

Zimbabwe's E-Health Strategy

2012-2017

Ministry of Health and Child Welfare

E-Health Draft

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Zimbabwe's Health Delivery System

Zimbabwe's health delivery system, once amongst the best in Sub-Saharan Africa, has suffered severely in the period 2000 to 2009. This decade has witnessed significant declines in key health indicators. A summarised review of the Zimbabwean health status notes the following:

- HIV prevalence of adults between 15-49 years at 13.7% by 2010¹
- HIV prevalence amongst adults between 15-24 years was at 5.5%² (ZDHS, 2010-2011)
- Child health status indicators are worsening, with infant mortality and under five mortality rising from 53 and 77 per 1000 live births in 1994, to 60 and 86 per 1000 live births respectively in 2009 (MIMS). By 2011, these indicators had not improved with under 5 mortality at 84 per 1000 live births and infant mortality at 57 per 1000 live births (ZDHS, 2010-2011).
- The nutritional status of children indicators are unacceptably high with stunting increasing from 29.4 in 1999 to 35% among children under 5 years old (National Health Strategy, 2009-2013)
- Maternal mortality levels are at an unacceptably high level of 725 deaths per 100,000 births (Zimbabwe Maternal and Perinatal Mortality Study, 2007). By 2010 this was reported to have increased to about 960 per 100,000 births (ZDHS, 2010-2011).
- It is estimated that over five million people are at risk of contracting malaria annually (National Health Strategy 2009-2013)
- Outbreaks of rabies and anthrax continue being reported in some parts of the country
- There is continued and increasing public health significance of chronic non-communicable conditions such as diabetes and hypertension (Zimbabwe STEPS survey, 2005)
- Life expectancy at birth has fallen from 63 in 1988 to 43 years in 2005/6 (National Health Strategy 2009-2013)

These findings note that Zimbabweans are dying from mostly preventable and treatable conditions such as HIV and AIDS, TB, Diarrhoea, Acute Respiratory Infections, Malaria, Malnutrition, Injuries, Hypertension, Pregnancy Related and Perinatal complications, Mental Health disorders to name a few.

¹ Ministry of Health and Child Welfare

² Zimbabwe Demographic and Health Survey 2010-2011

Health Delivery System Structure

Zimbabwe's health service delivery is established at four levels: primary, secondary, tertiary and quaternary. The Primary Health Care (PHC) is the main vehicle through which health care programmes are implemented in the country. The main components of the PHC include maternal and child health services; health education; nutrition education and food production; expanded programme on immunization; communicable diseases control; water and sanitation; essential drugs programme; and the provision of basic and essential preventive and curative services.

The majority of health services in Zimbabwe are provided by the public sector (Ministries of Health and Child Welfare and Local Government, and to a lesser extent through Ministries of Education, Defence, Home Affairs and Prison services), both in rural and urban areas. Public sector health services are complemented by the private sector, which includes both private for profit (e.g. industrial clinics, private hospitals, maternity homes and general practitioners) and not-for-profit private sector (e.g. mission clinics and hospitals and Non-Governmental Organizations) health facilities.³

Public Private Partnerships

The country is making efforts to increase collaboration and health service provision through numerous public private partnership initiatives.

Health Systems Strengthening.

According to the National Health Strategy there are gaps in the six pillars of health systems for efficient health delivery services.

- Public sector Human Resources for Health vacancy levels (December 2008), were at unacceptable levels of 69% for doctors, and over 80% for midwives,
- Health management has weakened as a result of high attrition rates of experienced health service and programme managers.
- By 2008, access to essential drugs and supplies had been greatly reduced with stock availability ranging between 29% and 58% for vital items and 22% and 36% for all categories of items on the essential drugs list.
- Medical equipment, critical for diagnosis and treatment is old, obsolete and non-functional.
- As a result of serious shortage and disruption of transport and telecommunications several programs including patient transfer, immunisations, malaria indoor residual spraying, drug distribution, supervision of districts and rural health centres have been compromised

³ Ministry of Health and Child Welfare. National Health Information Strategy, 2009-2013.

