding of the current state of E-health policy and strategies in Ethiopia. There are limited studies in Ethiopia and Africa which address the E-health policy issues. This thesis will serve as guideline for E-health policy development and future researches on the area.

Currently there are numerous E-health initiatives which are deployed by government or non-governmental organization. However, little attention is given for E-health policy issues which are a milestone for successful implementation of E-health solutions. This subtopic includes a discussion of the most relevant findings of the study.

4.4.1. Analysis of the existing E-health policy and strategy documents

The deductive analysis was conducted by re-categorizing and selecting E-health policy analysis frameworks. The Re-categorized E-health policy analysis framework consists of eight themes and 25 subthemes. All the variables of the frameworks are clearly defined for better understanding of E-health policy issues.

All the documents are developed by government entities (FMoH and MCIT). During the development of the documents only few NGOS and International organizations were also participated. Entities like Academic institutions, professional Associations, Patient groups, software companies and private sector are not fully involved in the development of the national policy and strategy documents. This can be a cause for major drawbacks throughout the implementation process of the policy documents. Similar study conducted in LAC countries shows that the involvement of non-governmental sector in the development of E-health policy was very little to no participation at all [41]. The study conducted in Africa by ITU and UN regional Commission shows a contradicting results. According to the result of the study non-governmental sectors and civil societies were very active in the development of ICT policies in Africa [45].

Almost all policy documents include deliverables E-health solutions, but there is variability between the documents. Despite the planning of E-health solution in each document, there is no detailed action plan about their deployment and provision of technical support. There is also no clear policy on how to integrate different E-health solution in order to avoid duplicating efforts. This shows that, E-health solution deployments in Ethiopia is not coordinated and integrated in all policy documents. A cross-sectional study conducted in selected public hospitals of Addis Ababa shows that, all E-health programs are completely dependent on donors and there are also duplicate efforts in each hospital [8]. The report presented in the 4th African conference of Minster of Health noted that existing and increasing efforts in E-health will result in uncoordinated systems, duplicate efforts, and unrealized potential [46].

Main E-health Policy Themes

Operational

All subthemes under this theme are vital for successful deployment of e-health. Among the subthemes, all documents provide a detail description regarding human resource. Many researchers in Europe put human resource as major barrier for implementation of E-health [5]. Similarly, research conducted in Addis Ababa by Anteneh Aklilu indicated lack of skilled personnel as barrier for deployment of EMR in hospitals [47].

Collaboration is another key area for successful deployment of e-health. That is why; most countries now are giving much attention for collaboration at all level. The European Union (EU) countries developed E-health policy toward the achievement of "Glocal" E-health [5]. In 2009, the African Union is also called on governments to form regional collaboration in E-health implementation [33]. Collaboration is also emphasized in all documents. However there is no strategy for regional collaboration in all documents. Similar studies conducted in LAC countries shows that all the E-health policy documents only mentioned national collaborations [41].

The absence of good governance and lack of communication could lead to extensive duplication of E-health effort and creation of new solutions that cannot scaled up [5]. That is why, in 2005, the World health Assembly urged governments to form national E-health bodies, which will be responsible for providing support in areas of E-health policy and strategy development [48]. All the E-health policy documents provided information regarding how to establish governance. The

documents also provided information regarding data stewardship, information quality. However, all the E-health policy documents do not give much attention to reimbursements. In contrast, European E-health policy gives much attention in providing incentives for health care professionals especially in telemedicine specialty [32]. Lack of clear policy in reimbursement is another reason for early failure of E-health solutions in Ethiopia. Michael indicated in his works that one of the major problems in Tikur Anbesa Hospital, Telemedicine unit was lack of incentive (reimbursement) for specialists [8]. Another area which was not mentioned by the E-health policy documents was liability. Study in the LAC countries show similar result, almost all LAC countries failed to mention liability [41]. However, several studies show that there was major problem in liability. The study conducted in Addis Ababa hospitals with EMR solutions revealed a problem of accountability and responsibility because of lack of defined authorization mechanisms [49].

Infrastructure

A successful adoption of E-health system depends on availability, and arrangements of Infrastructure [50]. In Ethiopia, there is insufficient ICT infrastructure that can support the deployment of E-health solutions [47], [8] and a big problem in network connectivity [8]. According to WHO and ITU, the major reason for failure of E-health in developing countries is lack of ICT infrastructure [27]. Regarding infrastructure, the ICT policy documents provided detailed information in acquisition and deployment of ICT infrastructure. Similarly LAC countries and European countries also emphasized on acquisition and establishment of infrastructure [41], [32]. The National HIS road map was gives less attention for building ICT infrastructure.

