A STUDY OF MALAWI'S 2003 HIS POLICY IMPLEMENTATION AND ITS IMPLICATIONS ON HEALTH INFORMATION SYSTEMS IMPLEMENTATION

MSC. (INFORMATICS) THESIS

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DECLARATION

I, the undersigned, declare that this thesis, being submitted for examination, is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work. This thesis was prepared according to the regulations of the University of Malawi and has not been submitted in whole or in part for an award in any other institution, college, or university.

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Date

CERTIFICATE OF APPROVAL

I, the undersigned, certify that this thesis represents the student's own work and effort and has been submitted with my approval.

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Supervisor

DEDICATION

To the memory of my father, Francisco who inculcated a spirit of perseverance and hard work in his children.

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ABSTRACT

Literature indicates that most developing countries have developed Health Information Systems (HIS) policies to strengthen their health information systems. Malawi launched its first health information system policy in 2003 which was in force until 2015 when it was replaced. Literature also shows that most public policies in developing countries are rarely implemented according to plan or are not implemented at all. This study was conducted to assess how Malawi's 2003 health information system policy was implemented, including its implications on the health information systems implementation. The study used mixed methods where data was collected through in-depth interviews, structured questionnaires, and document review. The research was informed by the interpretive research paradigm. Findings show that the policy was successfully implemented, but main objectives were partially achieved. In addition, the policy's implementation lacked enforcement. Despite this lack of enforcement, the policy made notable contributions to two areas namely; information systems integration and data accessibility. The integration was realised after several parallel health program information systems had been incorporated in the national District Health Information Software (DHIS2). The accessibility to data improved after data users were able to access the data at anytime and anyplace as DHIS2 is web based. The results also indicate that these two achievements improved data quality and use. The study however found that due to lack of policy enforcement the health information system was overloaded with too many data collection and reporting tools which overburdened health workers and threatened the quality of data. The policy enforcement challenges were due to lack of strong government enforcement institutions. Findings also indicate that continued lack of motivation to HIS staff and lack of local IT expertise at the district and national levels pose a threat to the sustainability of the national health information system. The study recommends continuous policy evaluation and enforcement. It also recommends continuous motivation of HIS staff and use of local IT personnel for sustainability of the national health information system.

Key words: health information system, policy, implementation, developing countries.

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LIST OF ACRONYMS

ANC	: Antenatal Care
CHAM	: Christian Health Association of Malawi
CHIP	: Committee on Health Information Policy
CMED	: Central Monitoring and Evaluation Division
DHIS2	: District Health Information Software version 2
DHMT	: District Health Management Team
DHO	: District Health Office
EPI	: Expanded Program on Immunization
Ex-DHMT	: Extended District Health Management Team
GAVI	: Global Alliance on Vaccines and Immunization
GF	: The Global Fund
HFIMC	: Health Facility Information Management
Committee HIMS	: Health Information Management Secretariat
HIMTC	: Health Information Management Technical Committee
HIS	: Health Information System
HMIS	: Health Management Information System
HSSP	: Health Sector Strategic Plan
HISP	: Health Information Systems Programmes.
HIV	: Human Immunodeficiency Virus.
IDSR	: Integrated Disease Surveillance and Response.
ICT	: Information and Communications Technology
M&ETWG	: Monitoring and Evaluation Technical Working Group
MOH	: Ministry of Health
NSS	: National statistical System
NTP	: National TB Control Program
RH	: Reproductive Health
SOP	: Standard Operating Procedure
TB	: Tuberculosis Bacillus
WHO	: World Health Organisation

CHAPTER ONE
INTRODUCTION

This chapter introduces an overview of the study. It covers background, problem statement, objectives and questions of the research. It also provides a structure of this thesis.

1.1 Background

This thesis focuses on health information systems policy implementation. A "Health information system is an integral part of the health service delivery system. Accurate, timely and accessible health care data play a vital role in the planning, development and maintenance of health care services" (WHO, 2003,2018). For this reason, many developing countries continue to reform their health systems in order to respond to various challenges they face.

Despite various improvements in national health information systems, literature such as WHO (2000) indicate that countries continue to face a lot of social- technical and cultural challenges. These include human resource, finances, lack of an information culture and infrastructural limitations such as equipment, internet connectivity and electricity. WHO (2000) and Moucheraud, et al., (2017) observe that, in most cases, computerized systems development in the health sector in developing countries is managed using financial and technical assistance from donor agencies and that the sustainability of such systems has been a major challenge in many countries.

In light of known challenges, developing countries are pursuing different strategies in order to strengthen their information systems. Among them, according to Nyella (2009), is pursuing an integration strategy as an attempt to ensure availability and accessibility of comprehensive health information at the national health departments, districts and the vertical programs. To achieve this integration, Smith (as cited by Msiska, 2018) argues that many developing countries are adopting the web-based

District Health Information Software (DHIS2) as it is seen as a vehicle towards integration. Nyella (2009) also adds that integration of information systems improves information availability and accessibility.

Development and implementation of health information policies and strategies is also seen as one way of dealing with documented health information systems institutional challenges. In 2006, countries in the South East Asia region developed a regional strategy with the goal of improving availability, quality and use of health information to enhance efficiency and effectiveness of health programs. Policy development topped the list of the agreed ten strategies to strengthen their health information systems (WHO, 2006).

Malawi started implementing health information systems way before the 1990s. By then, the health information systems were largely paper based, too many and uncoordinated as each vertical health program had its own information system. Consequently, there was duplication of work whereby several programs could report on the same data. The data generated by these uncoordinated information systems was of poor quality and could rarely be used in planning and management of health services (Chaulagai, et al., 2005). To address these challenges, the Ministry of Health, from 1999, embarked on a comprehensive review of the health information system (Chaulagai, et al., 2005; Manda, 2015). As one of the strategies in the comprehensive review, in 2003 the Ministry of Health developed its first health information system policy (Chaulagai, et al., 2005; Manda, 2015). The policy was in force until 2015 when it was replaced. To understand effects of the implementation of the policy on health information systems, there was need to assess the policy implementation.

1.2 Problem Statement

The problem which this study addresses is unavailability of formal 2003 HIS policy implementation assessment due to financial constraints to conduct the assessment. This lack of assessment negatively affected the feedback loop in the policy cycle; there was

no documented evidence of successes and challenges of this policy implementation to inform development and implementation of successor policy. Kunyenje & Chigona (2017) argue that policy implementation assessment helps to measure effectiveness of policy objectives in addressing the identified problems. On the lack of policy implementation assessment, Bennett et al., (2011) argue that the little body of research on health policy and systems in developing countries is mainly due to acute shortage of researchers and training courses on the same.

Although the successor policy had already been developed in 2015 and dissemination to districts done in 2017, it would be too early to conduct implementations assessment of this new policy in 2018 when this study was conducted. This justifies the choice of the 2003 HIS policy.

1.3 Research Aim and Objectives

The aim of this research was to assess how 2003 HIS policy implementation affected national health information systems development and implementation.

1.3.1 Research objectives

a) To examine socio-technical demands of the Health Information System policy objectives

b) To investigate how other prevailing factors affected achievement of the policy objectives.

c) To analyse how achievement of the policy objectives affected implementation of health information systems.

1.4 Research question

As the implementation of the policy was meant to strengthen the health information system, the main question of this research was; How did implementation of the 2003 HIS Policy affect health information implementation?

sub questions:

a) What demands were in the 2003 HIS policy objectives?

b) What HIS governance structures emanated from the policy?

c) What other prevailing factors influenced achievement of the policy objectives?

d) How did the achievement of policy objectives affect the implementation of health information systems?

1.5 Research Focus

The research focused on two implementations namely; HIS policy implementation and the implementation of the National Health Information System. Figure 1.1 summarizes the focus of the study.

As indicated in Figure 1.1 below, the policy was developed to strengthen HIS implementation. For successful implementation of the policy, there were social technical demands including governance structures. This study wanted to identify and analyse these social technical demands and how they contributed to the policy implementation. The study then analyses how the implementation contributed to the policy objectives realization. This was followed by identification and analysis of how the other factors influenced the policy objectives realization. And as the final goal of the study, detailed analysis of how the realisation of the policy objectives affected HIS implementation was done. As earlier indicated, for the analysis of how the policy implementation affected the implementation of the health information system, the study investigated both implementations.

Malawi HIS Context

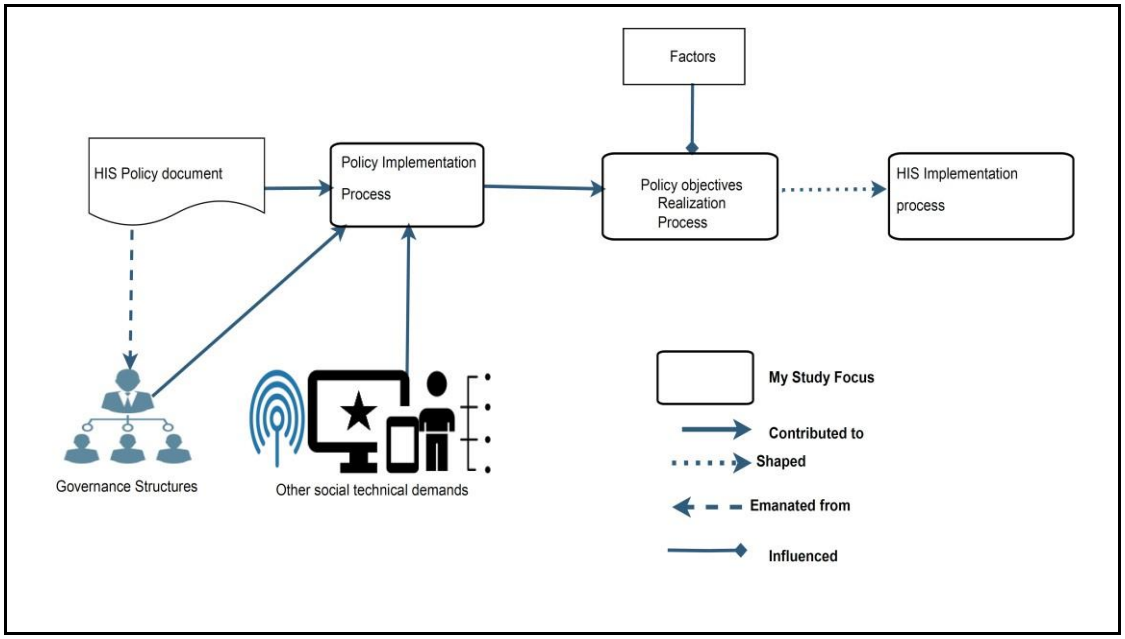

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Figure 1: **Research Focus**

1.6 Study Significance

Gilson & Raphaely (2008) argue that generating understanding of the factors influencing policy results can inform action to strengthen future policy development and implementation. Buse, Mays, & Walt (2005) point out that apart from policy implementation which is "*turning policy into practice*", policy assessment is another equally important stage of the policy process which identifies what happens when the policy is put into practice. Buse, Mays, & Walt (2005) also observe that policy assessment helps to establish how the policy was monitored, whether it achieved its objectives and whether it has unintended consequences.

Based on the literature presented above, it became convincing that conducting this study was a necessary undertaking.

The results from this study may help Malawi and other countries with similar social-technical context in strengthening the health information system in general and improve

HIS policy implementation in particular. Specifically, the results from this study will help HIS policy developers and implementers to learn factors which influence realisation of some of HIS policy objectives. The study results may also help HIS developers, implementers, health program managers and donor agencies on how compliance to national health information system policies contribute to the strengthening of the health information system.

In summary the necessity of the research is backed by literature at global level and also by unavailability of formal assessment of the Malawi 2003 HIS policy at the local level.

1.7 Targeted audience

The results from this study are intended for health information system policy developers and implementers. The results will help them to know the policy development and implementation approaches which maximise chances of policy objectives‟ realization. The results will also be useful to health information system developers and implementers. The results will assist them to learn practices which strengthen health information systems. The findings are also intended for health program managers, planners and donor agencies. The results will help them to understand the benefits of complying with the national health information systems policy.

1.8 Structure of this thesis

This thesis is divided into five chapters. The first chapter introduces the topic and area of focus for the study. Chapter two presents review of literature relevant to the topic to understand what is already known in the study area. Chapter three describes the methodology used in this study. Chapter four discusses the results from the study and chapter five provides a conclusion of the study.

CHAPTER TWO
LITERATURE REVIEW

This chapter presents literature on health information systems implementation in developing countries in general and health information system policy process including implementation assessment. Review of literature on HIS challenges was done to understand if the content and implementation of the policy being evaluated was responding to existing HIS challenges by then as supported by the literature.

2.1 HIS implementation challenges

Health information system as an integral part of health service delivery, is defined by WHO (2008) as a set of components and procedures organized with the objective of generating information which will improve health care management decisions at all levels of the health system. WHO (2000), Hotchkiss, et al., (2010) also summarize the objective of health information system as to integrate data collection, processing, reporting and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services.

Fitzgerald, Philippides, & Probert, (1999) and Patel (2007) define information system implementation as the process of defining how an information system should be built; ensuring that the information system is operational and used and also ensuring that the information system meets quality standards. Creswell, Bates and Sheikh (2013) argue that information system implementation is a challenging stage of an information system life cycle as its success is dependent on several factors such as technical, social, organizational as well as wider social political factors. WHO (2000) and Hotchkiss, et al., (2010) also point out that although developing countries have developed health information systems to address their health information needs, they are facing challenges in institutionalizing and implementing these information systems.

For the sake of this research, HIS implementation challenges have been broadly categorised into long standing challenges and emerging challenges.

2.1.1 Long standing challenges

As used in this research, long standing challenges are those challenges which developing countries have been struggling to deal with for quite a long time and they are still persistent in the implementation of health information systems.

(i) **Overdependence on donor aid**

Some researchers argue that developing countries are failing to make a quick headway in the implementation of health information systems due to their heavy dependence on development donors for financial and technical support. Gladwin, Dixon, & Wilson, (2002) argue that unfortunately some of these donors sometimes push for their own short-term agenda at the expense of developing countries' long-term health information systems objectives. Gladwin, Dixon, & Wilson (2002) further observe that some donors tactfully disregard national policies on health information systems just to meet the interests of their headquarters offices. The challenge of donor overdependence is also pointed out by Chaulagai, et al., (2005) who argue that dependency on external funding is one of the main challenges affecting health information system implementation in developing countries.

Smith, et al., (2008) point out that although international development partners support developing countries with resources to strengthen the national health information system, they sometimes play double standards as they also provide resources (both financial and technical) to parallel health information systems.

Statistics Norway (2017, p. 11) also observes that "*donors often have to meet demands from their headquarters" interests rather than supporting the Ministry of Health"*.

The literature presented above indicates over dependence on foreign aid as one of the challenges in health information systems implementation in developing countries.

(ii) Irrelevance of the collected information

WHO (2000) attributes this challenge to lack of coordination and consensus between data producers and users of the data at each level of the health care system regarding the information which either side deems necessary. As pointed out by WHO (2000), when health workers do not see the relevance of the data they collect or when the data does not help them improve service to patients, it becomes difficult to convince them on the need for collecting such data. This consequently leads to incomplete and poor-quality data. Another contributing factor to collection of irrelevant data is due to information or indicator overload which is mostly caused by international donor agencies (ibid).

Statistics Norway (2017) points out that one of the issues which need to be sorted out if health information systems are to be strengthened is indicator overload. And it argues that a key element in strengthening health information systems is to determine what data should be collected, at which levels of the system and by whom. This can be extended to include "of what purpose".

In Figure 2.1 below, the quantity of data decreases as we go up the information pyramid. WHO (2012) points out that countries should always make decisions on what data need to be reported upwards, for what purpose and special consideration should be given to a limited set of indicators to avoid overburdening the health information system.