- The health system is grossly under-funded. The current budgetary allocation works out to approximately US\$7 per capita per annum against the WHO recommendation of at least US\$34.

Emerging from a severely constrained health system are opportunities for e-Health in Zimbabwe.

The Need for E-Health in Zimbabwe

Globally, all sectors are embracing Information and Communication Technologies to enhance service delivery and increase competitiveness. Health care is no exception. ICTs can transform how health care is delivered and how health systems are run. The use of Information and Communication Technologies in health care service delivery is termed e-Health. The World Health Organisation defines E-Health as “the combined use of electronic communication and information technology in the health sector”. In more practical terms, E Health is the means of ensuring that the right health information is provided to the right person at the right place and time in a secure, electronic form for the purpose of optimising the quality and efficiency of health care delivery.

Examples of efficient resource utilisation using ICT in health care can include:

- At the point of care, resource wastage can be avoided if electronic medical record systems are used to order investigations and reported immediately to the care provider,
- Services can be provided at the least cost where telehealth services are provided to provide specialist services remotely to communities who are unable to travel to get these services,
- **Electronic surveillance systems can provide decision makers with the power to decide on the most appropriate interventions, a service relevant to the target population.**

Through ICTs, critical functions in health are strengthened by improving the ability to gather, analyse, manage and exchange information in all areas of health, from human resource training, research to large-scale population level systems from tracking diseases, resource allocation through evidence based decision support systems. Through the use of ICTs in health “the right health information is provided to the right person at the right place and time in a secure, electronic form to optimise the quality and efficiency of health care delivery, research, education and knowledge⁴”.

Key tools and applications in health include:

- Electronic Medical Record Systems, to track individual patient records over time throughout the health care delivery system

⁴ WHO/ITU National E-Health Strategy Toolkit, 2012

- Population level database applications such as the district health information system to track disease conditions and the national health state.
- Telemedicine services this is the use of medical information exchanged from one site to another via electronic communications to improve patients' health status. These services can include:
 - Specialist services/referrals. These can include remote diagnosis of pathological specimen through email services or real time video conferencing, patient management support by specialists to less specialised service providers operating in hard to reach areas.
 - Medical Education to practitioners for continuous medical training or for patients on their health condition
- Mobile Health: This is the use of mobile devices in health delivery. The mobile tools include mobile phone technologies use in disease monitoring and reporting, mobile computing tools such as wireless laptops, and tablet computers that provide easier mobility that more localised devices. Key health related applications that can be used in mobile health include:
 - National disease surveillance and monitoring tools
 - Patient information repositories
 - Helpline
 - Education and training resources.
- Medical Education and Research Services: access to evidence based clinical practice and training through global knowledge repositories significantly improve the current the quality of health practitioners that are produced in-country. Access to international and national knowledge repositories build a rich source of reference for health service delivery.

E-Health Readiness in the Country

National Infrastructure

Internet and Communications Technology

According to the International Telecommunications Union (ITU) by Dec 2011, Zimbabwe had about 1.4million (12% of the population) accessing the Internet. The country continues to increase its access into the World Wide Web through numerous fibre optic links linking the country to the rest of the world through international links such as the SEACOMM cable in the Indian Ocean.

The mobile phone communications rate was estimated at 78.5% by the Postal and Telecommunications Regulatory Authority of Zimbabwe by March 2012.

Power

A major challenge has been erratic power supplies in the country, where load shedding in-country is now occurring at more frequent rates and for prolonged periods in some cases for as long as 8 hours per day, every day.

ICT tools

Zimbabwe still enjoys duty free importation of ICT tools in order to increase the usage of these tools in country.

Policies

A national ICT policy is in place and efforts are being made to incorporate numerous sector wide policies including e-Health.

Human Resource Capacity

Though the country has numerous graduates in computing science, the best of them are not staying in-country. Those that stay specialise mostly in support services and not in solutions development, a skill that is critical to the development of key e-health applications.

Users and practitioners are not trained in e-health and its applications as evidenced by the lack of a post-graduate programme in all national universities and colleges to support e-health applications.