Interoperability

All the E-health policy documents mentioned the need of mechanisms to ensure standards and interoperability. However, some of the documents only emphasize on technical interoperability and other on semantic interoperability. In order to ensure interoperability there should be national agreements on the meaning of standards, technical interoperability and semantic interoperability [51]. The LAC countries study show that all the countries acknowledged the relevance of interoperability but still there are no guidelines for standards [41]. In contrast, the

European countries consider limited interoperability as major challenges and they are in the way for preparing guidelines to achieve standards and interoperability at all levels [32]. Michael in his work indicted that, even EMR and LIS in governmental hospitals are not able to exchange information [8].

Institutional

Most of the subthemes in this theme were not given much attention by all E-health policies documents. Only training is acknowledged by the E-health policy documents. The cross-sectional study conducted by Michael also identified that, most all health care professional, who participated in the study, agreed on insufficient training provided to professionals [8]. This shows that there is a need for comprehensive statements in all documents regarding training. Competence, credentialing and readiness are not included in the E-health policy documents. In contrast, the study conducted in Canada mentioned competence and readiness as major barrier for adoption of E-health in Canada [23]. Michael also stated in his work that almost all health care professional, who participated in the study are not ready and interested to utilize E-health [8].

Professional Practice

This was another area which was not mentioned in all E-health policy documents. Similarly, the LAC countries study also stated that licensure is not given much attention by LAC countries E-health policies [41]. In contrast, a European countries E-health policy provided a comprehensive information regarding licensure with detailed descriptions [32].

Security, Privacy and Confidentiality

Securing the confidentiality, integrity, and availability of patient information is no longer a goal; it is a legal requirement [51]. The adoption of new technologies such as electronic health records (EHRs) and on-line personal health services makes the task even more difficult [44]. The cross-sectional study conducted in Addis Ababa hospitals with EMR solutions, revealed that one of the weak points associated with EMR are data lose due to virus, poor backup system, and software corruption [49]. Another study conducted in Addis Ababa public and private hospitals shows

that, patients and professionals are concerned regarding privacy and confidentiality of EMR data [52].

Security is mentioned as major policy area in two of the E-health policy documents. However, all documents give less attention to privacy and confidentiality of patient's data. Similarly, LAC study shows that E-health policy in the LAC countries also lacks to provide detailed information on privacy and confidentiality [41]. In contrast, the European countries experience can be taken as an exemplary for developing countries in deployment of secure and integrated technology [32].

Funding

The sustainability and success of E-health deployment is largely dependent on the availability and adequacy of funds. European countries also face crucial policy challenges in raising the level of financing [32]. According to WHO and ITU reports, the governments in developing countries has no role in funding and technical support for e-health, this instead comes from donors and NGOs [4]. According to Michael's study, all informants revealed that there is no budget allocated for any E-health activity in their hospital. All the programs are completely dependent on donors [8].

Funding is not adequately mentioned in all E-health policy documents. All E-health policy documents failed to mention source for private funding. The study in the LAC countries also shows similar results. All the LAC countries do not provided adequate information regarding public and private funding mechanisms [41]. Even almost all European countries with E-health initiatives do not mentioned non-governmental funding sources [32]. This shows that Ethiopian government should develop a clear policy on how to provide public and private funding sources for planned E-health solutions.

Monitoring and Evaluation

This is the area where all the E-health policy documents provided detail information. Similarly the European countries strategy reports included how to monitor and evaluate E-health solutions [32]. The study in the LAC countries result also indicated that there is detailed information regarding evaluation in most of LAC countries E-health policy [41].

5. Strengths and Limitations of the Study

5.1. Strengths of the study

The strengths of this study include:

- The study was conducted on qualitative data, which helps to provides extensive information regarding E-health policy issues
- The analysis is conducted based on the Re-categorized E-health policy analysis frameworks which can serve as a guide for future works
- E-health policy issues study are rare in Ethiopia, so the study can be used as baseline information for developing and revising E-health policy documents at all levels.

5.2. Limitations of the study

There are various limitations that should be considered during interpretation of the results. The limitations of this study include:

- The E-health policy variables which are identified by the study are developed by literatures searches and are not mutually exclusive. Further research should be conducted to identify all E-health policy issues.
- The methods applied by this study to identify E-health policy issues were focused (not systemic) literature searches
- The categorization and selection of theme and subthemes (8 themes and 25 subthemes) for Ethiopian E-health system was based on expert (subjective) judgment. Further research should focus on policy debate among stakeholders for better understanding of the E-health policy issues.
- The inclusion criteria were restricted only to e-heath policy documents issued by governments. Other important E-health policy documents developed by non-governmental organization are not included in this study. Further research should be conducted on these documents to analyze another important policy issues.

6. Conclusions and Recommendations

6.1. Conclusions

E-health solutions can bring changes in current health care system, if it is carefully planned and deployed. There are so many factors for successful implementations of E-health initiatives. This includes government support, collaboration among stakeholders, availability of basic infrastructure, training of skilled human power, financing mechanisms and so on. However, one of key area is E-health policy, which can serve as a guideline for successful deployment of e-health. All the challenges and factors associated with E-health should be addressed by clear policy.