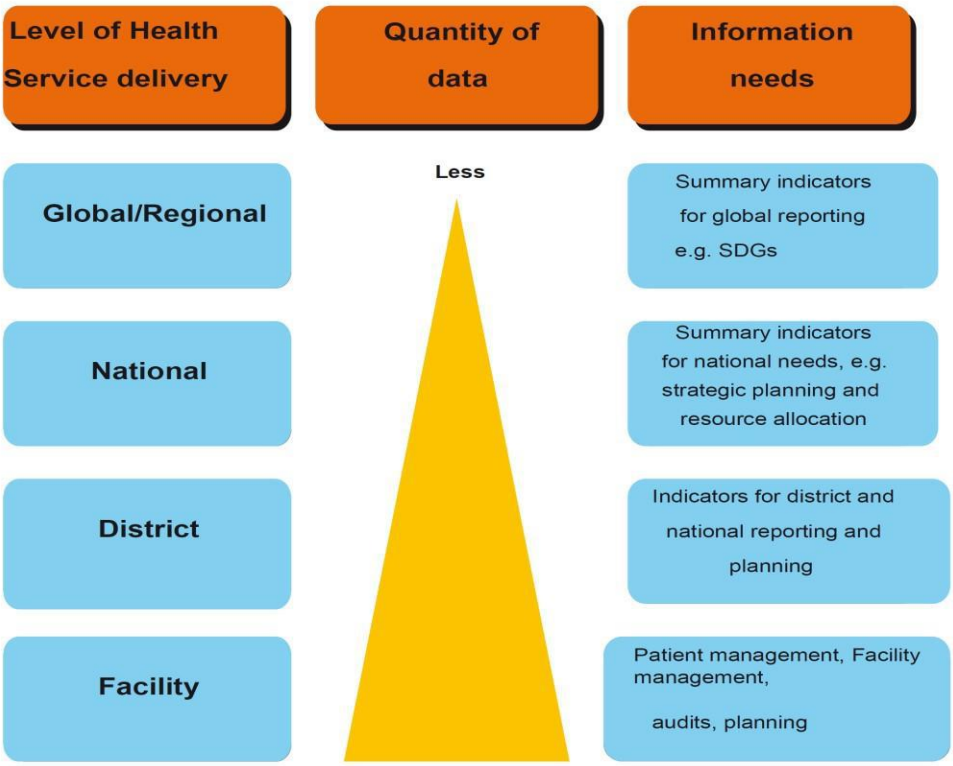

Figure 1: **Information Pyramid (WHO,2012)**

(iii) Poor quality data

This challenge, as (WHO, 2000; Hotchkiss, et al., 2010) argue, is mainly because people involved in data management processes are poorly trained and motivated. Sometimes data requirements do not take into consideration the available human resource and their technical skills and diagnostic equipment (ibid). Kasambara, et al., (2017) while noticing some improvements in health data quality, also posit that inadequate qualifications among different cadres of health workers involved in data management and use of unstandardized tools are some of the contributing factors to poor data quality.

Another longstanding challenge affecting data quality especially data completeness in developing countries is the weak link between the community and health facility levels. This challenge is highlighted by Kanjo & Kaasbøll (2009), Kanjo (2011) and Kanjo (2012) who posit that the poor link between the community level and health facility

service providers affects information flow and consequently data quality. It is also argued by WHO (2012) that one of the guiding principles for improving data quality is by reducing the necessary information to a minimum dataset. This comes from the reasoning that the more data is collected, the more the quality of that data is compromised. On indicator overload as one of the contributing factors to poor data quality, Statistics Norway (2017) suggests that partners should consider reducing their reporting requirements to countries in order to contribute to improving data quality. But it also casts doubt on this happening as more and detailed data is required for countries to report on progress on the Sustainable Development Goals. This shows that health information systems will continue to be overloaded with more and more data.

Manya and Nielsen (2016) point out that failure to adhere to registers‟ instructions, use of multiple tools to aggregate data and lack of data collection tools contribute to poor quality data. Slimperi et al., (2002), Manya and Nielsen (2016) also suggest that implementation of just a simple and practical incentive can contribute to data quality.

Statistics Norway (2017) points out that lack of feedback from higher levels down to reporting levels is also one of the causes of poor-quality data. It further elaborates that lack of feedback from national to district staff and district staff to health facility staff demotivates them from improving data quality.

The cited literature shows that poor quality data is a challenge in health information systems.

(iv) Lack of information use

WHO (2000) observes that assertions that there is poor health data utilization especially in developing countries is usually based on anecdotal evidence as researchers have not adequately evaluated information use. It however notes that low information use is usually attributed to poor quality of the information which is not always correct as it is not all the data that is of poor quality. And therefore, lack of use of health information

cannot be attributed to this factor alone. Kasambara, et al. (2017) while agreeing with WHO (2000) on the need for a detailed evaluation of health information use, notes that there is reported insufficient use of health information.

Galimoto (2007) argues that accessibility to health information determines the utilization level of the information. She argues that, for example, program managers who have their parallel reporting systems are more likely to use their data than the data from the national information system. Some literature such as Braa, Heywooda, & Sahay (2012) also suggest that regular data use reviews can contribute to improving health information use.

WHO (2012) also argues that lack of data analysis capacity especially at lower levels of the health service delivery system also contributes to low use of the information. It argues that better information will lead to better decisions and better health if the information is used. It further points out that another contributing factor to low health information use in developing countries is that usually health information systems in these countries are data-rich but information- poor.

Figure 2.2 shows how transformation of data into information influences its use and lead to better health outcomes.

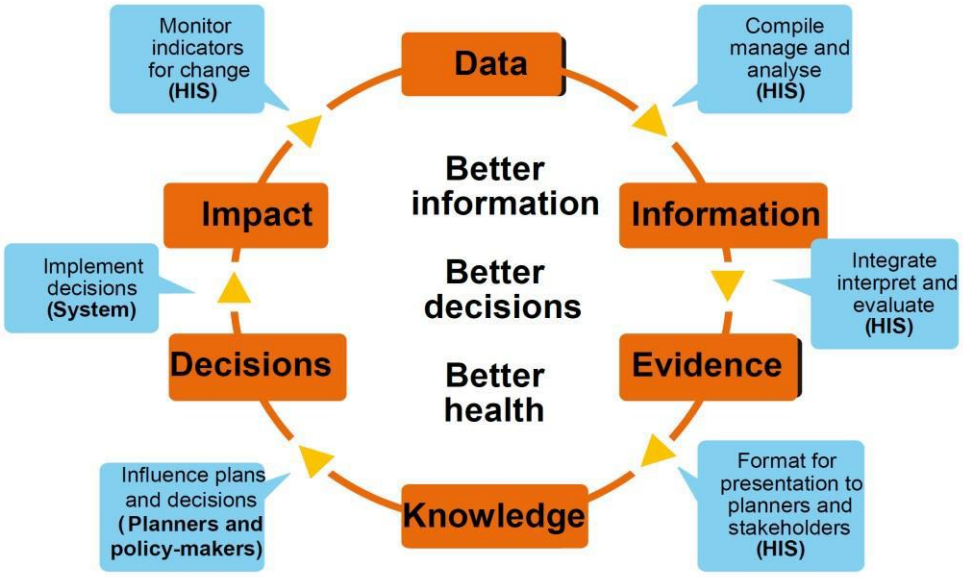

***Figure 2.2*: Transforming data into information: Influencing its use (WHO,2012)**

(v) Infrastructure

WHO (2000) observes that although the use of computers offers many benefits in health service delivery, it comes with a high cost in the context of developing countries and this limits access and use of health information systems as computers are the main tools for using these information systems.

Even access to and use of computers in some areas in developing countries is still a challenge mainly due to cost and power availability (Ouma & Herselman, 2008). They further point out that, as it is well known that the main challenge for rural areas to use health information system is lack of computers, internet connectivity and power, it is important for authorities in developing countries to make these available so that health information systems are scaled even to rural areas. The challenge of intermittent power supply is also echoed by Kasambara, et al., (2017) who add that delays in computer maintenance and repair is another infrastructural challenge especially at district and health facility levels.

Frøyen (2015) observes that due to poor internet connectivity, some health workers, especially in the rural areas, are unable to use the web based national health information system. Frøyen (2015) further notes that even in areas where internet connectivity is available, the users are sometimes unable to access the national health information system because of power outages. Frøyen also points out that with the poor road network in many developing countries, it becomes challenging for paper reports to move from rural health facilities to higher levels such as districts and this negatively affects reporting completeness and timelines.

The above cited literature shows that infrastructural challenges such as poor internet connectivity, intermittent power supply, poor road network and lack of computers are affecting implementation of health information systems in developing countries.

2.1.2 Emerging challenges

Emerging challenges in the context of this research, are those challenges which have been given less attention in the past and are now becoming more and more prominent in health information system implementation in developing countries.

i **System Usability**

The International Organization Standardization (as cited in Adebesin et al., 2010) defines usability as "*the extent to which a product can be used by the specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use"*.

Sharp, Logers and Preece (as cited in Kushniruk et al.,2008) define health information systems usability as "*the degree to which the information systems are useful, effective, efficient and enjoyable"*.

Kushniruk et al., (2008) point out that it is essential that health information systems are easy to use. However, they argue that there are currently a wide range of issues and

problems with health information systems related to human-computer interaction and these have been a major impediment to adoption of the information systems. They identify information system intuitiveness, information system complexity and patient safety as some of the main concerns in health information systems usability.

Zikos, Diomidous, & Mantas (2009) point out that usability of an information system is related to the usefulness of the system in the real environment and that this usefulness of any system affects its overall implementation. Zikos et al., (2009) observe that information system screen appearance such as lay out, font and colour palette as some of the issues in information usability. They argue that though looking insignificant, these basic system characteristics can affect system usability. They also mention quality of information produced by the information system as one of the usability concerns.

Alshamari (2016) describes usability as one of the major factors affecting health information system acceptability in general and successful implementation of health information system in particular. He describes usability as one of the critical attributes of any system's quality. Alshamari points out that there are different usability factors that are expected to influence health information systems" usability. He identifies the following as some of the main current health information usability factors worth considering; patient safety and privacy, system availability and response rate, error prevention, complexity and learnability. Alshamari points out that these factors will be relevant depending on the type of the health information system. Alshamari further argues that with aggregate reporting information systems, patient safety and privacy will not be issues while the same will be very critical with patient management information systems.

ii. Digital divide

Wilson (as cited in Adebesin, Kotzé, & Gelderblom ,2010) describes digital divide as a multidimensional phenomenon that refers to disparity in access, distribution and use of ICTs between two or more populations. Wilson argues that digital divide is not only

about lack of acquisition of the computing devices but it is also about lack of cognitive resources as effective human-computer interactions require basic IT skills. Wilson further points out that it is the IT skills which enables users to recognize the need for information, to find the information, process it, evaluate the information for its appropriateness and even how to utilize it in a meaningful way.

Norman and Skinner (2006) point out that although it is necessary for technology users to have capacity to access and make sense of the information they access, there are limited tools to assess their capacity for engaging in e-health. They argue that e-health resources are useful only when intended users can use them. They further mention that HIS developers and implementers need to always consider the end users' capacity when designing and deploying information systems. Norman and Skinner (2006) cite complex interface designs of the health information systems as an example of causes of digital divide as they make it difficult for some people to access or use the information system.

Adebesin et al., (2010) also argue that language in which technology is accessed can contribute to digital divide and point out that lack of relevant content (information system availability in local language), is contributing to poor use of health information systems in most developing countries.

Neter and Brainin (2012) point out that some 30 years back, the concern over inequalities associated with the digital divide was mainly focussing on availability, affordability and ownership of digital infrastructure. They argue that now the discourse on digital divide has broadened and even changed focus to patterns of access, use and online skills rather than just mere access to technology. They further point out that when thinking about digital divide as one of the challenges faced in health information system implementation in developing countries, focus should not only be on providing the IT devices but also technical skills on how to use them.

The cited literature shows that lack of computing devices, complex interface designs, lack of cognitive resources and relevant content are widening the digital divide and consequently affecting implementation of health information systems in developing countries.

iii. Health information system Scaling

Sahay and Walsham (2006) describe an information system scale as a scope of the system and scaling as implying an expansion of this system in size and scope such as making the system accessible to more users or increasing its functionalities. They argue that for these systems to grow to this required level of scale, they need to be accompanied by the scaling of human resource capacity at two levels at least.

The first level of the human resource capacity scaling is that of the system end users which may be necessitated by an escalated technical complexity of the system. And the second level of human resource capacity scaling is that of the system implementers which is necessitated by the scaled complexity and number of users of the information system which calls for more technical support. For this reason, they argue that system implementers need to be scaled in terms of both numbers and technical skills.

Nguyen, Nielsen, & Jørn (2017) point out that scaling of health information systems from small scale pilots to national systems in developing countries pose a big challenge to both system designers and health managers. They argue that this challenge of scaling makes many projects to dissolve and die before they even reach the scale where they can be useful for information management.

Sahay et al., (2013) observe that scaling of information systems is a field of research with growing importance. The importance of scaling of health information systems in health sector is also echoed by Mengiste et al., (2007) who argue that scaling of health information systems in health sector is almost *"a pre-requisite and not a luxury*" because for a health manager to make sense of any health program data, they will

require data from all facilities or districts or provinces. They however observe that despite this imperative of sustainable information systems, scaling has not been explored in depth as a field of study.

Mengiste et al., (2007) however point out that there should always be consideration of available human resources, access to technology, volume of data that a specific information technology collects and interdepencies of these factors when planning scaling of an information technology.

According to the cited literature, it shows that challenges on scaling are not only technical as it is usually assumed but a multidimensional phenomenon which involves all social technical aspects of the health information system.

vi. Technology

Carroll et al., (as cited in Mohamadali & Aziz,2017) point out that despite countries looking for ICT in general and information system in particular as an enabler for them to improve their health service delivery, research reveals that there are still some technological factors that cause a major roadblock to health information system implementation. Mc Ginn et al., (as cited in Mohamadali & Aziz ,2017) also reveal that technological factors are impeding successful implementation of health information systems not only in developing countries but even in very advanced economies. Mc Ginn et al., gives as an example that a study conducted in 2011 revealed technological factors had caused an obstacle to health information system implementation to 16 countries in Europe and 14 states in the United States of America.

Mohamadali and Aziz (2017) mention low system speed, unexpected system outages and data loss caused by different system errors as some of the technological factors that pose a challenge to health information system implementation. They also identify lack

of integration as one of the technological factors impeding health information systems in developing countries.

They summarize the technological factors affecting health information system implementation based on some of the concepts of McLean and DeLone model where they argue that information quality, system quality and service quality are some of the main technological factors affecting successful implementation of health information systems.

The literature reviewed shows that most of the challenges faced by developing countries in health information implementation include both technical and social aspects of health information systems and therefore their solutions should be social technical as well.

2.2 Efforts to strengthen health information systems.

This section presents literature on strategies the developing countries are taking to strengthen their health information systems.

Vital Wave Consulting (2009) notes that many developing countries have launched reforms of their health information systems to respond to various challenges which the countries are facing. Presented below are some of the initiatives taken by the developing countries to reform their health information systems.

2.2.1 Integration of the scattered information systems.

Bhatt (as cited in Dlodlo & Hamunyela ,2017) defines information systems integration as the extent to which data and applications through different communication networks can be shared and accessed for organizational use.

Nyella (2009) argues that many developing countries have realized the need for having all the health information in one system to ensure availability and accessibility of comprehensive health information at all levels of the health services delivery system.

Galimoto (2007) posits that health information system integration is a difficult concept as its success depends not only on technical aspects but social aspects as well. Galimoto (2007) further argues that information systems integration becomes even more challenging to achieve when the parallel information systems provide more real time and accurate information than the national main information system.

Nyella (2009) argues that other challenges in health information systems integration include tension between standards and local adaptations, interorganizational power relations, divergent agenda and interests of multiple actors and developing countries donor dependence.