Reference Implementations

Despite these challenges a number of e-Health applications are underway in country. These include:

- Strengthening of the national health information system through the use of the District Health Information System (DHIS). This system is deployed throughout the country and captures data from all the 67 districts in the country. The system is now being supported by mobile application tools where mobile phones are being used in remote facilities reporting to the national database.
- Human resource information systems. Human Resources for Health are being tracked through an integrated database system that includes relevant regulatory authorities, and the Ministry of Health and Child Welfare. This system can transfer data to the National Health Management Information System (HMIS) which is the DHIS. In addition, private sector systems and ordinary citizens can query the registration status of health practitioners with their respective councils.
- Private Sector Initiatives: A number of private sector initiatives are beginning to take hold with one service provider linking all care centers in a single network.
- Telemedicine applications: the medical school has installed a telemedicine application through which teaching and training can be provided to undergraduate medical practitioners.
- Knowledge repositories: the medical school has access to key international data repositories currently accessible to postgraduate and undergraduate health care practitioners.

Other limitations

- Health care training institutions outside of the capital still have limited connectivity to the global information highway.
- The systems being developed and deployed do not use any national or international standards increasing the risk of developing vertical silos of data and limited information exchange across the health care divide.
- High operational costs: internet costs and acquisition of equipment are still high in the country.
- There is no clear well-coordinated mechanism in place where e-health implementations are organised. This will produce serious duplication of effort, unworkable system implementations where one service providers is confronted with numerous service points, poor quality of care, costly systems that do not produce desired results and create an inefficient service delivery system.

There is need therefore for the country to come up with a common vision on e-Health. This vision must encompass expectations from each of the stakeholders in health care, including patients and ordinary citizens. The vision must strive for international best practices and recommendations. This vision is documented in the E-Health Strategy.

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E-Health Components

E-Health is a broad field however; there are basic components that must be in place in order to successfully implement it. These components are⁵:

- Leadership and Governance
- Strategy and Investment
- Services and Applications
- Infrastructure
- Standards and Interoperability
- Legislation, policy and compliancy
- Workforce

Leadership and Governance

There must be a nationally constituted body, representative of all key stakeholders in e-Health to take ownership, responsibility and steer forward the delivery of the national e-Health agenda. The leadership and governance composition must be composed of varied skills sets.

Strategy and Investment

This component looks at how e-Health addresses national health needs i.e. the national health strategy. In addition, there is need to identify how sustainable investment can be achieved in e-Health services and applications and e-Health infrastructure requirements.

Services and Applications

eHealth encompasses a wide variety of applications. There is need to take stock of these and understand the reason for their implementation. This will assist in how information stored or generated from these applications can be shared or used by other sectors.

Infrastructure

E-Health requires reliable connectivity for uninterrupted service delivery. Depending on type of service application, the underlying infrastructure must address the needs of each service applications. The infrastructural needs are:

Network Availability: Availability describes how much time a network is available for use. A clinical care application might not require as much network availability compared to an emergency services mobile application.

Network Security: Security describes how data is transmitted across the network. A clinical care system will require high security (encryption, authentication and authorisation services) compared to a national reporting system.

Network Ubiquity: Ubiquity describes how widely available the service points of the network should be for the successful implementation of e-Health applications. For example, service points for clinical care systems need to be available only at the point of care, whereas patient knowledge

⁵ World Health Organisation/ITU. National E-Health Strategy Toolkit, 2012.

repositories must be made more widely available for better use.

E-Health Application Bandwidth requirements: Bandwidth describes how much data a particular media of transmission can carry. E-health applications with heavy images will require media capable of carrying more data compared to a national reporting mechanism.

Network Latency: Latency describes the response time from sending a request into the E-Health application and the time it takes to get an answer. E-Health applications hosting services such as national patient repositories must have shorted response times compared to national reporting mechanism.

These characteristics will form the basis of building the e-Health infrastructure requirements.

Standards and Interoperability

Standards will allow disparate systems to share information across the same or different service domains. The adoption of standards will allow for systems extensibility across the national e-Health infrastructure and applications platform. A mobile application can easily plug its services into a population level information system. Health care standards must address the following critical areas:

- **Information Security:** A clear protocol must be defined on how patient identifying data is stored, transmitted and shared/distributed.
- **Patient identification across domains.** Here there is need to come up with a national unique identifier for each citizen/patient.
- **Common terminology dictionary.** Medical terms have specific meanings and these must be maintained by as such by all service applications.
- **Health Information Exchange:** transfer of a patient from one service provider to the next, medical billing, request for investigations, and prescription services must all adapt national or internationally agreed standards for information flow across the service domains.