The result of this study shows that the involvement of non-governmental entities in the process of E-health policy development was limited. Involvement of stakeholders in E-health planning is very important, so the government should consider on how to improve the participation of civil societies in the process of E-health policy development. There is also variability in planned E-health solutions in each policy documents and there is no detail plan on how to implement the E-health solutions.

E-health policy issues like; human resource, infrastructure, governance, training, public funding, and monitoring and evaluation were described in detailed in most of the E-health policy documents. Regarding collaboration, interoperability, standard, security, privacy and confidentiality, less attention was given by the E-health policy documents. There are also E-health policy issues which are not mentioned at all by the E-health policy documents including liability, reimbursements, competence and private funding

There were also problems in the categories of policy subthemes in each policy documents. For example, the E-health strategy includes security confidentiality and privacy under building infrastructure. There is variability in all documents in categorizing policy themes and subthemes.

6.2. Recommendations

E-health policy is needed to create an enabling environment for successful implementation of E-health in the country. To create enabling environment for E-health in Ethiopia the E-health policy and strategy documents of the country should incorporated all the relevant E-health policy issues. To make the Ethiopian E-health policy and strategies documents a guideline for successful implementation of E-health the following points are recommended:

- In the development process of E-health policy and strategy documents, there should be active involvements of key stakeholders, civil societies, citizen and other non-governmental entities
- The planed E-health solutions also should be integrated in all documents in order to avoid duplication of systems.
- There is a need for detailed strategy and action plan in acquisition of skilled human resources
- The Ethiopian E-health policy should consider partnership and collaboration at regional and Global level based on mutual benefits.
- There should be clear government structure and hierarchy for E-health implementations at all levels. There is also a need to align the developed E-health policies and strategies with other relevant policy documents
- Detailed action plan should be developed on the standard, acquisition, deployment and maintenance of E-health infrastructure.
- To make E-health system interoperable at all level, there should be a national agreement regarding standards, semantic interoperability and technical interoperability. Detailed description and frameworks should be developed on standards and interoperability.
- The Ethiopian E-health policy should carefully consider security, confidentiality and privacy as key E-health policy issues.
- The E-health policy of Ethiopia should include information regarding the public and private funding sources for acquisition and deployment of e-health.
- The E-health policy issues like liability, reimbursement, licensure and competence should be considered in the country E-health policy document.

- On each major E-health policy areas, a strategy and detailed action plans should be developed in alignment with the E-health policy document.
- Finally, rather than using ICT policy as an umbrella for E-health implementation a separate E-health policy document should be developed by the MoH and MCIT. This a common experience in other countries because of the unique characteristics of e-health. There is also a need to define national common E-health policy themes and subthemes which guide the development E-health policy at local and organizational level.

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Annex I: Summary of the Ethiopian ICT Policy

Vision: Every aspect of Ethiopian life is ICT assisted.

Mission: To develop, deploy and use information and communication technology to improve the livelihood of every Ethiopian, and optimize its contribution to the development of the country.

Goal: To vigorously promote the ICT sector and enhance its contribution in political, social and economic transformation to make the country beneficial from the rapid development and progress.

The Broad Objectives: The objectives of the ICT policy and strategy are as follows:

- Build ICT Infrastructure throughout the country and make it accessible.
- Create the necessary skilled human resources required for the proper development and application of ICT and expand the society's basic knowledge and usage of it.
- Develop the necessary legal framework for the application of ICT and design and implement appropriate security systems for the prevention of unlawful practices.
- Promote the use of ICT for modernizing the civil and public services to enhance its efficiency and effectiveness for service delivery; so as to promote good governance and reduce wastage of resources.
- Expand and strengthen the role of the private sector to ensure the rapid development of ICT.

Principles: The implementation of this policy and strategy will be guided by the following principles:

- The government shall provide strategic leadership and facilitate conducive conditions for the implementation of the policy.
- The goals and objectives of the policy shall be to support and strengthen the general objectives and programs of the country.
- Develop the necessary legal framework for the application of ICT and design and implement appropriate security systems for the prevention of unlawful practices.

- Promote the use of ICT for modernizing the civil and public services to enhance its efficiency and effectiveness for service delivery; so as to promote good governance and reduce wastage of resources.
- Expand and strengthen the role of the private sector to ensure the rapid development of ICT.

Annex II: Summary of E-health Strategy of Ethiopia

Vision: To rationalize the use of ICT for Planning, managing and delivering health services in an equitable and timely manner.

Mission: To adopt ICT solutions in the health sector of Ethiopia, to improve the health outcome; to bridge the equity gap in the health sector and minimize the cost of health care services.