However, Nyella (2007) recognises some progress made by developing countries on health information systems integration through use of essential minimum dataset agreed upon by health programs and reported by all reporting health facilities. WHO (2006) points out that having an essential minimum dataset reduces the burden of data collection and reporting.

Nyella (2009) also mentions that data management approach whereby gaps, inconsistencies and overlaps in datasets from different programs are sorted out to streamline the datasets.

2.2.2 Adoption of the web-based District Health Information System (DHIS2)

Smith (as cited in Msiska,2018) points out that the health information systems in Malawi come from a fragmented background and DHIS2 is seen as a vehicle towards an integrated health information system.

Kiberu et al., (2014) also observe that the adoption of DHIS2 helped the Ministry of Health in Uganda to further integrate their health information systems and this helped to improve timeliness and completeness of health service data.

2.2.3 Developing and implementation of health information systems policies.

In their regional HIS strategy of 2006, Southeast Asian countries prioritised development of HIS policies to improve availability, quality and use of health information (WHO,2006). Kenya also attributed weaknesses in their HIS to lack of policy (Ministry of Medical Services; Ministry of Public Health & Sanitation, 2014). In its HIS policy of 2011, Republic of South Africa emphasized the need of policy to improve availability, quality and use of health information (National Department of Health ,2011, p. 15). Likewise, Republic of Fiji also emphasizes the positive role that HIS policy plays in strengthening health information systems (Ministry of Health, 2011). Malawi also developed its HIS policy in 2003 as one of the interventions to improve its health information system (Manda, 2015).

The cited literature indicates that development and implementation of health information system policies, adoption of the web-based District Health Information System (DHIS2) are some of the strategies countries are using to strengthen their health information systems.

2.3 Policy Process.

This section presents the literature reviewed on stages of policy making which is also called policy process. It is necessary to briefly look at the other stages of policy process as implementation and evaluation are not independent of the other stages of policy making.

Birkland (as cited in Kunyenje, 2019) defines *policy process as a* system that realizes policy ideas into actual policy documents, which can be implemented and have positive

effects. Buse, Mays, & Walt (2005) point out that there are several models for making a policy and one of the models is a stages model whereby policy making is seen as a process of several stages namely; problem identification, policy formulation, passing of laws and regulation, policy implementation and policy evaluation. Figure 2.3 is an illustration of the stages model of policy making suggested by Stephen Brooks (as cited by Kunyenje,2019).

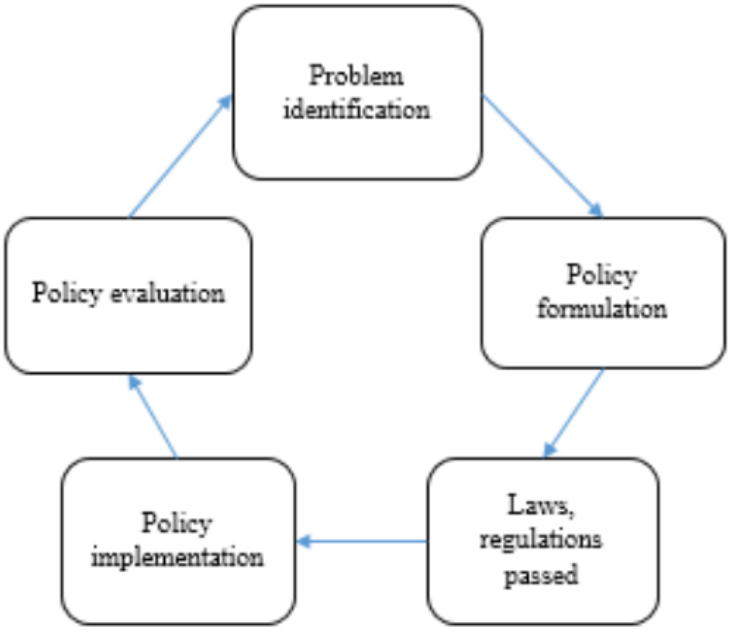

***Figure 2.3*: Policy process (Kunyenje, 2019)**

2.3.1 Problem identification

Buse, Mays, & Walt (2005) describe this stage as an agenda setting stage where issues are identified as a matter of concern for policy. Dye (2013) defines this stage as identification of policy problems through demand from individuals and groups for government action while Babu et al., (2000) and Sutcliffe & Court (2005) define this stage as a problem structuring stage where following activities are done;

- Identifying a problem situation by collecting evidence indicating the magnitude of the problem. This information, they claim, is necessary for the decision makers as well as other stakeholders.
- Documenting the importance of a problem and its determinants.
- Challenging frameworks to be used for the policy.
- Identifying decisive, relevant data characterizing the problem.

Khan et al., (2017) argue that sometimes problem identification can be influenced by external factors such as international donor agencies by prioritizing which health areas are provided funding for.

2.3.2 Policy formulation

Buse, Mays, & Walt, (2005) posit that rationale and justifications for the identified issues for their inclusion in the policy are provided at this stage. Dye (2013) describes this stage as the development of policy proposals by different actors including interest groups.

Khan et al., (2017) argue that the external actors can also influence what gets into the policy through their greater proficiency in using data from surveys or studies to develop policies.

2.3.3 Laws and Regulations passed

Dye (2013) describes this stage as a policy legitimation stage whereby the selection and enactment by government is done. Birkland (2015) also describes this stage as a starting point for putting into effect a regulation or a piece of legislation. Dye (2013) points out that main activities at this stage include; selection of a proposal, development of political support for it, enacting it into law and deciding on its constitutionality.

2.3.4 Policy implementation

Buse, Mays, & Walt (2005) point out that this is where policy objectives are put into practice and argue that it is the most neglected phase of policy making.

Anderson et al., (2006) describe three main activities involved in policy implementation namely;

- Translation of the policy into administrative directives which they also describe as policy interpretation.
- Establishment of administrative units and methods, which are necessary for putting the policy into effect which they call policy organization.
- Routine administering of the policy which according to them can also be described as actual policy application.

Levitsky and Murillo (2009) argue that in most cases policies are never implemented because they are adopted just to serve as window dressing to convince donor agencies. They further point out that a major barrier to policy implementation is state weakness, resulting in weakly enforced institutions.

Fukuyama (2004) observes that in many developing countries, lack of a meritocratically selected, well paid and rule-abiding administration is a major impediment to policy implementation. He notes that most developing countries may adopt a law in the national legislature only to find that enforcement, regulation, and oversight are impossible in practice. He also argues that where state capacity is lacking, many implementation challenges arise.

Kamanga et al., (2017) identify six factors contributing to unsuccessful health policy implementation namely; i) selective prioritization of policies by government, ii) lack of involvement of implementers in policy making process, iii) lack of health workers training, iv) unsatisfactory supervision of policy implementation, v) lack of clarity about guidance to those implementing the policy and vi) unclear roles and reporting authority among main national coordinating units.

Lewis Gunn (as cited in Hunter, 2002) argues that policies fail to achieve intended objectives because of the following factors;

- Poor understanding of the objectives of the policy.
- When tasks are not fully specified and are not in the correct sequence.
- When dependency relationships in issues in the policy are multiple.
- When those in authority are unable to demand or obtain perfect compliance from implementing institutions.
- When the required combination of resources is not available.
- When there is an imperfect communication and coordination between top authority and the implementing officers.
- When the policy to be implemented is not based on a valid theory of cause and effect.
- When there is an imperfect communication and coordination between top authority and the implementing officers.
- When the relationship between cause and effect is indirect and there are multiple intervening links.

2.3.4.1 Policy implementation approaches

Buse et al., (2005) describe three main approaches for policy implementation;

i. Top- down approach

They argue that under this approach, policy formulation and implementation are seen as distinct activities whereby the policy is developed at the highest level and communicated to lower levels for technical, managerial, and administrative implementation. The authors argue that the challenge with this approach is that top-level policy makers may formulate objectives or tasks that are impractical. Under this approach there are two distinct groups namely; policy makers and policy implementers. In most cases the policy makers rarely consult the lower-level implementers of the policy being made. As the authors point out, this approach envisages a clear division between policy formulation and implementation. It is an approach whereby the subordinate levels of the policy system put into practice the intentions of the higher levels based on the setting of objectives.

One of the biggest advantages of this approach, as advanced by the authors, is that it empirically distinguishes between failed and successful implementation of the formulated policy. However, the authors point out that the major challenge with this approach is that policies which are difficult to put into practice or not implementable at all can be formulated and passed to lower levels for implementation.

ii. Bottom -up approach

In this approach, the authors argue that officers at lower levels actively participate in the policy development and implementation and they may have discretion to reshape some of the objectives and change the way the policy is implemented. This approach looks at the policy implementation as an interactive process whereby top-level policy makers, low-level implementers and other stakeholders are actively involved.

The challenge with this approach is that evaluation of the effects of the policy becomes difficult as objectives may be modified during implementation.

The approach has an advantage of ensuring formulation of implementable policies as the people to do the actual implementation on the ground actively contribute to the policy formulation process thereby minimising the chance of making policy directives which are not implementable on the ground.

iii. Principal-Agent Theory

In this approach, the authors those who define the policy (the Principal) check whether the Agent (those who implement the policy) have accomplished what was specified in the policy.

The principals who in the case of government are usually politicians and top public servants formulate policies and delegate the whole process of implementation to agents

who are lower-level public servants. There is little or no monitoring of implementation by the principals and the agents have the

discretion of implementing the policy in their own way. The authors argue that the agents do not usually feel obliged to put into practice what the principals have communicated. The agents are indirectly and incompletely controlled during the implementation of the policy.

The authors argue that the biggest challenge with this approach is that the policy is sub optimally implemented due to lack of direct monitoring and enforcement of the policy implementation. However, they point out that the approach gives discretion to the agents to implement those policy directives which are practical on the ground and relevant to their work and the people they serve.

2.3.5 Policy Evaluation

Buse et al., (2005) describe policy evaluation as a stage which identifies what happens when the policy is put into effect.

The authors argue that this stage is usually overlooked and policies are either retained or replaced without conducting any evaluation. They argue that bad policies effectively implemented but without producing the intended impact can be maintained. Likewise, a good policy may end up being replaced blindly.

WHO (2012) emphasises the importance of this policy process stage by arguing that the stage answers the following questions;

- Were the policy objectives met?
- What were the unexpected outcomes of the policy implementation?
- Did the policy objective remain the same?
- Was the policy implemented effectively?
- Did the condition being addressed change over time?

Buse et al., (2005) also argue that that it should be after this stage that a policy can be retained or replaced. Khan & Rahman (2017) posit that policy evaluation is a tool for measuring worthiness, performance, and efficacy of a policy. They argue that policy evaluation implies looking backward in order to better steer forward. The authors further argue that failure to conduct policy evaluation is a recipe for danger as factors which might have facilitated the failure or success of the policy would be missed and this would negatively affect even future policies. They also argue that policy evaluation is usually not done in developing countries due to limited technical skills and resources.

2.4 Conceptual Framework

This section describes the conceptual framework which guided the whole process of the study.

Conceptual framework is defined in different ways. For example, Adom et al., (2018) define conceptual framework as a structure which the researcher believes can best explain the natural progression of the phenomenon to be studied. Lester (as cited in Ngulube et al., (2015, p. 47) define conceptual framework as *"an argument that the concepts chosen for investigation, and any anticipated relationships among them, will be appropriate and useful given the research problem under investigation".*

Ngulube et al., (2015) point out that conceptual framework graphically or narratively explains the main dimensions to be investigated in a research. Guided by these definitions, a conceptual framework with concepts from two theories namely theory of change and institutional theory was constructed.

Creswell J. W (2014, p.86) defines theory as "a set of interrelated constructs (variables), definitions and propositions that presents a *systematic view of phenomena by specifying relations among variables with the purpose of explaining natural phenomena".*

To construct the conceptual framework for this study, constructs were selected from each theory.

2.4.1 Theory of change

Stein and Valters (2012) describe theory of change as an articulation of how and why a given intervention will lead to specific change. The authors argue that theory of change shows how Inputs, Activities, Outputs, Outcome, and Impact are related to one another and how each affects the desired project goal. Valters (2014) defines theory of change as a model of how and why an initiative works.

Mayne (2015) argues that theory of change is a model of "contribution to*"* and not "cause" per se of the intended result because there may be other external factors contributing to the intended results. Mayne posits that theory of change should be used as a model of causality *only* when there are no confounding factors at work.

Mayne's definition of theory of change fits well with how it was applied in this research. Figure 2.4 is a graphical presentation of the selected concepts of theory of change. Theory of change assumes a logical flow of the five elements namely; Inputs, Activities, Output, Outcome, and impact. The first three concepts are at the level of policy implementation and the last two are at results level. Based on the definitions of theory of change presented above, the graphical presentation in Figure 2.4 means that each component starting from Inputs contributes to achievement of the next component.

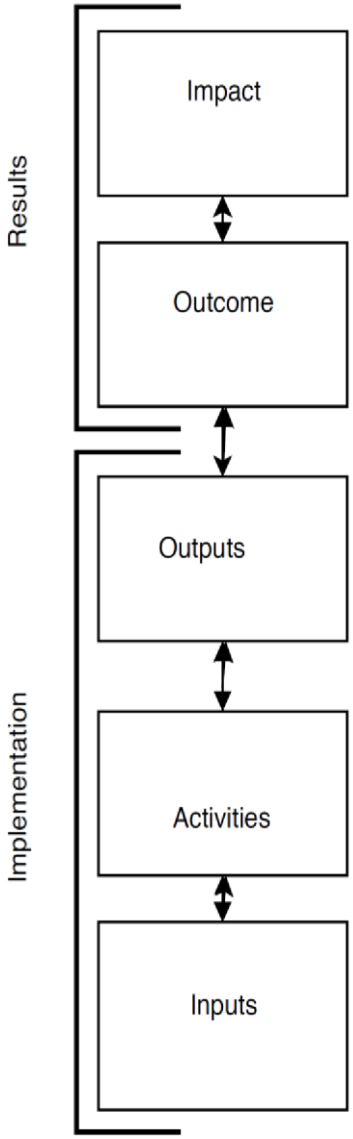

***Figure 2.4*: Theory of change concepts**

The relationship between two adjacent components is bi-directional hence the double arrow used.

Rogers (2014) defines the five Theory of Change components as follows;

i)Inputs: *The financial, human, and material resources used in a Programme or policy.*

ii)Activities: Processes that make use of the inputs to produce outputs.
iii)Outputs: The immediate effects of Programme/policy activities, or the direct products or deliverables of Programme/policy activities.

iv)Outcome: The likely or achieved short-term and medium-term effects of a Programme or policy outputs.

v)Impact: Positive and negative, primary, and secondary long-term effects produced by a development intervention, directly or indirectly, intended, or unintended.

Harries et al., (2014) summarize these definitions as follows;

- Inputs are the resources that a project requires to carry out the planned activities while Activities are all the processes or interventions which were planned to produce outputs required in the project.

- Outputs are the direct products emanating from the processes or the activities conducted, and outcome are the short term or intermediate results while impacts are the long-term effects or the overall project goal.

The conceptual framework for this research used the first four concepts of the theory of change and left out the impact concept as it was considered beyond the scope of the evaluation. These four concepts were chosen for two reasons;

i) Policy implementation assessment is an evaluation study. Evaluation studies normally aim at establishing if some intended or unintended change happened after an intervention was carried out and this is closely related to what theory of change is all about.

ii) The policy document specifies inputs and processes which were anticipated to achieve the policy objectives. In order to understand how and why the objectives were achieved or not, theory of change proved to be appropriate to guide the study.