Legislation, policy and compliance

There is need to develop legislation instruments that support eHealth implementation and policies that ensure compliance to agreed protocols and standards.

Workforce

The adoption of e-Health requires key human resource expertise in place. These expertise include:

- Appropriately trained project management managers
- Health informaticists
- Electronic Law experts
- Software Developers
- Enterprise Architects
- Systems administrators

These components will form the basis of implementation of the e-Health Strategy.

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Vision

To have quality, timely and accessible health information for every Zimbabwean on an integrated platform.

- To have total interoperability among all health institutions country wide in health information and services.
- To have timely and limitless access of health information to users through use of ICT
- To have all health functions and services seamlessly running on a single integrated CIT platform
- To attain the highest possible level of e-Health technology in Zimbabwe.
- To have a seamless electronic health information system availed across Zimbabwe.
- To have an integrated electronic platform for health information access and sharing for quality health care delivery

Mission

To support, promote and advocate for the provision of quality and efficient health information technology in Zimbabwe, while maximising the use of available resources.

Objectives

- To provide policy makers and stakeholders with timely, aggregate and correct information on request
- to improve and aid health practitioners Continuous Personal Development (CPD) through availing E-learning facilities and clinical case studies in facilities
- assist in improving private-public sector collaborations and standardisation so that both these sectors will be able to interact seamlessly, this will also allow all health actors to be able to interconnect and create linkages
- provide ease of reach of health services to the greater populace
- assist in allowing greater resource utilization , collaboration and removal of duplicate activities between health funders, WHO, UN agencies and the government
- provide a standard patient identification template to all health actors

- promote and ensure the confidentiality and security of patient data at any level

Principles

The following principles need to be observed in the application of E Health

- Patients will be informed and consulted about an electronic health record network, including potential uses of the information it contains.
- A patient's decision about whether to participate in an electronic health record network will be voluntary, free from coercion and based on full information.
- Patients will have access to their own personal health information.
- Patients will decide who else can access their personal health information.
- Patients' personal health information will be held and transferred securely.
- Governance of electronic health record networks will be transparent and accountable.
- The development and operation of any electronic health record network will be independently evaluated, including its impact on patients and other stakeholders.

Governance

A governance body will be established to oversee the implementation of the e-Health Strategy. .

This is a nationally representative body that will oversee the implementation framework of eHealth in Zimbabwe. This body can be called eHealth Secretariat. This body must include:

- Ministry of Health and Child Welfare (Chairing)
- Ministry of ICT (Secretariat)
- Ministry of Transport and Communication
- Ministry of Finance
- Private Health Care Associations
- Consumers group
- Institution of Higher Learning e.g. College of Health Sciences
- Medical Research Council of Zimbabwe

The following may be included:

- Telecommunications and Internet Service Providers

- Ministry of Energy
- Civil Society Organisations
- Other interested groups.

Roles and Responsibilities

The roles and responsibilities will include:

- Oversee the coordination and implementation of eHealth initiatives in the country
- Recommend formation of dully constituted technical working groups in addressing key needs.
- Establishing policies and frameworks to protect integrity, privacy of health information the government sets the tone of a national e-health solution. Currently there is the Access to Information and Protection of privacy Act (AIPPA) which governs access, consumption and transmission of all forms of information. For health records it becomes more critical to define how electronic health records should be governed. Privacy, confidentiality, data protection, and liability challenges all need to be addressed in order to enable a sustainable implementation and use of E Health applications.
- Addressing the required standards from organisational, software, hardware to policy level.

The governance body must encourage the market to develop quality e-health solutions which are scalable, aligned with national policies and use predefined standards for storing, transmitting and receiving messages.

Incentives for those that align their e-solutions to set standards, preventing data silos (Vertical systems).