Objectives: The main objective is to utilize ICT to generate, capture, transmit, store, and retrieve digital data for clinical, educational and administrative purposes.

Specific objectives:

- To improve access, quality, efficiency of the health care services
- To enhance decision support system through a timely, accurately, and comprehensive data/information system
- To improve the referral system and reduce duplication of service delivery
- To continue the human resource development
- To support the health research operations
- To support public information dissemination on health services
- To provide standards for ensuring interoperability on the health sector

Strategic area:

- Implementing the national E-health infrastructure and rules to allow information to be seamlessly accessed and shared across the Ethiopia health system
- Developing management information system and application that can deliver tangible to benefits to public, care providers and health care workers
- Establishing governance and leadership regime to ensure effective coordination and oversight of E-health activities
- Educational promotions to all stakeholders on technology usage

Guiding Principles: the strategy is guided by seven key principles as described here under:

- Phase implementation of E-health initiatives in line with HSDP/HIS/ICT frameworks
- Ensure interoperability and adopt common standards for collaboration and partnership to share information and services in line with one plan, one budget, one report
- Consider health service integrity, confidentiality, privacy and security for data/information interchange and management
- Continue to support and staring E-health programs on available human, financial, and technical supports
- Coordinating disparate health and IT experts, resources finance and ICT
- Engage key health stakeholders in the design and delivery of E-health solutions
- Under the guidance and support of NAC, establish governance mechanisms for successful M and E of E-health programs.

Annex III: Summary of Ethiopian HIS Roadmap

Vision: The vision of HIS road map is having timely, complete and accurate health and health related information made available from an integrated data repository and used for evidence based decision making at all levels in the country.

Objectives: The following five strategic objectives are defined with corresponding interventions to address the priority problems identified during the assessment.

1. To Strengthen HIS governance, regulation, coordination and leadership
2. To institutionalize, improve and strengthen HIS Resources
3. To improve health data coverage
4. To improve health data management and quality
5. To strengthen and institutionalize information dissemination and use at all levels

Opportunities: The following opportunities are considered relevant to implement the HISSP and achieve the strategic objectives.

- Strong government and stakeholders interest to strengthen the Ethiopian HIS, and M&E and harmonization and alignment.
- Presence of a National Advisory Committee (NAC) that could be revived and strengthened to take the lead in coordination of HIS road map implementation, encourage working relationship & collaboration with stakeholders,
- Ongoing health sector reform and decentralization demanding standardization, as well as accountability and quality information,
- Increasing demand for accountability and evidence based decision making in health and all sector related to global initiatives

Annex IV: Planned e-health solutions In Ethiopia

Table: Planned and implemented e-health solutions in Ethiopian Health Care system, Addis Ababa, 2013.

S.No.	E-health Solutions	Descriptions
1.	**Health Information system**	
1.1.	EMR	Single shared resource for collection, storage and use of patient data
1.2.	LIS	Use for collection, storage, exchange and use of patients laboratory information
1.3.	RIS	Use for collection, storage, exchange and use of patients Radiology information
1.4.	EHR	Provide accurate patient data for informed decision at all level.
1.5.	e-HMIS	National information system that serve as national database system for holding information on health care delivery and administration.
1.6.	Human Resources for Health Information System (HRIS)	makes available timely and accurate information about the size, composition, skill sets, training needs, and performance of the health workforce which is critical for planning and for making key decision about human resources
1.7.	Information on Health Financing and Expenditure	provides information about the sources, agents, providers, functions of health care financing
1.8.	Geographic Information Systems (GIS) for Health	enables the collection, storage, management, analysis, retrieval, modeling and visualization of spatially referenced information
1.9.	National Nutritional Surveillance Information System Project	Information system which support national nutritional surveillance and monitoring activities

1.10.	National Drugs Database Information System	enhance the nation's drug administration and distribution system
1.11.	National and Regional Health Insurance Information System	Support national and regional health insurance and financing system
2.	**E-learning**	
2.1.	Community-based Medical Education	support the training of medical personnel to improve on medical skills and train more health professionals
2.2.	Online Health Service Delivery Initiative	facilitate the provision of online medical information and public health education and awareness; information on healthy living and illness, prevention; online medical consultation appointments, and online medical records retrieval system
3.	**Telemedicine**	Provide health services based on referral, remote and rural setting
4.	**M-Health**	Serve as tool to improve the quality and access of Maternal, Neonatal and child health care as part health extension program

Source:

- *Ministry of Capacity Building, Ethiopia. The National ICT for Development Action Plan. 2006*
- *FMoH of Ethiopia. Ethiopian National E-health Strategy 2012-2015. Addis Ababa ver.1. April, 2012*
- *FMoH of Ethiopia. National Health Information System Road Map 2012/13 - 2019/20. Addis Ababa. 2012*