Harries et al., (2014) identify 4 methods for establishing or confirming that the effect realised was caused by the stated interventions;

i. Statistical methods: This involves using correlation or regression measures and other statistical models. You need to have *before* and *after* situations to use this method.

ii. Experimental method: You can use this method if you have both *intervention* groups and *control* groups.

iii. Case based approach: In this approach selected individuals or groups or places are studied to establish if the intervention has brought any effect.

iv. Theory based approach: This approach uses different stakeholders including staff members describing in detail how an intervention affected the project.

This study used components of both (iii) and (iv).

2.4.2 Institutional theory

Bjorck (as cited in Sherer, 2010) defines Institutional Theory as a collection of ideas related to the mechanisms supporting and restricting social behaviour. Sahay et al., (2010) and Bjorck (as cited in Sherer, 2010) posit that Institutional Theory is based on institutions as its basic building blocks. Bjorck defines Institutions as social structures based on taken-for-granted, formal or informal rules that restrict and control social behaviour. Alghatam (2018) describes institutions as durable structures that influence actions of people and societies.

Sahay et al., (2019) point out that various studies of health information systems in developing countries have adopted an institutional lens to explain the relation between health information systems, users' practices, and institutions. This research selected one concept called Institutional Work from the Institutional Theory.

Lawrence and Suddaby (2006) define Institutional Work as the purposive action by individuals and organizations aimed at creating, maintaining and disrupting institutions. This means the concept of institutional works focuses on understanding how institutions are created, maintained, and disrupted.

2.4.2.1 Creating institutions

Lawrence and Suddaby (2006) identify nine ways to create institutions which include 1) advocacy,2) defining,3) vesting, 4) constructing identities,5) changing normative assciations,6) constructing normative networks,7) mimicry,8) theorizing and 9) educating.

This study applied advocacy and educating. This choice was based on the researcher's expectation that level of mobilisation of support for the policy especially among the private actors such as implementing partners and private service providers would have effects on the overall implementation and success of the policy. The choice was also based on the researcher's expectation that the level of orientation and general education about the aspirations in the policy being assessed would influence the overall implementation and success of the policy. Lawrence and Suddaby (2006.p.222) describe advocacy as mobilization of political and regulatory support through direct and deliberate techniques of social suasion. Lawrence and Suddaby further argue that advocacy, if used effectively, can determine which norms are followed and which ones are violated which they point out as key elements in cognitive legitimacy in new institutions.

On educating, Lawrence and Suddaby point out that educating is an important form of cognitive work as creation of new institutions usually involves development of novel practices, and in addition, connecting those practices to control mechanisms.

2.4.2.2 Maintaining institutions.

Scott (2001) argues that maintaining institutions has been given less attention than how institutions are created. Lawrence and Suddaby (2006) identify six forms of institutional work involved in maintaining institutions which include 1) enabling work,2) policing,3) deterrence,4) valorising ,5) mythologizing and 6) embedding and routinizing.

This research applied policing and embedding and routinizing. This choice was based on the researcher's assumption that level of policy enforcement and ongoing embedding of required practices in policy implementers would have a bearing on the overall implementation of the policy. Lawrence and Suddaby (2006.p.232) describe policing as ensuring compliance to the existing institutions through enforcing, auditing, and monitoring. Russo as cited in (Lawrence & Suddaby, 2006) point out that this can be done using both sanctions and inducements or incentives. Embedding and routinizing is defined by Lawrence and Suddaby (2006.p.234) as actively infusing the normative foundations of an institution into the participants' day-to-day routines and organizational practices. Lawrence and Suddaby point out that institutions can be maintained and reproduced through the stabilizing influence of the embedded routines and repetitive practices, for instance, educating, training, hiring and certification routines and ceremonies of cerebrations.

2.4.2.3 Disrupting institutions

Lawrence and Suddaby (2006) identify three ways to disrupt institutions; 1) disconnecting sanctions and rewards,2) disassociating moral foundations and 3) Undermining assumptions and beliefs. This study applied undermining assumptions and beliefs.

The concept of institutional work was chosen as appropriate for this research after an inquisitive literature exploration in which it was learnt that successful or unsuccessful implementation of a project including policies also depends on the social practices and beliefs among the individuals and organizations involved. This means that sometimes there might be a need to come up with new social practices or sustain the existing ones that would support the project implementation to achieve its objectives. It also means that there would be a need to disrupt those social practices or beliefs which would impede successful implementation of the project. In other words, this extra concept was included in the conceptual framework after learning that success or failure of a project can not only be explained by the availability or unavailability of human and material

resources but also by the prevailing individual and organizational social practices and beliefs.

Figure 2.5 below is a graphical view of the conceptual framework which combines four concepts from theory of change and one concept from institutional theory. This figure summarizes assumptions in the study conceptual framework. The left-hand side of the framework are the four concepts from theory of change. The right-hand side which has one box represents institutional work. This is my own view of this part of institutional theory in the framework. Individual and organizational practices were regarded as at the levels of inputs and activities of the implementation of the policy.

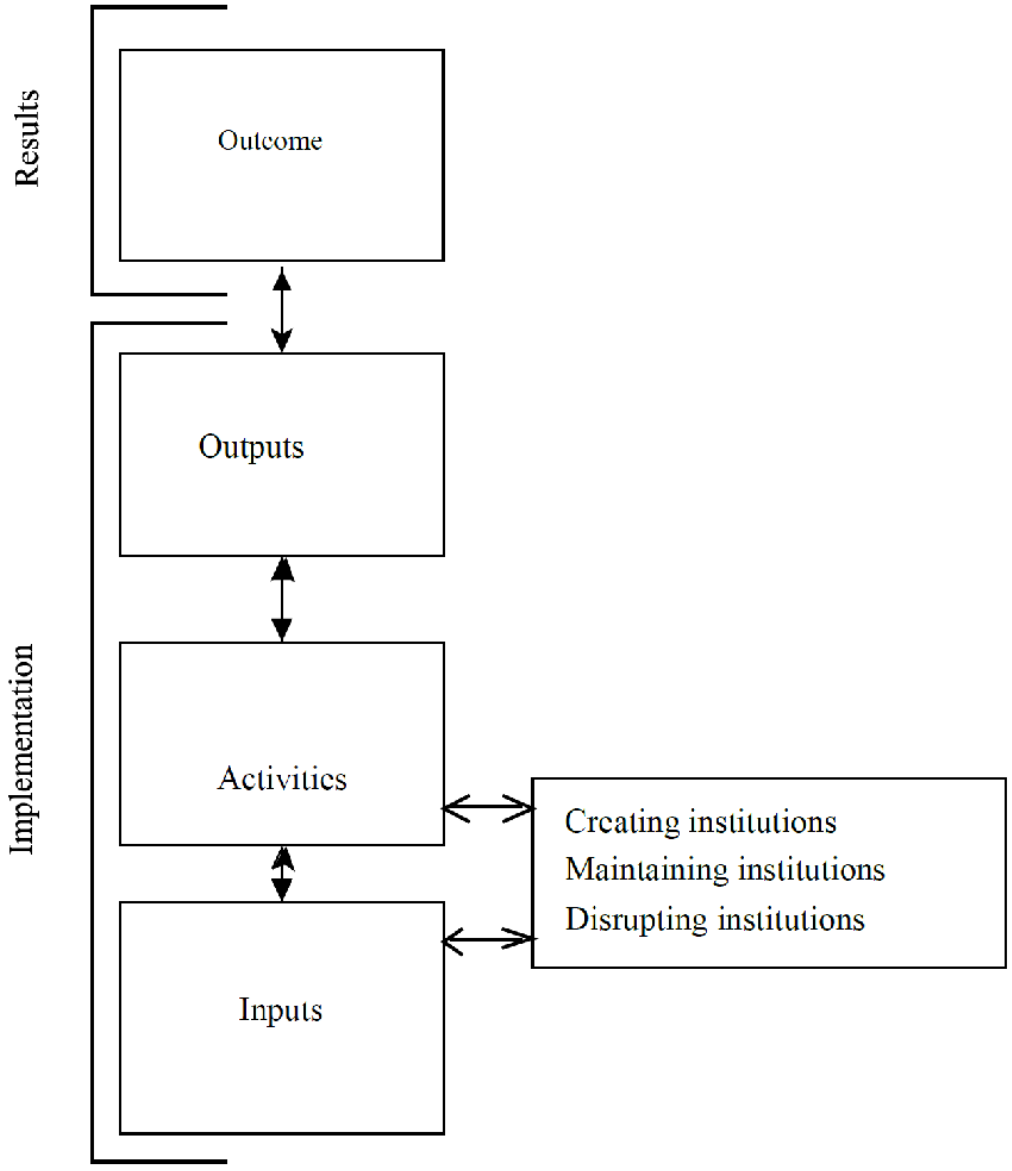

***Figure 2.5*: Study Conceptual framework**

CHAPTER THREE
METHODOLOGY

This chapter presents the methodology used in this research.

3.1 Philosophical Foundation

Creswell (2014) posits that it is necessary for every researcher to explicitly state which philosophical paradigm guided their research.

Walsham (1995) identifies two philosophical paradigms used in Information Systems research; i) Positivism and ii) Interpretivism.

Archer (as cited by Walsham,1995) defines positivism as a philosophical position that facts and values are distinct, and that scientific knowledge consists only of facts. Oates (2006) points out that the aim in positivism is to find universal laws, patterns, and regularities in an attempt to increase predictive understanding of the phenomenon under investigation.

Interpretivism, according to Walsham (1995), is the position of normativism which takes the view that knowledge is ideological and inevitably conducive to particular sets of social ends.

This research was guided by interpretive paradigm based on the fact that data collection, analysis, interpretation and conclusions were based on participants' perceptions of how the policy was implemented and how the implementation affected health information system.

3.2 Research Methods

Myers (1997) defines research method as a strategy of inquiry which spans from the underlying philosophical assumptions to research design and data collection while

Creswell (2014) describes research methods as plans and procedures for research that span from broad philosophical assumptions to detailed research design including data collection, analysis and interpretation.

Three types of research methods as advanced by Creswell (2014) include; i) Quantitative methods ii) Qualitative methods and iii) Mixed Methods.

Quantitative methods originally developed in the natural sciences to study natural phenomena and it involves numerical representation and statistical analysis of observations with the aim of describing and explaining the phenomena reflected by those observations (Myers, 1997). Quantitative methods mainly focus on testing theories by examining the relationships between or among variables (ibid).

Qualitative methods focus more on exploring and understanding the meaning individuals and groups ascribe to a social problem (Creswell (2014).

Mixed methods is an approach involving collection of both quantitative and qualitative data, integrating them and using distinct types of designs that may involve philosophical assumptions and theoretical frameworks (ibid). Mixed methods are usually used for purposes of complementarity, diversity, developmental, expansion, completeness, compensation, and corroboration (Venkatesh et al., 2013). Creswell (2014) observes that the combination of quantitative and qualitative approaches provides a more complete understanding of the problem than either of the two.

In this study Mixed methods were used by designing and administering a structured questionnaire with both open and closed ended questions in addition to in-depth interviews and document review.

The qualitative aspect was implemented through administering the open-ended questions on the questionnaire, conducting in-depth interviews and document review.

Creswell (2014) points out that mixed methods approach is further divided into several types but the most common are; the converged parallel mixed methods, the explanatory sequential mixed methods and the exploratory sequential mixed methods.

In this study a convergent parallel mixed methods approach was used. According to Creswell (2014), in a convergent parallel mixed methods, the investigator typically collects both forms of data almost at the same time and then integrates the information in the interpretation of the overall results. Figure 3.1 below illustrates the convergent parallel mixed methods as described above.

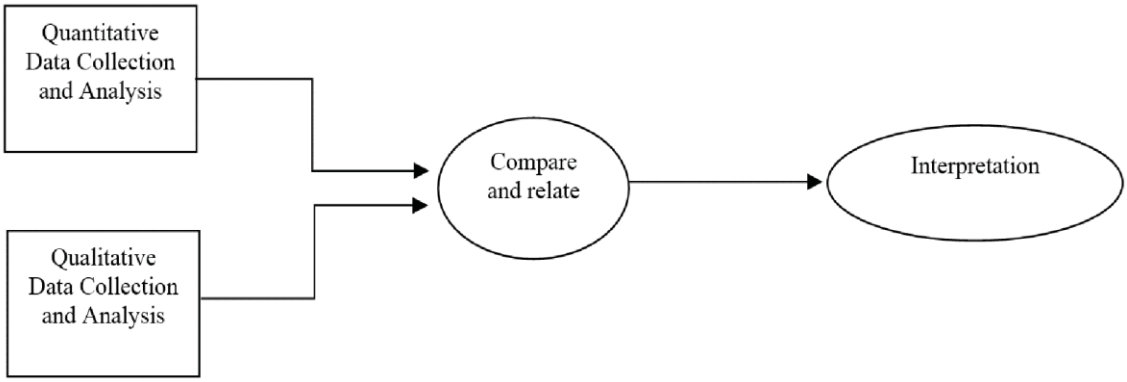

***Figure 3.1*: Convergent parallel mixed methods Model (Demir & Pismek, 2018)**

3.3 Policy Evaluation methods

Health Information Systems policy evaluation falls under Health Policy and Systems Research. WHO (2012.p.19) describes this type of studies as a field *"that seeks to understand and improve how societies organize themselves in achieving collective health goals, and how different actors interact in the policy and implementation processes to contribute to policy outcomes".*

WHO (2012) points out that health policy and systems research is interdisciplinary; a blend of economics, sociology, anthropology, political science, public health and

epidemiology that together draw a comprehensive picture of how health systems respond and adapt to health policies, and how health policies can shape and be affected by health systems and the broader determinants of health.

Buse et al., (2005) describe Policy evaluation as a policy stage which identifies what happens when the policy is put into effect- how it is monitored, whether it achieves its objectives and whether it has unintended consequences.

HM Treasury (2011) posits that policy assessment examines the actual implementation and impacts of a policy to establish whether the anticipated effects, costs and benefits were in fact realized. Mthethwa (2012) also observes that the starting point for a policy implementation assessment is naturally, the policy itself, arguing that policy content, formulation process, and extent of its dissemination influences effective implementation. Nakamura & Smallwood (1980), Walt & Gilson (1994), Hardee et al., (2004) all agree with Mthethwa (2012) on the need for clear policy content by stressing that the policy should clearly frame the underlying problem, the policy goals and objectives and the members of society to benefit, along with the broad actions and strategies to address the problem.

However, Gilson and Raphaely (2008) observe that there is thin and fragmented published work on health policy evaluation.

Purdon et al., (2001) describe several types of policy evaluation. Firstly, they categorize them as summative or formative evaluations.

- **Summative evaluation** is defined as an evaluation whose purpose is to provide a summary judgement on how a project or policy was implemented.
- **Formative evaluation** is when it is undertaken to provide information that would be used to improve the policy implementation.

Purdon et al., (2001) also group evaluations into either process evaluations or impact evaluations.

- **Process evaluations** are those that are conducted to determine whether the policy is implemented as intended. Purdon et al., (2001) argue that this type of evaluation provides most of the information on how the policy should be managed or developed in the future.

- **Impact evaluations** are those that measure the impact the policy has on the defined outcome measures. Purdon et al., (2001) argue that this is more difficult than the process evaluation as there is a need for estimating counterfactual which means measuring outcomes without the intervention or policy in this case.

In this research, summative approach and process evaluation method were used.

3.4 Survey participants

This section presents health workers who participated in this research.

3.4.1 Survey participants' categories

Following groups of survey participants were identified based on their different roles in health information systems:

- Health Management Information System Officers
- District Health Management Team members
- Central Monitoring and Evaluation Division Officers
- Zonal Monitoring & Evaluation officers
- National Health Program officers
- District Health Program Coordinators
- Health facility in charge
- Monitoring & Evaluation Technical Working Group members
- Participants in 2003 HIS policy development.
- Participants in 2015 HIS policy development.