In addition to central level governance there should be sector level governance and sector standards compliance bodies, these self-governing structures are especially important as they will have all the locale specific information needed for controlling and monitoring of their members. Such bodies may come in the form of:

- medical doctors association
- medical funders association
- pharmacists association

To ensure compliance bodies may give sanctions to non-adhering members.

Legal Framework

There should be an enabling legal environment which will support the implementation and sustenance of the E Health framework

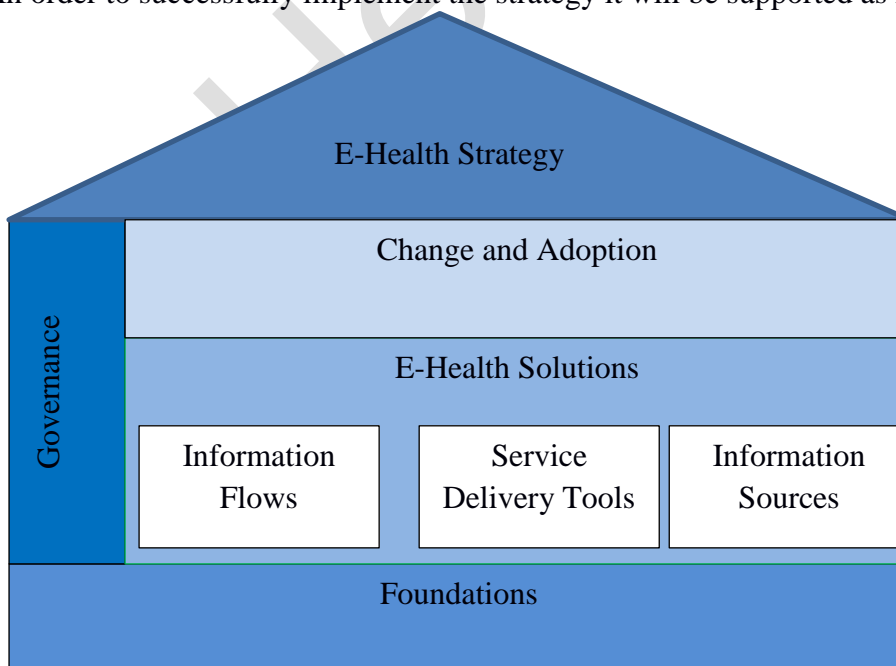
Priority Areas of Implementation

Noting the pacing in which the country is implementing eHealth Services and Applications, the following is the recommended priority list:

- Establishing Standards in key sectors
- Patient Centric Information Systems supporting Continuity of Care across the different service domains
- Disease Surveillance and Population Based Information Systems
- E-Learning Services
- Financial Systems
- Mobile Applications
- Telemedicine Applications

National Action Plan

In order to successfully implement the strategy it will be supported as follows



Adopted from the Australian National eHealth Strategy.

Foundations

Foundations constitute the pre-requisites required for the successful implementation of e-Health.

These foundations are:

- Health information standards
- Appropriate network bandwidth availability
- Appropriate computing infrastructure capable of processing and storing large amounts of health data.

E-Health Solutions

The eHealth solutions include all software artefacts that will consist of:

- Information Flow solutions such as mobile devices used to provide information access to patients.
- Service delivery tools such as electronic medical record systems, pharmacy management systems or billing systems
- Information sources such as knowledge repositories for consumers and practitioners.

Change and Adoption

For effective and efficient use of eHealth solutions, consumers, practitioners and care managers must be motivated to use the solutions as well as have an understanding of them. A change and adoption framework must be developed and implemented. Change and adoption can be effective at national level, organizational or individual levels. All these factors must be taken into consideration.

Governance

The eHealth Secretariat will oversee the implementation of all the key components from Foundations to Change and Adoption, as guided by the eHealth strategy.