3.4.2 Sampling method and Sample size

For primary data, 100 health workers were selected using purposive sampling. Purposive sampling method was used to ensure that only participants who were knowledgeable enough about the health information system in general and also the health information policy in particular were included in the sample. Creswell (2014, p. 239) posits that the idea behind qualitative research is to purposefully select participants or sites (or documents or visual material) that will best help the researcher understand the problem and the research question.

3.4.3 Survey participants and response rate

72 participants were interviewed using a questionnaire and in-depth interviews were also conducted with ten more participants translating to a response rate of 82%. Table 3.1 below presents stratification of sampled participants and response rate.

Table 3.1: Survey participants stratification

Stratum	**Number sampled**	**Number responded**	**Response rate**
HMIS Officers	33	30	91
CMED officers	5	5	100
DHMT Members	29	19	65
Zonal M&E officers	5	3	60
Health Facility In charges	5	5	100
National Health Program Officer	4	4	100
District level Program Coordinator	10	10	100
2003 policy development participant	2	2	100
M&E TWG Members	5	2	40
2015 policy development participant	2	2	100
Total	100	82	82

3.5 Strategic documents reviewed.

The following strategic documents were reviewed as source of secondary data;

- Health Information Systems National Policy and Strategy 2003
- Health Information Systems Policy 2015
- Health Sector Strategic Plan 2011-2016
- Health Sector Strategic Plan 2017-2022
- M&E/HIS strategy 2017-2022
- National ICT Policy 2013
- Malawi National E-Health Strategy 2011-2016

3.6 Data collection

This section will describe the data collection tools and methods used in this study.

3.6.1 Data collection Tools

A structured questionnaire with closed and open-ended questions was designed. As Creswell (2014, p. 43) posits, both closed and open-ended questions were included to get both quantitative and qualitative data.

A different shorter tool was also developed to guide the in-depth interview. Five modules on the guide for in-depth interviews were as follows:

a) 2003 HIS policy development and dissemination
b) Social technical demands in policy objectives
c) Governance structures which originated from the policy
d) Actual policy implementation
e) Effects of the policy on HIS implementation

3.6.2 Testing of the questionnaire

The draft questionnaire was piloted at Bwaila hospital and Kawale Health centre in Lilongwe using face-to-face interviews.

DHMT members, district program coordinators, HMIS officers, health centre-in charge, statistical clerks and facility program focal person were involved in the pilot.

The main changes made after the pilot were as follows:

- Dropping of statistical clerks and health facility program focal persons.

Most of the questions proved to be irrelevant and difficult for them.

- Applying more skip patterns in the questionnaire.

To ensure that questions which were not supposed to be asked based on the response to the preceding question are not asked.

- Changing some questions from being closed- ended to open -ended to get more insights from survey participants.

- Grouping questions into modules.

To improve logical flow of the questions.

- Unpacking some questions into two or more questions

To improve clarity of the questions.

- The geographical study area was increased from one district to all districts.

To maintain number of participants after dropping clerks and health facility program focal persons.

3.6.3 Data collection methods

The questionnaire was administered using more than one methods. Respondents from Lilongwe were interviewed using the face-to-face method. Most respondents from the other districts were reached by emailing the questionnaire. To improve response rate and quality of the data, the emailing method was supplemented with phone calls and follow up emails.

3.7 Data Analysis

MS Excel 2016 and Stata/MP 14.0 were used for data entry and analysis respectively. Analysis mainly included generation of frequency tables. The qualitative data was also coded and turned into frequencies except direct quotes from informants which were quoted in results section of this document.

3.8 Research Limitations

Postal/emailing method leads to low response rate and compromised data quality. However, follow up emails and phone calls mitigated these risks.

3.9 Ethical Considerations

- Research participation in this study was voluntary and this was explicitly mentioned by the researcher and also stated on the questionnaire.
- Consent was sought before start of each interview.
- Research participant names were not required and recorded on the questionnaire to ensure anonymity and confidentiality of the information each participant provided.

CHAPTER FOUR
RESULTS AND DISCUSSION

In this chapter survey results are discussed.

The main research question for this study is; How did the Malawi health information system policy of 2003 affect implementation of the health information system? The results are presented and discussed by the 4 survey sub questions:

Before discussing the results on the 4 sub questions, the chapter starts with findings on the familiarity of the key informants with the policy including how it was developed. The questions on familiarity with policy aimed at assessing the knowledge that the key informants had with the policy whose implementation this study evaluated. This policy familiarity assessment was based on the 72 participants interviewed using the structured questionnaire through face-to face and emailing methods.

Table 4.1 below shows that all the informants were aware of the policy whose implementation was being assessed.

Table 4.1: Informants' knowledge of the Policy.

Are you aware of the HIS 2003 policy?	Number	%
Yes	72	100
No	0	0
Total	72	100

The study also wanted to establish whether the respondents understood the objectives of the policy. To do this, informants were asked to mention the policy objectives in

their own words. The data presented in Table 4.2 below indicate that respondents were aware of the policy objectives. This was confirmed after comparing the mentioned objectives and the objectives in the 2003 HIS policy document.

Table 4.2: HIS Policy Objectives as understood by informants.

1	To improve data completeness and timeliness
2	To improve data quality
3	To improve data availability
4	To improve data accessibility
5	To make sure that all programs are using the national system
6	To guide on how data should be collected
7	To improve data use
8	To guide on which data to collect for decision making
9	To stop parallel health information systems

All responses which had data quality dimensions such as data completeness and data timeliness were taken as the same objective of improving data quality. Similarly, all responses which mentioned stopping parallel health information systems and use of one national health information system were also taken the same objective of improving health information systems integration. For the sake of analysis, the mentioned objectives were grouped into four categories as presented in Table 4.3 below. This grouping was based on what the policy (Ministry of Health, 2003, pp. 6-9) mentions as the main objectives of the policy namely; (i) to improve health information systems integration, (ii) to improve data quality, (iii) to improve data accessibility and (iv) to improve data use. Table 4.3 below presents this grouping of the objectives mentioned by key informants.

Table 4.3: Policy objectives.

1	To integrate fragmented health information systems
2	To improve data quality
3	To improve data accessibility
4	To improve data use

As presented in Figure 4.1 below, it was also found out that about 95% of the key informants had the opinion that the policy was developed through the bottom- up approach and this might mean that lower-level health workers were involved in the development process. As argued by a number of authors under literature review, an approach used in developing a policy has an impact on its implementation. For example, it has been argued under literature review that if lower level policy implementers are not involved in policy development, it is possible to include tasks that cannot be practical on the ground.

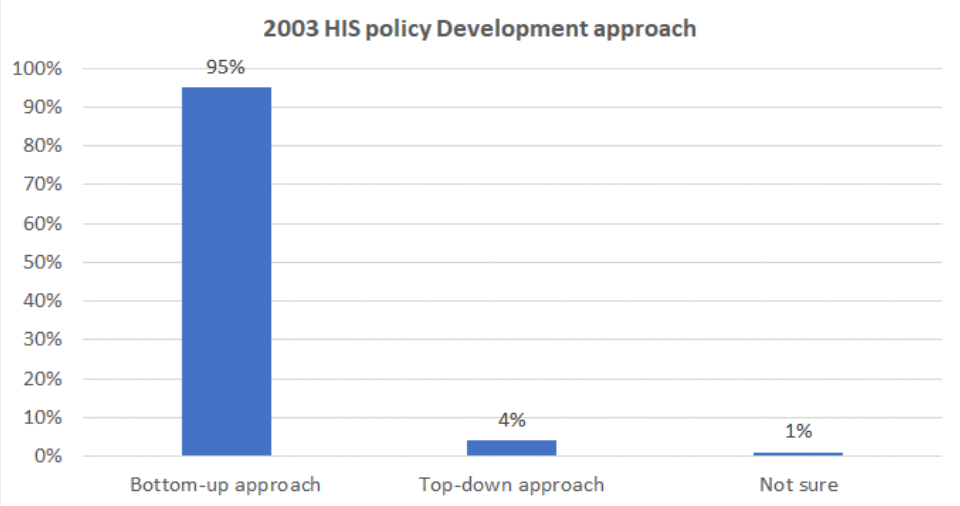

***Figure 4.1*:Participants' knowledge of the policy development approach**

The study results are now discussed by each study question.

4.1 What demands were in the 2003 HIS policy objectives?

According to survey participants, the main technical requirements for the achievement of the policy objectives included (i) Office equipment and other technical services such as internet connectivity and (ii) Well trained human resource for Health Information System (HIS).

4.1.1 Office equipment and internet availability

Survey participants were asked about the office equipment they required most during the policy implementation and whether those were provided to them throughout the implementation. As presented in Figure 4.2 below, respondents mentioned laptops, desktop computers and internet connectivity as the most important additional IT device and services required for them to contribute to the policy implementation effectively.

Results presented in Figure 4.2 indicate that 85% of the office equipment and internet needs were met. The most met need was the internet followed by desktop computers. As reported by survey participants, major programs such as TB, HIV, Malaria, Safe motherhood, EPI, Nutrition and Integrated Disease surveillance and Response (IDSR) received computers for health information management at both national and district levels. This enabled health worker who acted as the grass root implementers of the policy to contribute to the strengthening of the health information system.

The provision of these devices and services satisfies one of the components of this study's conceptual framework which calls for availability of necessary inputs for any project or policy implementation.

Appreciating the provision of office equipment to policy implementers, one DHMT member at Lilongwe District Health office thanked development partners for providing most programs with computers and other office equipment.

She said, "*Had it been not for CMED and some donors to give us computers, our work would have been very difficult".*

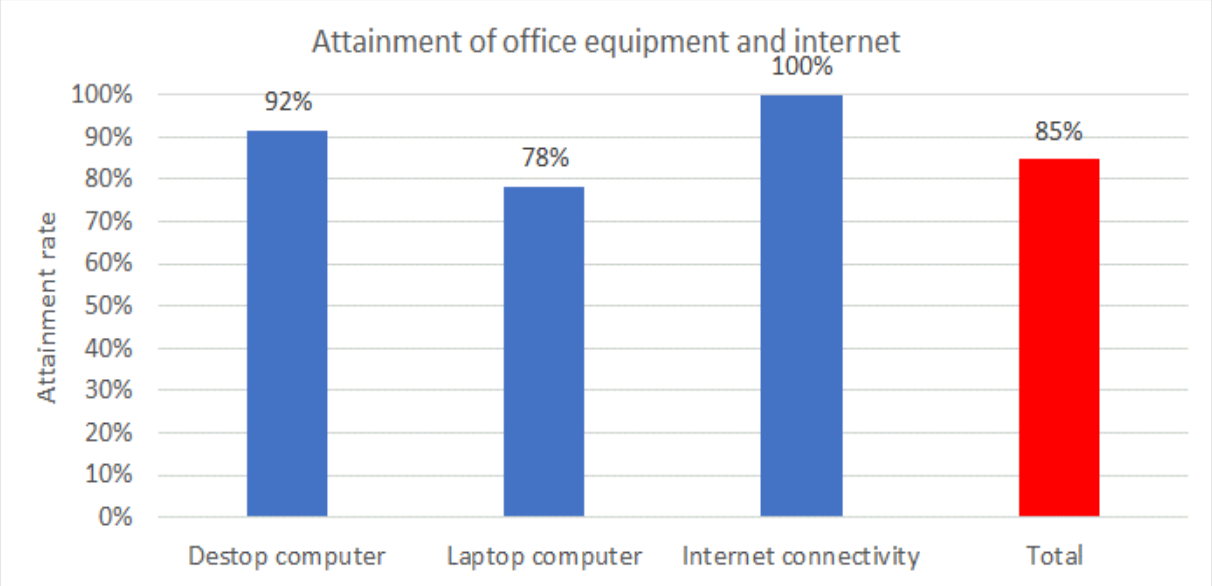

***Figure 4.2*: Availability of office equipment and internet**

4.1.2 Human resource and skills need.

As presented in Figure 4.3 below, 47% of the respondents mentioned database management as their most important skill that would be needed for them to work effectively during the policy implementation. If we combine database management and general computer operation, over 70% of the informants required computer related skills. An in-depth interview with one informant at CMED narrated that another social demand of the policy objectives was to have a health information system dedicated person at health facility level. *"In order to improve data quality at source we needed to have an officer dedicated to health information at the health facility level where this data is generated",* he commented. He added that it was pleasing that the facility level health information system dedicated officers were recruited during the policy implementation period.

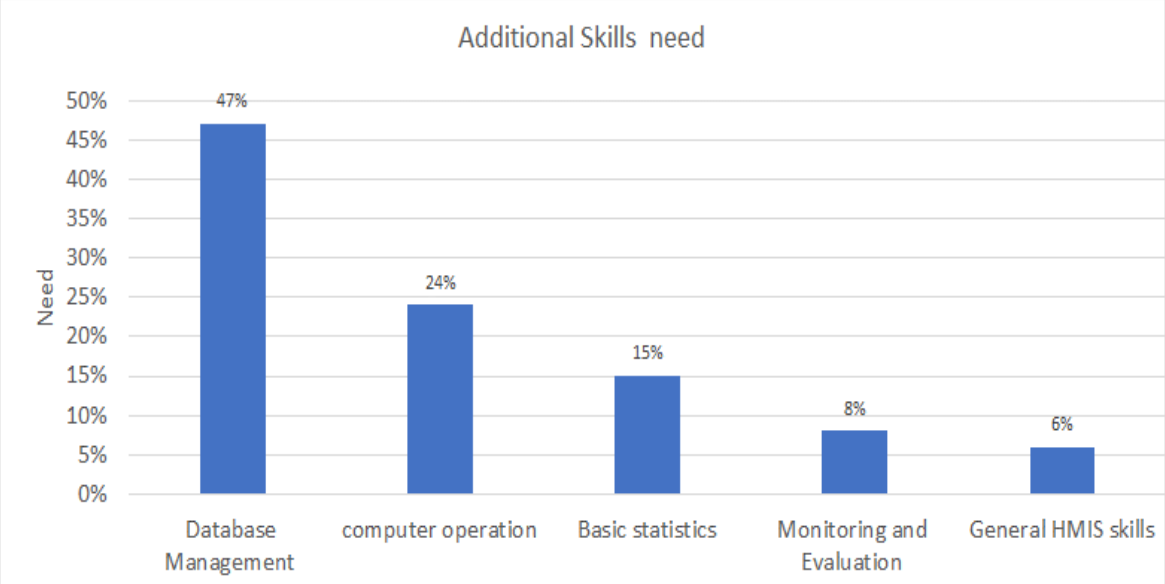

***Figure 4.3*: Additional skills need**

4.1.3 Additional skills attainment.

Results presented in Figure 4.4 show that most of the prioritised skill needs were not adequately met. Only general HMIS skill need was met. The other skills have attainment rates ranging from 73% for basic statistics to 18% for database management skill. The relatively lower attainment rates for these skills as compared to attainment of office equipment can be attributed to development partners who mostly supplied the office equipment on assumption that government would train the officers on how to use them. Based on this finding, it can be argued that some health workers had office equipment which they were never trained on how to use. It can also be argued, based on these findings, that health workers involved in health information system were provided trainings on areas they did not need.

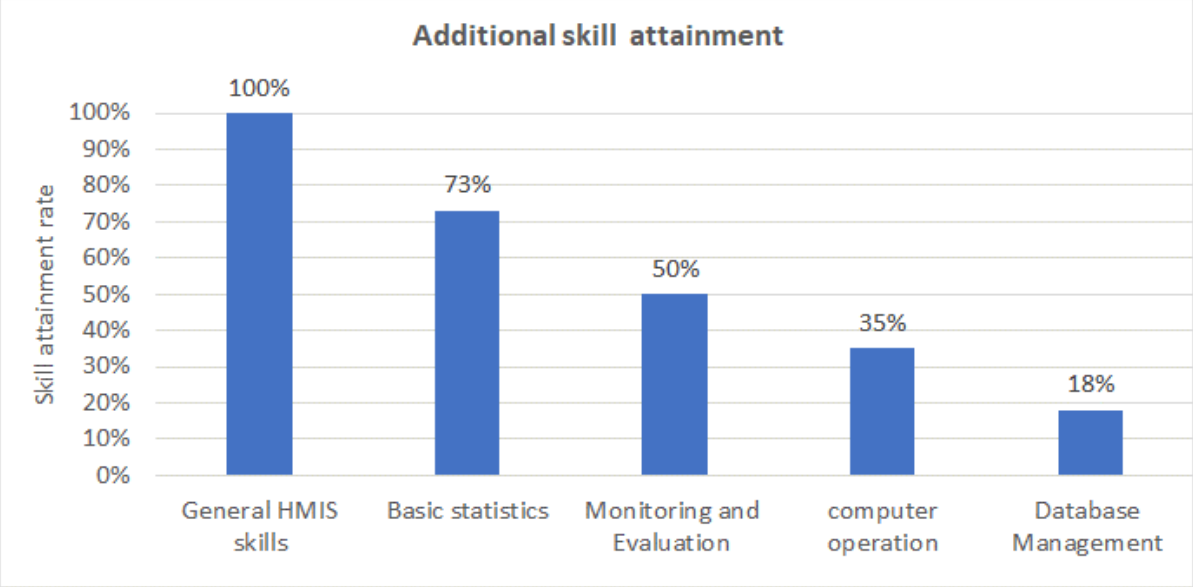

***Figure 4.4*: Additional skills attainment**

4.1.4 Capacity for Human resource for HIS.

In support of the challenge revealed in Figure 4.2 where necessary IT equipment and services were provided without the necessary trainings, Sahay and Walsham (2006) argue that when talking about health information systems implementation, focus is usually on technical artefacts while social issues such as human resource capacity are rarely considered. Oak (2007) also posits that continuous training of health workers is a key pillar in health informatics as this familiarizes them with the ever-changing technology. Msiska and Nielsen (2017) identify five categories of human resource capacities required for human resource for health information system:

i) **Deployment capacity**: The Capacity to set up the needed hardware and software environment and deploy the software platform.

ii) **Customization capacity**: The capacity to configure the software platform to match the needs in the context of use.

iii) **Usage capacity**: The capacity of end users to use the software platform and the associated applications.

iv) **System administration capacity**: The capacity to keep the software platform up to date and in good running condition to ensure its reliability and availability.

Application development capacity: The capacity to develop complementary applications addressing needs not readily addressed by the platform.

Most of the respondents in this study were in the third category. In some cases, these users need basic computer literacy before equipping them with health information system specific skills. Usually, potential information system users don't show interest to use the system just because of lack of the basic computer literacy skills.

The concept of institutional work which forms part of this study's conceptual framework emphasize the need for training whenever new practices are introduced. In this case the new practice was the use of computers and the internet in managing health data.

4.2 What HIS governance structures emanated from the policy?

Results presented in Figure 4.5, show that 96 % of the respondents were aware of the governance structures established to support the implementation of the policy. This knowledge can mean that there were regular interactions or engagements between lower level policy implementers and the higher level governance structures. But it can also only mean that the informants were very familiar with the policy document itself.

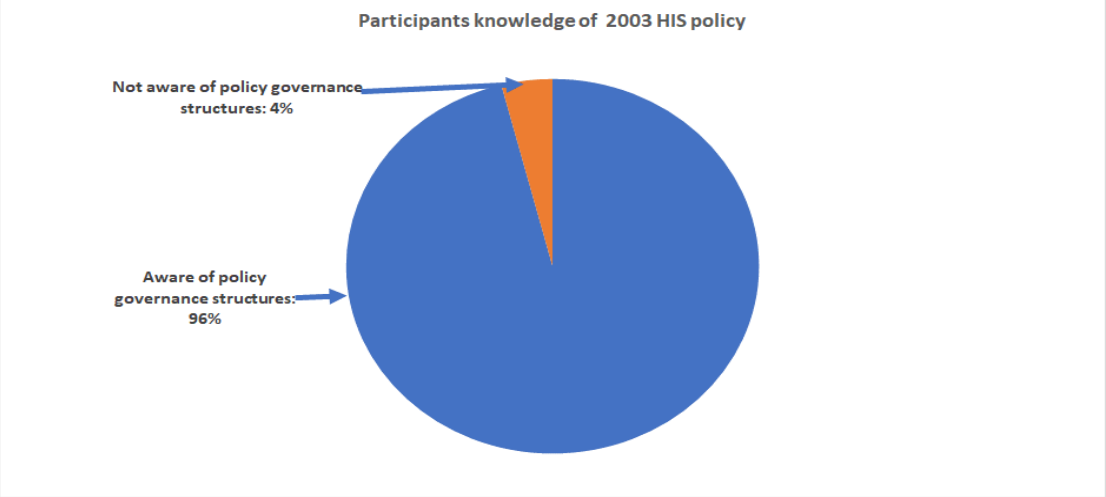

Figure 4.5*: Additional skills attainment*

Survey participants were also asked about the actual existence of the governance structures. This was done to establish if the structures mentioned in the policy document actually existed on the ground during the policy implementation. The results in Table 4.4 below show that the Committee on Health Information Policy (CHIP) and the Health Information Management Technical Committee (HIMTC) were not known and therefore not mentioned by any informant.

***Table 4.4**: Governance structures understanding by survey participants.*

What was the governance structure created for each level?	**As indicated in policy document**	**As mentioned by informants**
Health Facility level	Health Facility Information Management Committee	Health Facility Management Team
District level	District Health Information Management Committee	Extended District Health Management Team
National level	Committee on Health Information Policy	Not known
	Health Information Management Technical Committee	Not known
	Health Information Management Secretariat	Central Monitoring and & Evaluation Division (CMED)
		Monitoring & Evaluation Technical Working Group (M&E TWG)

The fact that some of the structures mentioned in the policy were not known by the informants can be interpreted as nonexistence of such structures. Or if they existed then

it means they were not functional during the policy implementation. All the respondents were able to mention the structures by level of the healthcare system (Health facility, District and national level). The Monitoring and Evaluation Technical Working Group (M&E TWG) which was mentioned as one of the national level structures does not exist in the policy document but was probably created in the course of the policy implementation. By the fact that it was mentioned by the respondents, it may mean that this structure (M&TWG) was functional during the policy implementation.

One key informant at CMED said this in relation to governance structures; "*the policy was clear on who should do what at all levels. Some of the structures even at national level were not that active during the whole life of the policy you are talking about".* In summary, the findings presented in Table 4.1 to Table 4.4 show that health workers were familiar with the policy, including how it was developed, its objectives and even the structures that were created to champion its implementation. This knowledge of the policy objectives helps in achieving them. Hunter (2002) argues that sometimes policies fail to achieve their objectives because those to implement it on the ground have Poor understanding of the objectives. This knowledge can also mean that the policy was well disseminated or publicized. Lack of adequate policy dissemination can negatively affect policy implementation. As Mthethwa (2012) points out, the extent of policy dissemination influences its implementation. The results in these tables also indicate that some of the governance structures to enforce the policy implementation were not functional.

Having presented the governance structures as mentioned by the informants, the governance structures as extracted from the actual policy document are now presented below. Some statements from in-depth key informants' interviews related to each of the governance structures are also presented here. The summarized composition and key responsibilities for each governance structure are also presented. Findings on whether each structure was active or not during the policy implementation are also presented.

Based on the 2003 HIS policy document review, there were five governance structures that were established to spearhead the implementation of the health information system in general and the health information systems policy in particular.

4.2.1 The Committee on Health Information Policy

This structure was to be responsible for policy and strategic issues on health information such as approving minimum datasets, data standards, data access and release protocols and coordination of all health data collection and other policy issues. The structure, according to the policy document reviewed (Ministry of Health, 2003, p. 10), was supposed to be the highest in terms of authority on health policy issues and was expected to comprise:

i. Director for Planning &Policy Development in the ministry of health as chair.
ii. Director for CHAM Secretariat as Co-chair.
iii. Ministry of Economic &Development.
iv. Ministry of local government.
v. Commissioner for National Statistical Office.
vi. Director for Centre for Social Research-University of Malawi.
vii. Representative of Health and Population Donor group.
viii. One District Health Officer (nominated by the committee).

This research found that this structure was not functional throughout the implementation of the policy. Of all the key informants, not even a single one had knowledge of the existence of this committee.

One key informant at CMED said *"I don't think this committee ever existed or if it did, it should be long time ago because all along CMED has been performing all the functions pertaining to enforcement of the policy".* This statement can imply that enforcement of the policy was not given due attention during the implementation as there was technically no institution to enforce compliance to the policy directions.

4.2.2 Health Information Management Technical Committee

This structure, based on the policy document review (Ministry of Health, 2003, p. 10), was to be responsible for all technical issues to do with management of health information including the implementation of the policy in such areas as; defining minimum dataset, reviewing data collection tools and procedures, reviewing information policy, strategy and plans, assessing data quality and departmental routine monitoring, identifying integrated sentinel sites for all purposes, setting operational research priorities and approving operational research proposals, overseeing the quality of data at all levels by all parties and overseeing data processing, storage and dissemination by HMIS Secretariat (now CMED). This Committee was supposed to comprise;

i. Director for Planning and Policy Development in the ministry of health as chair.
ii. Directors of all departments in the ministry of health.
iii. Officers-in-charge of Central Medical stores and the Community Health Sciences Unit.

This research found that this governance structure did not function on the ground and some of its responsibilities were transferred to a new structure which was not mentioned in the policy document. This new structure is known as Monitoring and Evaluation Technical Working group (M&E TWG). Although it was learnt during in-depth interviews that the new structure (M&E TWG) sometimes met during the policy implementation, the meetings were poorly attended especially by the directly-donor supported programs.

One key informant who was part of the team involved in the formulation of the 2003 HIS policy observed that "*this structure (M&E TWG) is not as strong as we wanted the Health Information Management Technical Committee to be when it was being instituted".*

During the policy implementation this new structure had three subgroups namely; Data standards, Data security and architecture. One respondent had this to say about this

technical working group*, "I think CMED was trying to rejuvenate this group but the problem was with donor supported programs which rarely attended these meetings and as result we didn't know what was going on in these programs as regards health information system and monitoring and evaluation in general".*

This poor meeting participation by the donor supported programs led to further weakening of the national health information system and frustrating efforts of integration. These donor supported programs then continued with their parallel health information systems.

4.2.3 Health Information Management Secretariat

This committee was not mentioned by respondents as it changed name during the implementation of the policy to CMED (which was rightly mentioned by the informants). This structure which, according to the policy document (Ministry of Health 2003, p. 11), was expected to lead in all data management activities including conducting practice-based training for health workers on data recording, processing, analysis, use and dissemination. Procuring and supplying data recording, processing, monitoring, and reporting tools Additionally, the committee was also expected to be implementing decisions made by the committee on health information policy and the health information technical committee. It was also supposed to be generating quarterly monitoring reports for the ministry of health.

This research found that this was the most active national level governance structure during the implementation of the policy. This can be partly explained by the fact that the other two national structures were committees while this structure was, and still is an organization.

One officer at CMED doubted if it was a good idea to give policy enforcement powers to a committee (Committee on health information policy) which ended up dying natural death even before the implementation of the policy which established it. He said, "*In*

my opinion, it could be better if those powers were invested in an organization and not a committee whose existence depended on commitment by few individuals through participation in meetings".

After the natural death of the committee on health information policy (CHIP) and change of composition of the health information management technical committee, CMED naturally assumed all the responsibilities of the committee on health information policy and some of the roles of the health information management technical committee. This was narrated by one informant who said, "*CMED was doing everything, including the responsibilities which were not assigned to it in the policy. The other committees just vanished".* This had serious implications on implementation of the health information system in general and the health information policy in particular. These implications are twofold; a) Human resource capacity (both numbers and technical skills) and b) mandate (as from the policy itself on enforcing compliance to the policy.

a) Human Resource Capacity**.**

Organizationally, CMED was divided into two subsections namely Economic analysis subsection and the health statistics subsection. The economic analysis subsection was responsible for monitoring and evaluation. Specifically, it supported program managers to identify health interventions which are effective, affordable and acceptable. The section was staffed by economists seconded from the ministry of Finance, Economic Planning & Development. The health statistics subsection was responsible for health data collection, analysis and dissemination. It was also responsible for designing, printing and distribution of HMIS tools to districts. The health statistics is staffed by statisticians seconded from the National Statistical Office. It should be noted that this demarcation was just for administrative purposes only. Operationally these roles overlap.

Now, the additional responsibilities assigned to this structure called for additional staff with epidemiological and IT background which did not happen. This was described by one respondent at CMED as one of the biggest blows to the effective implementation of the health information system policy. He said that, *"We were made to carry out extra functions without strengthening our team here".*

b) Mandate

The policy document specifically mentions the committee on health information policy (CHIP) as responsible for policy enforcement. This meant that any structure other than this committee would be powerless to enforce compliance to the policy. Additionally, CHIP was planned to be composed of heads of departments and programs which made the committee to be strong for policy enforcement purposes.

4.2.4 District Health Information Management Committee

Based on the policy document review (Ministry of Health, 2003, p. 11), this district level governance structure was expected to ensure that:

- Reports are complete and correct before submission to higher levels.
- All health workers involved in data management are properly trained.
- There is sufficient use of information,
- Feedback is sent to health facilities on the reports they send to the districts,
- All health facilities have enough data collection, processing, monitoring and reporting tools including a buffer stock of the same for 5 months at the district health office.
- It was also expected to oversee data collection, processing and dissemination in all health facilities (including CHAM and private).

In this research, informants did not mention this committee by the name as it appears in the policy document, however its responsibilities were understood by the informants to be those of the Extended District Health Management Team (EDHMT).

This research established that the committee was very active during the policy implementation. This was based on informants' responses on how each governance structure had contributed to the achievement of the policy objectives.

4.2.5 Health Facility Information Management Committee

This committee was, according to the policy document, to be the lowest but equally important governance structure in the implementation of the policy. Unlike the district and national level governance structures, the facility level structures did not have anyone who was health information dedicated. This committee was not mentioned by all the respondents because on the ground the name did not exist although all the responsibilities mentioned in the policy document for this committee were understood by the informants to be those of the health Facility management team. In the policy document, this structure was expected to be responsible for;

- Ensuring report completeness and correctness before reporting to higher level,
- Ensuring availability of data collection, processing, monitoring, and reporting tools.
- It was also supposed to be promoting information use at community and health facility level.

This research established that meetings on health information issues took place especially when it was time to send reports to the district health office. It was also established that meetings at this level were happening quite often in the past when there were projects which were providing at least refreshments for such meetings. Chitedze Health Centre in-charge narrated that;

"Yes, we meet when we want to send reports to HMIS Office. Some of these meetings were easy to organize in the past when we could buy some drinks for the meetings".

In summary, this research found that the topmost governance structure (Committee on health information Policy was not functional during the whole life of the policy. It was also established that all the responsibilities of this committee were pushed to the Health Information Management Secretariat which later became the Central

Monitoring and Evaluation Division (CMED) which also lacked capacity to carry out those policy enforcement tasks.

Table 4.5 below further sums up this section by indicating the structures as they appear in the policy document, whether they were functional and the implication of their functionality status on the policy implementation. As indicated in this table, two of the five committees that were created to support the policy implementation were not functional on the ground.

Table 4.5: Governance structures functionality during policy implementation.

	Structures that emanated. From 2003 HIS Policy	**Functional (Y/N)**	**Implication on policy implementation**
1	Committee on Health Policy	N	No policy enforcement
2	Health Information Management Technical Committee	N	No technical support to Health Information Management Secretariat.
3	Health Information Management Secretariat	Y	Managed to coordinate everything related to health information gathering, processing and dissemination at national level
4	District Health information Management Committee	Y	Supported health facilities through supportive supervision and trainings
5	Health Facility Information Management Committee	Y	Supported the policy implementation by Consistently submitting reports to the district level.