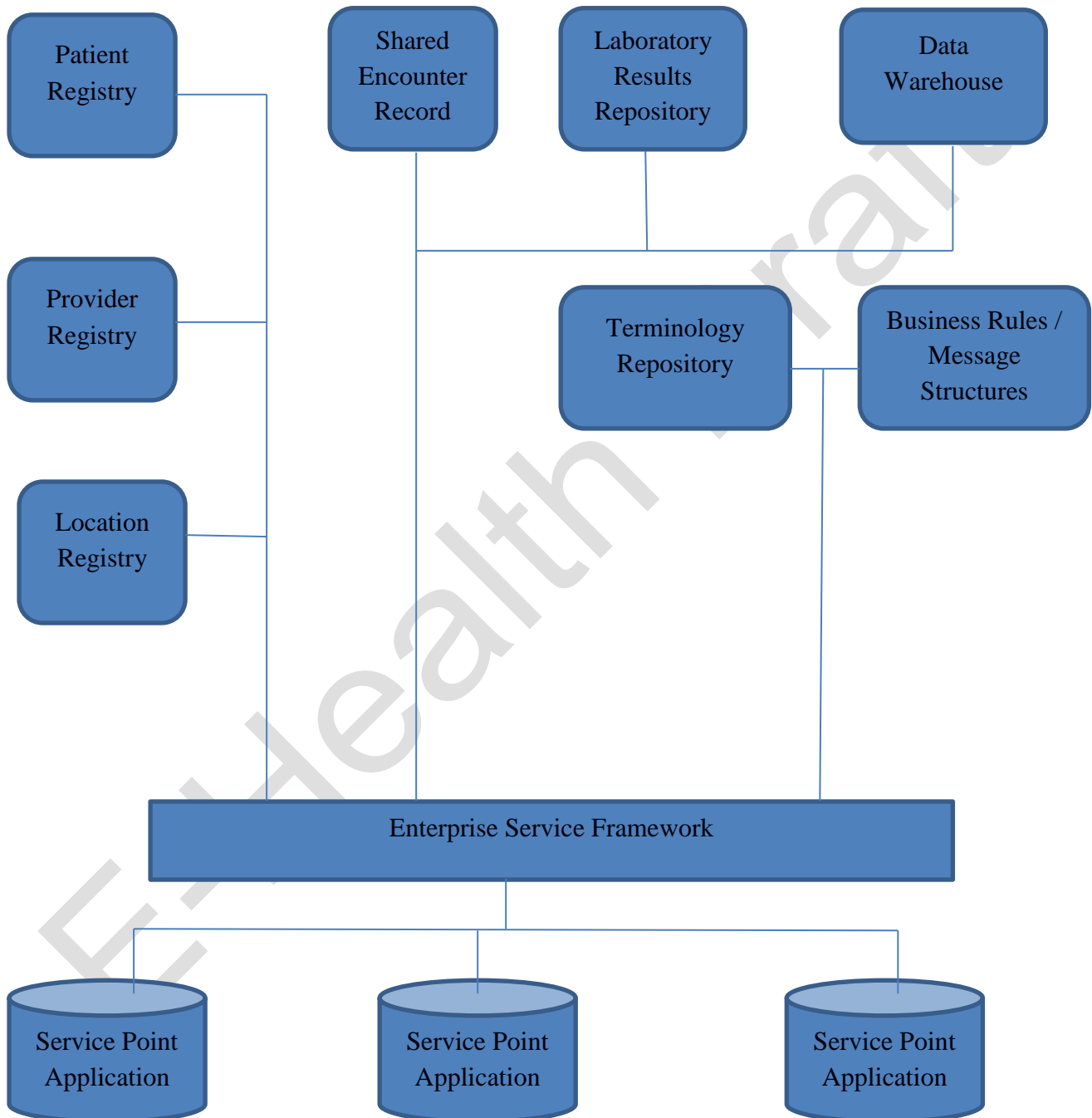
Implementation Framework

In order to achieve seamless integration of various systems, add new products and scale the systems an enterprise architecture approach will be adopted. An enterprise describes the fact that the system is composed of different business domains each with its own independent processes yet sharing information. An architecture describes the structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time⁶. It is with these two definitions that an enterprise architecture framework will be developed.

⁶ The Open Group Architecture Framework (TOGAF). Enterprise Architectures.

EA Framework

Below is the proposed architecture framework as adopted from global best practice methodologies in health care information systems.