Based on findings presented in section 4.1.2, about 96 % of the respondents expressed knowledge of the established structures for the implementation of the policy.
Importance of establishment of governance structures for policy implementation is emphasized by Anderson et al., (2006) who point out that establishing administrative units is one of the important tasks in the implementation of any policy.

The concept of institutional work which forms part of the conceptual framework guiding this research shows that in order for practices such as policy adherence to be sustained there is always a need to keep on policing them through enforcement among others.

Although 96% of the respondents expressed knowledge of the establishment of the governance structures, not all of the structures were reported to be functional during the policy implementation. The Committee on Health Information Policy and the Health Information Management Technical Committee did not function effectively during the policy implementation. Key responsibility for these two governance structures was to enforce adherence to the policy directives. As a consequence of these two structures not being functional, there was poor adherence to policy directives on overall health information management practices. The consequence of weak governance structures on policy implementation is also echoed by Hunter (2002) who points out that policies fail to achieve their objectives when governance structures are weak such that they are unable to demand perfect compliance from implementing institutions.

Challenge of weak governance structures in policy implementation is also pointed out by Fukuyama (2004) who notes that weak institutions to enforce policy implementation is the major factor for policy failures in most developing countries. Kamanga et al., (2017) also mention functional governance structures as one of the most important preconditions for successful policy implementation. The consequence of weak governance structures in policy implementation is also in agreement with Levitsky and Murillo (2009) who argue that in most cases especially

in developing countries policies are poorly or never implemented at all due to weak governance structures.

4.2.5.1 Human Resource Capacity at Health Information Management Secretariat.

Despite being functional during the policy implementation, the Health Information Management Secretariat (HIMS) experienced human resource capacity challenges. During the policy implementation the institution was staffed with economists and statisticians only. The adoption of electronic methods of managing health information required special expertise in informatics which this governance structure did not have. The adoption of a web-based information software (DHIS2) which happened during the policy implementation, required this IT expertise more than before.

4.2.5.2 Motivation of HMIS officers.

Creation of the post of HMIS officer at the district health office was one of the key outputs of the HIS restructuring which the ministry of health carried out from 1999 to 2003 to strengthen health information system implementation. But Chaulagai et al., (2005) argue that the position of HMIS officers is low compared to their roles and responsibilities and worse still their career path at the district level is closed (there is no higher post than the one they are holding). This lack of extrinsic motivation affected policy implementation especially at district level. In agreement with this Machungwa and Schmitt (as cited in Hamre, 2007) argue that when chances for promotion are very unlikely, it is considered demotivating and can result in decreased efforts at work. Although this motivation looks too individual, the overall performance of an organization can also be affected. Ddamulira (2009) and Ansah (2017) also point out that extrinsic motivators such as promotion can improve individual and organizational performance. It can also be argued that the low position for these health management information officers affect the perceived profile of health information at district level where these people work. This is also echoed by Chaulagai et al. (2005) who argue that

the low position of the HMIS Officers is affecting the profile of health statistics at district level.

4.3 What other prevailing factors influenced achievement of the policy objectives?

In this section results on achievement of policy objectives as perceived by survey participants are discussed. Factors that contributed to the achievement are discussed.

4.3.1 Policy objectives achievement

Each respondent was first asked to share their own assessment whether the 2003 HIS policy objectives were achieved after the policy implementation. According to the results presented in Figure 4.6 below, data accessibility came out as the most achieved objective at 89% followed by health information systems integration at 80%. Data use and data quality are at 58% and 52% respectively. It should be pointed out that the level of objective achievement in this study is equivalent to the proportion of survey participants who responded whether or not a particular objective was achieved.

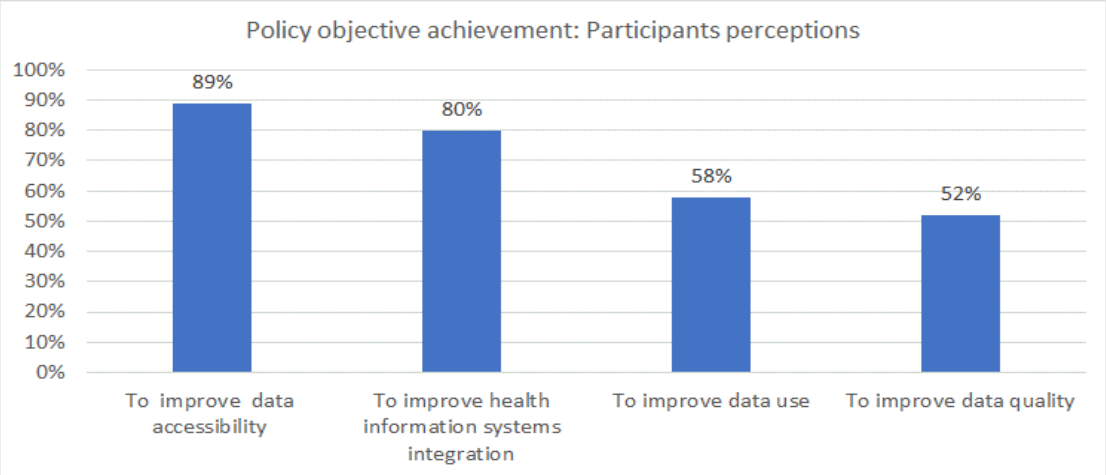

Figure 4.6:Policy objectives achievement. ,

The informants were also asked to mention what they thought were the main influencing factors for the achievement of the objectives. Table 4.6 presents factors

mentioned by key informants to have contributed to the realization of the objectives. Looking at the factors presented in Table 4.6 below, some factors are indirect while some are direct. They were therefore grouped into those two categories (direct and indirect) based on the researcher's personal experience with the health information system in Malawi. As can be observed from the factors mentioned, Implementation of DHIS2 as a national health information system comes out as a most common influencing factor as it appears in all the four objectives.

***Table 4.6*: Factors influencing objective achievement.**

What do you think are the main influencing factors for this objective achievement?	Factors mentioned by key informants.
To improve data accessibility	1. Use of one system. 2. Use of DHIS2
To improve data quality	1. Use of DHIS2 by programs that had their systems before
To improve data use.	1. Data easy to find through DHIS2. 2. Improved data timeliness and completeness.
To improve systems integration.	1. Advice by donors to use DHIS2. 2. Use of DHIS2 by programs whose direct funding phased out.

Table 4.7 below presents the grouped factors. The results show that all the three indirect factors contributed to the realization of all the four objectives. One interesting thing to note in Table 4.7 is the phasing out of parallel information systems funding which was mentioned as a blessing in disguise as it influenced the realization of the policy objectives. This means that when some donors stopped funding the parallel information systems, the affected programs were compelled to start using the national information system which happened to be DHIS2 and in the process influencing the achievement

of policy objectives. Use of DHIS2 was the direct influencing factor for two policy objectives namely; health information systems integration and data accessibility.

Table 4.7*: *Grouped factors influencing realization of policy objectives.

Objective	Indirect factors	Direct factors
To improve data accessibility	1. MOH decision to use an integrated and web based HIS 2. Phasing out of parallel HIS funding 3. Program donor recommendation to use national HIS	Use of DHIS2
To improve systems Integration.	1. MOH decision to use an integrated and web based HIS 2. Phasing out of parallel HIS funding. 3. Program donor recommendation to use national HIS.	Use of DHIS2
To improve data use	1. MOH decision to use an integrated and web based HIS 2. Phasing out of parallel HIS funding 3. Program donor recommendation to use national HIS	
To improve data quality	1. MOH decision to use integrated and web based HIS. 2. Phasing out of parallel HIS funding. 3. Program donor recommendation to use national HIS	Integration

Improved system integration contributed to data quality which in turn also contributed to improved data use. Data accessibility also contributed to improved data use.

One DHMT member attributed improvements in data quality and data access to adoption of the DHIS2. He stated that, "*had it been not for DHIS2 to have all the data in one system, there would be chaos in the HMIS as there are now more programs and this would mean more and more information systems".*

As the use of DHIS2 was made possible by advancement in information technology such as the internet leading to web-based information systems and availability of open-source software which made it cheaper to scale the national health information system, it can also be argued that this advancement in technology contributed to the realization of the policy objectives.

To sum up on factors contributing to objective realization, survey participants mentioned four factors which directly or indirectly influenced the objective realization;

i. MOH decision to have one integrated health information system.
ii. Phasing out of funding for parallel information systems.
iii. Recommendation by some health program donors to use the national health information system.
iv. MOH adoption of the web-based health information system.

Table 4.8 shows that use of one health information system influenced achievement of this objective by making different program data accessible in one place. The results also show that use of DHIS2 influenced realization of improved data accessibility by simplifying how data is accessed; it is now possible to access the data whenever you want it regardless of where you are as long as there is internet connectivity.

The results indicate that use of DHIS2 by health programs that had their own information systems before also influenced this objective realization by making it possible to have inter data set consistency when their program data was integrated with other programs thus improving data quality.

These results also reveal that easy or simplified access to some program data which was previously difficult to access due to the nature of their parallel information systems, led to some improvement in data use. The results in this table also indicate that the improvement in data quality more especially timeliness and completeness, influenced improved data use by raising people's trust in the data.

Health program donors' recommendation to the programs to be using the national information system influenced the integration by making it possible to have more programs data integrated on DHIS2. These results also mean that use of DHIS2 by programs whose funding phased out led to availability of those programs' data on DHIS2.

***Table 4.8*: How the factors influenced policy objectives achievement.**

How do you think the factor you mentioned influenced achievement of this objective?	**Factors mentioned by key informants.**	**How the factor influenced achievement of the objective**
To improve data accessibility	Use of one system.	You find data in one place
	Use of DHIS2	You can export data when you want it even at home.
To improve data quality	Use of DHIS2 by programs that had their systems before	Data in DHIS2 can be checked if it is consistent
To improve data use	Data easy to find through DHIS2.	Previously you could not use data because it was not easy to get it especially from other program databases
	Improved data timeliness and completeness	Previously data was outdated, and you could not use it.
To improve health information systems integration	Advice by donors to use DHIS2	More programs data on DHIS2
	Use of DHIS2 by programs whose direct funding phased out.	More programs data on DHIS2.

To summarize this section, it shows that adoption of DHIS2 directly and indirectly influenced realization of the policy objectives.

In relation to this study's conceptual framework, this section focuses on two components of theory of change which are *activities* and *outputs.*

The results indicate that there were three main other social technical factors that contributed to the achievement of the policy objectives.

4.3.1.1 MOH decision to have one integrated health information system.

Adoption of the District Health Information Software (DHIS) enabled the ministry of health to accomplish the objective of integrating some of the scattered health information systems. The integration is described as partial because some few programs still implement parallel health information systems. DHIS facilitated integration by making it possible to have one dataset that encompassed indicators from several programs unlike previous when each program had its own information system.

The district health information software also made health information more and easily accessible to users as it was in one database.

Impact of the district health information software on systems integration is also echoed by Manda (2015) who points out that use of an integrated district health information software as part of HIS restructuring endeavour which started back in 1999 with an attempt of integrating all health information systems.

Although DHIS partially achieved the objective of systems integration, this did not fully satisfy program specific needs in twofold; firstly, the data that was captured in DHIS (version 1.3) was only addressing core national indicators on the summary form (HMIS15). Secondly, as the restructuring was still in progress, some of the data quality issues were still there. For these two reasons most health programs maintained their parallel information systems.

In the course of the policy implementation through the ongoing restructuring, MOH decided to upgrade the desktop- based District Health Information Software (DHIS 1.3) to the web-based version (DHIS2). This upgrade addressed a number of challenges; firstly, program specific datasets were customized on DHIS2 thus increasing the integration. Secondly access to health information was increased as users would now access it anytime and anywhere (online access). Thirdly, as different datasets were on

one platform, inter dataset consistency checking was made easy and hence data quality improved.

4.3.1.2 Health programs donors Recommendation to use national HIS.

Realizing the need for strengthening national health information systems, most donors started encouraging their supported programs to use national health information systems. In the case of Malawi, where DHIS2 had been chosen to be the national health information system, such programs were being encouraged to use it. Even major funding mechanisms such as the Global Fund (GF) and the Global Alliance on Vaccines and Immunization (GAVI) started encouraging use of this national health information system.

Sæbo et al., (2010) justifies this change by donors and funding mechanisms by observing that the push for strengthening national health information systems comes from the realization that major challenges with health information systems in developing countries stem from the tendency of installing program specific and narrow information subsystems which cover limited information needs. Sæbo et al., (2010) also observe that the global community of health has changed, with global partnerships such as the Health Metrics Network and the International Health Partnership spearheading harmonization and integration which has given legitimacy to those marginalized groups which have been campaigning for the same at county level.

This push by donors has indeed eventually assisted in increasing integration of health information systems in Malawi which was one of the aspirations of the 2003 HIS policy. However, while the international partnerships and MOH are pushing for harmonization and integration on one hand, the challenge of poor-quality data from the national health information system is frustrating such efforts on the other hand.

4.3.1.3 Phasing out of funding for parallel information systems.

As the findings of this research show, phasing out of funding of parallel health information systems by donors forced the programs to start using the national health

information system. From these findings, it can arguably be concluded that funding is one of the biggest motivations for programs to stick to their parallel health information systems.

Figure 4.7 below presents a summary of how the three factors discussed above influenced realization of policy objectives.

The first factor which was the Ministry of health decision to adopt an integrated health information system led to use of the DHIS2 as a national health information system. This is also supported by Sæbo et al., (2010) who describe this bringing together of health data from different sources into a single database as a warehousing approach of integration.

The second factor which was the phasing out of some parallel health information systems funding led to increased use of the national health information system (DHIS2).

The third factor which was the recommendation of some health program donors to use the national health information system also led to an increased use of the national health information system.

The integration of parallel health information systems through the use of DHIS2 facilitated easy access to data. Just by getting DHIS2 credentials, data users were able to have access to data from the different programs. Msiska and Nielsen (2017) argue that one of the technical attributes of DHIS2 is that it provides a means to reduce the information systems fragmentation and by doing so improve access to health information across different health programs.

The integration of information systems helped to reduce data duplication and inconsistency thus improving data quality.

From Figure 4.7, the improved data accessibility and quality contributed to increased use of the data. This is also supported by Manya and Nielsen (2016) who argue that there is some circular relationship between data quality and data use; meaning that improvement on one can lead to improvement on

the other. Galimoto (2007) also argues that easily and readily accessible data is more likely to be used than the data which is difficult to access. Moyo (2016) also argues that there is a circular relationship between fostering data use and increased data quality.

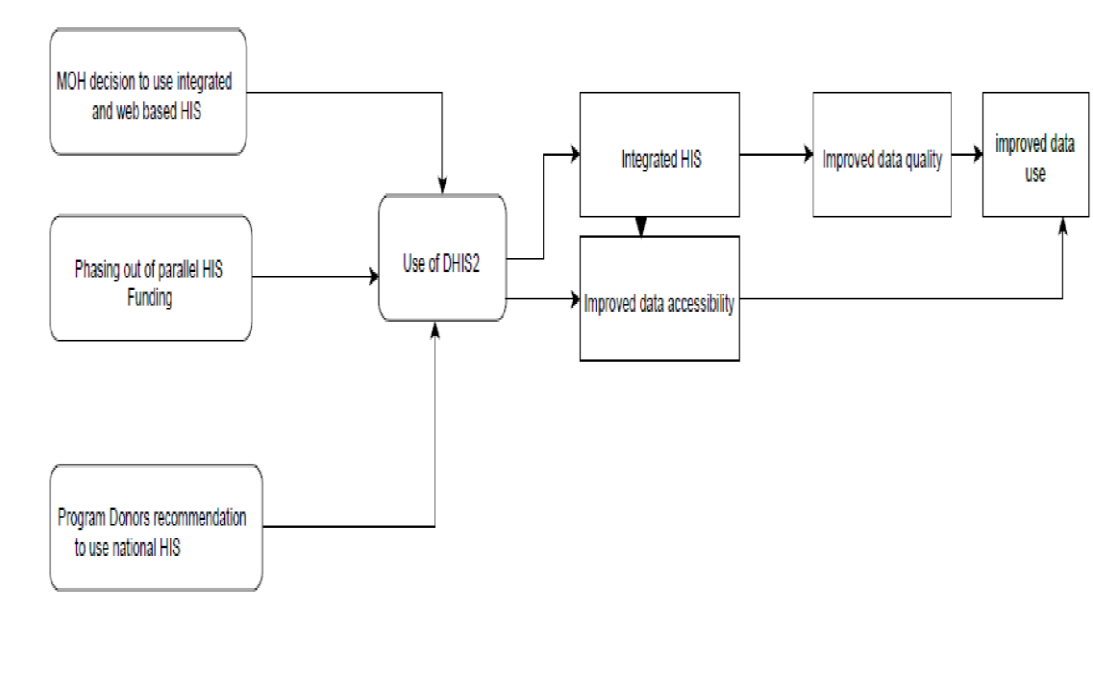

***Figure 4.7*: How other factors influenced objectives achievement**

4.4 How did achievement of the policy objectives affect the implementation of health information system?

In this section results on how realization of the policy objectives affected implementation of the national health information system are discussed.

Table 4.9 below presents shows how realization of the four policy objectives strengthened overall health information system implementation in Malawi. The results indicate that improvement in health information systems integration strengthened HIS implementation by making it less costly. The improved integration also brought in more stakeholders (concerted effort) for national HIS implementation. This means ownership of the national HIS grew due to this integration.

Improved data accessibility strengthened HIS implementation by making data quality and analysis a more shared responsibility between data users and data producers due to instant online data access. The improved data accessibility also changed the focus of HMIS officers from being more data disseminating staff to more data quality improvement staff as data users can now access data on their own (DHIS2 online data access).

***Table 4.9*: Effects of policy objectives achievement on HIS implementation**

How do you think the achievement of this objective affected HIS implementation?	Responses
Objective Realized	**How it affected HIS implementation**
To improve systems integration	By facilitating creation of a concerted effort (MOH including health programs which had their own systems and Donors) in implementation of the national HIS.
	By increasing ownership of the national HIS as it has various programs specific data now.
	By reducing the cost of implementing HIS as a substantial chunk of health information systems budgetary support is channelled to one information system.
To improve data accessibility	By reducing workload of HMIS officers who were previously preoccupied with data dissemination rather than giving more time to quality improvement tasks.

	By making data quality improvement a more shared task between data users (especially program officers) and data producers (especially HMIS officers). This is due to instant online access to data which allows users to flag out issues if some data looks questionable.
	By making data analysis a shared responsibility between HMIS officers and program officers. HMIS officers were previously doing almost everything in terms of data analysis. But due to improved access to data, program officers only ask for guidance on how to do the analysis.

As pointed out by Kunyenje (2019), policy evaluation aims at understanding the effects of policy implementation. In relation to the conceptual framework of this study, this is the results (outcome) level of the framework. Improved Health Information Systems Integration and data accessibility contributed to the achievement of the other two objectives namely; improved data quality and data use. Following is how integration and data accessibility contributed to the other objectives.

4.4.1 Information systems integration.

The realization of improved health information systems integration changed the overall implementation of the health information system in Malawi from a more fragmented to a more integrated system. This integration facilitated joint effort in improving quality of data whereby government and most of the other stakeholders are now providing technical and budgetary support to one national health information system.

Progress made in integration has broadened ownership of the national health information system. Integration has also made health data management easier and cheaper. In the past, both government and other stakeholders would invest in several health information systems to improve data quality.

4.4.2 Data accessibility

Realization of improved data accessibility to health data has made it possible for health program managers and other health information users to be contributing to data quality improvement. It has also changed how health program managers perceived the issue of data analysis; that it was the duty of HIS staff only. Now that the raw data is at their fingertips, data analysis is also done by themselves.

Figure 4.8 below summarizes some of the practices and perceptions before and after 2003 HIS policy implementation. Data used in this diagram is from both the secondary source (policy document review) and primary source (key informants).

Before the policy (the left-hand side of the diagram and labelled P1), the policy (Ministry of Health, 2003, pp. 5-6) mentions that there was no concerted effort to support the national health information system as most programs were using and strengthening their parallel information systems.

The policy document (Ministry of Health, 2003, p. 6) also highlights that there was limited data accessibility mainly due to fragmentation of the information systems. Key informants also mentioned that HIS officers were preoccupied with data dissemination due to this limited and controlled access to data. This made it difficult for the HIS officers to have enough time for data quality improvement tasks. During this pre- policy period, data quality improvement and data analysis were regarded as responsibilities for HIS officers only.

Key informants also mentioned the challenge of inter- reporting forms data inconsistency whereby same data elements on different reports but from the same facility would have conflicting values.

In 2003 the ministry of health developed and started implementing the health information system policy to strengthen the information system by addressing the issues mentioned above. Specifically, to improve: i) health information systems integration, ii) data access, iii) data quality and iv) data use.

The right-hand side of the diagram, which is labelled P2, represents the strengthened national HIS implementation. The health information system is now more integrated and able to facilitate easy access to data. Program officers contribute to data quality improvement as they can access raw data on their own.

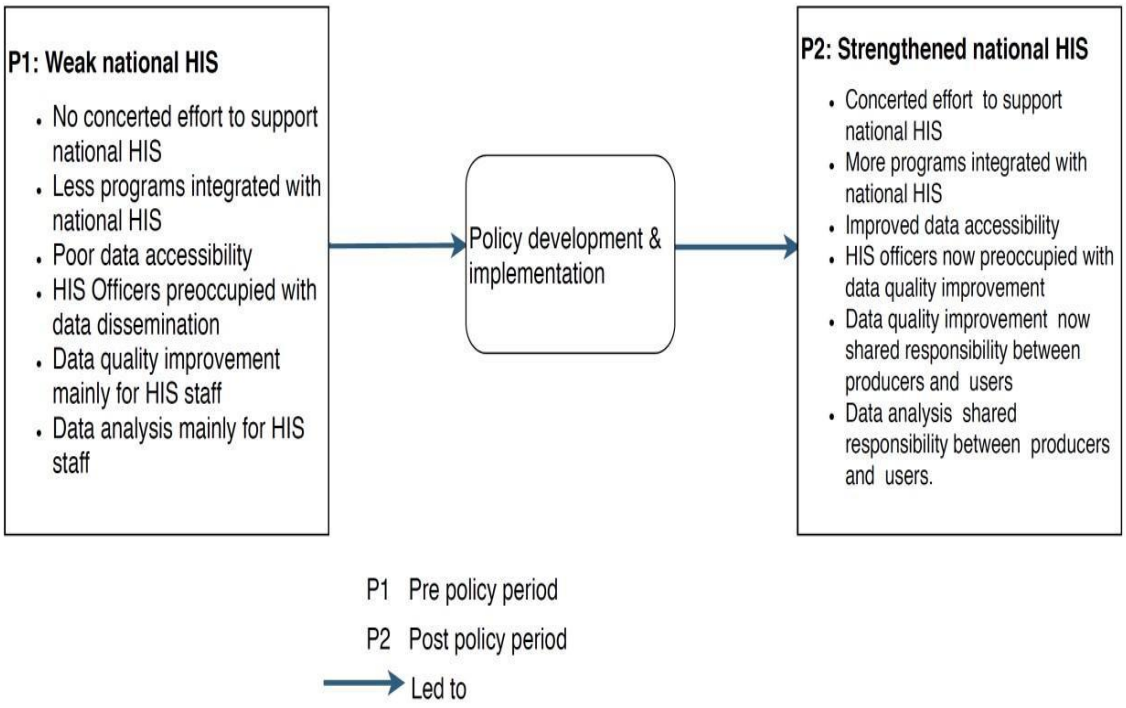

***Figure 4.8*: Pre- policy and Post- policy HIS practices**

Although the term "objective Realization" has been used in this document to mean that an objective was achieved, it should however be noted that no objective was fully achieved. For this reason, realization should be interpreted as improvement. In the real world, it would be almost impossible to have full achievement in all the four policy objectives; to improve health information systems integration, data accessibility, data quality and data use. Integrating health information systems was partially achieved mainly due to continued direct donor funding to parallel health information systems. This challenge of pulling things in the opposite direction by international donor

organizations in policy implementation is also echoed by Kunyenje (2019) who argues that policy implementation in developing countries is influenced by external forces who pursue their own agenda.

The continued use of parallel information systems by some programs also contributed to low progress on making health information accessible to all concerned users. If available, data from the parallel information systems is usually not in user friendly format.

Too many and complicated data capturing, and reporting tools compounded by limited human resource capacity for health information systems contributed to slow progress on data quality improvement.

CHAPTER FIVE
CONCLUSION

This chapter concludes the thesis.

5.1 Summary of findings

The research has investigated how the 2003 HIS policy was implemented and how the achievement of Policy objectives affected the national health information system implementation.

5.1.1 What demands were in the 2003 HIS policy objectives?

Findings show that to achieve the objectives, the key demands were;

i) Functional governance structures.

ii) Trained, equipped, and motivated HIS staff.

iii) Availability of technological solutions to facilitate health information systems integration and data accessibility.

5.1.2 What governance structures emanated from the policy?

The following five structures emanated from the policy;

i) Committee on Health Information Policy.

ii) Health Information Management Technical Committee.

iii) Health Information Management Secretariat.

iv) District Health Information Management Committee.

v) Health Facility Information Management Committee.

The results indicate that all the five except the Committee on Health Information Policy and the Health Information Management Technical Committee were functional during the policy implementation.

The results also show that health information system at health facility level was strengthened through recruitment of health statistical clerks. However, the results

indicate that lack of motivation of HIS staff especially at district level threatened data quality.

5.1.3 What other prevailing factors influenced achievement of the policy objectives?

Three other prevailing factors influenced achievement of the policy objectives:

- MOH decision to adopt a web-based District Health Information Software (DHIS2)
- Phasing out of some parallel health information systems funding.
- Health programs donors' recommendation to use the national health information system.

5.1.4 How did achievement of policy objectives affect health information system implementation?

The achievement of policy objectives strengthened the national health information system through improved HIS integration, data accessibility, data quality and data use.

5.2 Recommendations

Based on the findings, the following recommendations are suggested:

i) Use of bottom-up approach for HIS policy development and implementation

Results from this study have shown that bottom-up approach contributes to the successful policy implementation.

ii) Policy enforcement as part of HIS policy implementation

Findings from this study suggest that policy enforcement was not given sufficient attention which made some policy directives such as the need for approval of any data collection or reporting tool before being used, not to be adhered to

5.2.1 Contributions to practice

The research has contributed to HIS policy implementation by suggesting two policy guidelines namely;

i) Regarding policy enforcement as part of implementation process.

ii) Regarding HIS staff motivation as one way of increasing chances of HIS policy success.

5.2.2 Contributions to research

Integration of concepts from Theory of Change and Institutional Work in policy implementation assessment.

5.3 Proposed future research.

a) Assessing investments in health information systems in Malawi.

b) A study of health information use in Malawi.

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APPENDICES

Appendix A: Questionnaire

A STUDY OF MALAWI'S 2003 HEALTH INFORMATION SYSTEMS POLICY IMPLEMENTATION AND ITS IMPLICATIONS ON HEALTH INFORMATION SYSTEMS IMPLEMENTATION

QUESTIONNAIRE

INTRODUCTION AND CONSENT

My name is Stone Mbiriyawanda. Iam a Master of Informatics Student from University of Malawi. I am conducting a study on the implementation of the 2003 Malawi Health Information Systems Policy and its implications on health information systems implementation. The information collected will help Ministry of Health and its partners to improve quality of health services.

You have been selected to participate in this study. Your participation is voluntary which means you can choose not to participate. If you choose to participate, your responses will be anonymous and will be used for this research work only. All the information collected in this study will be handled with confidentiality.

IDENTIFICATION		
Organization	Code	Response
	1= MOH_HQtrs. 2= DHO 3= Health Facility 4=Central Hospital 5=MOH=Zone 99=Other (specify)	☐
Respondent Category	1=HMIS officer 2= DHMT Member 3= CMED officer 4=National Program Officer 5=District level Program Coordinator 6= Health Facility in charge 7= Zonal M&E Officer 8=M&E TWG Member 9= 2003 HIS policy Development participant 10= 2015 HIS policy Development participant	☐

SECTION A: INFORMANT KNOWLEDGE OF THE POLICY.			
Firstly, I would like to understand your knowledge about the Malawi 2003 health information systems policy			
Question		Codes	Response
A1	Did you ever hear about the Malawi 2003 health information systems policy?	1=Yes 2=No ➡E1	☐

A2	What were the main objectives of the 2003 health information systems policy? (**Number them if more than one)**		
A3	Which approach was used to develop the 2003 health information systems policy?	1=Top- down approach 2=Bottom -up approach 3= Don't know	☐
SECTION B: POLICY IMPLEMENTATION REQUIREMENTS			
Now let us discuss what was required for you to play your role in this policy implementation			
Question		Codes	Responses
B1	Did you require any additional skills to contribute to the implementation of the 2003 health information systems policy?	1=Yes 2=No ➡B4	☐
B2	Which additional skills did you require to contribute to the implementation of the 2003 health information systems policy?		
B3	Did you attain the required? additional skills	1=Yes 2=No	☐
B4	Did you require any equipment and services to play your part in the policy implementation?	1=Yes 2=No ➡C1	. ☐

B5	What equipment and services did you require to play your part in the policy implementation?		
B6	Were you provided with the required equipment and services?	1=Yes 2=No	☐

SECTION C: POLICY ENFORCEMENT STRUCTURES			
Now we will discuss governance structures that were expected to lead the policy implementation			
C1	Do you know about any committee which was set up at national, district or health facility level to lead in this policy implementation?	1=Yes 2=No → D1	. ☐
C2	Would you mention the committees by level **(National, District or health facility)**		
C3	Did these committees contribute to the achievement of the policy objectives? **(One option for each committee)**	1 Yes No Don't know 2 Yes No Don't know 3 Yes No Don't know 4 Yes No Don't know 5 Yes No Don't know	

C4	How did each committee contribute to the achievement of the policy objectives?	
SECTION D: POLICY OBJECTIVES ACHIEVEMENT AND IMPLICATIONS ON HIS		
We will now ask for your opinion on objectives achievement and how this affected health information systems implementation in Malawi.		
D1	Were the policy objectives achieved? (**Circle one option for each objective mentioned in A2)**	1 Yes No Don't know 2 Yes No Don't know 3 Yes No Don't know 4 Yes No Don't know
D2	What factors contributed to the achievement of the objectives?	

D3	How did these factors contribute to the achievement of the objective?		
D4	Did the policy implementation change the way health information systems are developed in Malawi?	1=Yes 2=No → D6	☐
D5	Briefly, explain how the policy implementation changed the development of health information systems in Malawi?		

D6	Did the policy implementation change the way health information systems are implemented in Malawi?	1=Yes 2=No → E1	☐
D7	Explain how the policy implementation changed the implementation of health information systems in Malawi.		
D8	What challenges in health information systems persisted beyond the 2003 health information systems policy implementation?		
D9	Why do you think these challenges persisted?		
D10	What most important changes would you suggest to improve implementation of health information system in Malawi?		
SECTION E: SUCCESSOR HEALTH INFORMATION SYSTEMS POLICY			
Lastly let us talk about the successor health information systems policy			
E1	When do you think we shall have a new health information systems policy?		

Thank you for your acceptance to participate in this study.