In this architectural framework the key components to be included are:

- a. **Patient Registry:** this is a register of all patients are registered in the national health care delivery system. Each citizen who becomes a patient must be allocated a unique identification number.
- b. **Provider Registry:** Currently these registrations are being developed through the Regulatory Authorities. They will form the basis of verification and access to all care providers in the country.
- c. **Location Registry:** A register of all key service locations and associated geographic information system coordinates will be incorporated.
- d. **Shared Encounter Record:** A shared encounter record where all service point systems will update summary encounter data will need to be developed.
- e. **Laboratory Results Repository:** a repository of all medical encounters investigations and laboratory based findings will be created.
- f. **Data warehouse:** this will store all de-identified data attributes for decision support and outcomes research.
- g. **Terminology Repository:** a repository of agreed medical terms and meanings will be developed to support common meaning of terms across systems.
- h. **Business Rules/Message Structure:** this will be developed to ensure agreed rules are enforced across systems.
- i. **Service Point Applications:** These are the applications running at the service provider site i.e. electronic medical record systems, pharmacy management information systems, laboratory information systems etc.

Standards and Interoperability

The adoption of a national eHealth framework will require changes to legacy systems and provide a template for all new Health ICT applications to use so as to provide seamless integration and communication between third party systems and health stakeholders. The eHealth framework will provide a foundational interface template which will be used and be adhered to by all health informatics developers and stakeholders. There will also be sectoral standards adherence committees who will be responsible for ensuring compliance with the national and global standards so that the fragmentation of health information and applications is reduced.

The outcome of this process should be a specification document which will be available to all the eHealth stakeholders. Standards are especially important in the following areas of eHealth:

- Patient Identification and naming
- Medical terms and meanings
- Medical aid cards identification and naming
- Encryption mechanisms of patient data being transmitted across applications
- Data elements to be shared and transmitted between applications and in what format e.g. HL7

All health stakeholders should be involved in setting up the standards and global standards being pursued by international organisations should also be considered as services offered may become global in the future. Some current standards that have been developed and being implemented across the world e.g. for diagnosis is the **ICD10** standard.

The eHealth Interoperability framework should be able to provide a shared language between both the human developers and users and the applications/system involved in eHealth. This allows for a national level alignment of existing and future systems to the framework. A current framework of note that has been developed and used in some countries is the **HL7 Service Aware**

Interoperability Framework (SAIF).

Adoption of standards and interoperability framework will allow organisations and systems to share clinical data in a seamless way and this will allow policy makers and other stakeholders to be able to access and consume the information they require. It also allow for reduced fragmentation of data as private and public sector health players will be using the same standards and methodologies.

Standard messages

The way messages are created and structured. The way messages are represented, structured and secured to allow datasets to be correctly exchanged between different systems. This will allow different systems to accurately handle data when they send and receive information.

Semantic – standards that enable information communicated to be understood across different domains as the same thing. This will allow common terms to be used to treat, diagnose and provide the right care to individuals.

Secure messaging standards – **provide** standards to be used in the transmission and delivery of messages. Security is critical in driving the e health strategy. Messages must be secured from point of creation all the way to point of delivery.

Standardisation has to be adopted for an E-health strategy to be effective. There is need for a nation implementation drive for E- Health standards. To accelerate the adoption of e-health standards there is need to work closely with all stakeholders. Particularly software vendors systems, care providers and professionals bodies. In Zimbabwe it would be development companies of health informatics systems, hospitals, clinics etc. and health bodies such as MDPCZ, NCZ etc.

Data Security

Security in an E Health framework setting is of paramount importance as it relates to the legal, principles, ethical and governance issues; it will involve the following aspect:

Physical Controls

Basic physical controls on where the E Health application resides, this will include issues to do with physical locks, buglar bars, and authorised entry passwords. Physical controls ensure that only authorised personnel will have access to the locations which house restricted E Health hardware.

Technical Controls

This involves software or application level security and will include:

- authorisation and authentication
- encryption

All applications in the enterprise will need to adhere to the set technical controls so as to limit liability in case of breach.

Procedural Controls

Security operating procedures will be given to all interested parties so that all members will be in the know of what needs to be done, who is allowed access to certain organisational resources and other routine issues.

Personnel Controls

All personnel in the organisation should have knowledge and appreciation of all security issues, and the following tasks will assist in the process:

- training all staff members in security issues
- having an organisational standards operating procedure
- retraining

Information Archiving

The eHealth strategy will be guided by the eGovernance policy on how to store, archive or delete electronic data. It is important to note that health information needs are not the same as other sectoral needs, hence this policy will be adjusted to suite the health care industry needs.

Privacy and Confidentiality

The concept of patient data confidentiality is an ethical principle in medical practice. Unless authorised by the patient or by some other legal instrument, no patient information must be divulged to other parties. In E Health the patient information will now be in electronic format which will be easily accessible, so measures should be taken to make sure that all patient electronic data is not linked to any patient identifiers so that if somehow the data goes into the wrong hands it will not point or identify with any patient. The patient should be afforded the right to be able to control the collection, use and or disclosure of their Personal Information or Personal Health Information.

Health practitioners and other stakeholders who will be in possession of patient information should understand and always protect the patient privacy, and the confidentiality of such information should be governed by statutes and legal instruments.

Patients should be able to do the following:

- decide whether or not their information is available to other systems and stakeholders
- authorise access to their data and documents
- view all their patient medical history

The strategy should be able to assure patient that they will have control in how the following identifying elements are collected, consumed and distributed:

- name
- address
- employment history
- family medical history
- health card number
- patient identification number

Supporting Infrastructure (Networks, Electricity, Tools)

Information and communication technologies (ICTs) have potential to address some of the challenges currently being faced in Zimbabwe. Rural areas and underserved communities traditionally suffer from lack of access to health care. The increased adoption of the cell phones has allowed the adoption of Telemedicine. Telemedicine has overcome geographical barriers, and has increased access to health care services. (Example where telemedicine is used)

Reliable infrastructure is required to help keep e-health systems online and keep information available. Consumer can only make informed decision when information is readily available. Infrastructure includes internet facilities, computers, cell phones, electricity facilities and backup power services. Setting up infrastructure for E- Health in Zimbabwe is expensive but the government of Zimbabwe development partners like UNDP are in the process of availing internet access to all districts. This will see better information flow as information is readily available and can be shared. Therefore making informed decisions with available information will go a long way to improve the health outcomes of the population.

Zimbabwe needs a **national health information highway and a master patient Index**. An information highway will allow information to be seamlessly accessed and shared among authorised care providers and will reduce the duplication of effort in terms of capturing and storing the same information. A master patient index will allow store information about each individual patient. It will have a unique identifier that allows a patient to be identified.

Successful set up of infrastructure should connect all health care providers, currently if a patient has joined one medical aid society and decides to switch to another medical aid society, the patient's medical history remains at the medical aid society and a new file is opened. This causes duplication

of effort and valuable information is left out. This leaves the patient solely responsible for their own medical history. A master patient index will store all relevant information about a patient. When a patient decides to change the medical aid society, the new medical aid society simply accesses the national health information highway and the master patient index will provide the patient information that is needed. The unique patient identifier will allow the right patient to be identified. Unique identifiers will not only apply to patients but to healthcare professionals, healthcare providers and pharmacies. It is a central requirement to assure patient safety. Identifying who treated the patient and where the patient has been will go a long way in ensuring the right treatment was provided and will be provided in the future.

To create a national health information highway, stable reliable internet facilities are required. National data warehouse should be created that can house the servers that can hold the master patient index. With reliable infrastructure e-health solutions used at facility level are always available and this ensures that the right care can be provided to the individual at a timely pace. A key barrier to E-Health take-up is the relatively poor quality of computing infrastructure (PCs, network connectivity and core patient, clinical and practice management systems).

Human Resource Capacity

In order to effectively use eHealth solutions, human resources must have the capacity to use and understand the eHealth solutions. In order to achieve this, the strategy emphasizes:

- a. Computer Literacy by all health care practitioners
- b. Health Informatics courses to be developed at different levels of tertiary education supporting health care workers
- c. Technical Training of Computing Science student in the business processes of health care
- d. Change management skills for health care organisations.

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