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Comparative study on system requirements and success factors of telemedicine solutions in resource-poor settings

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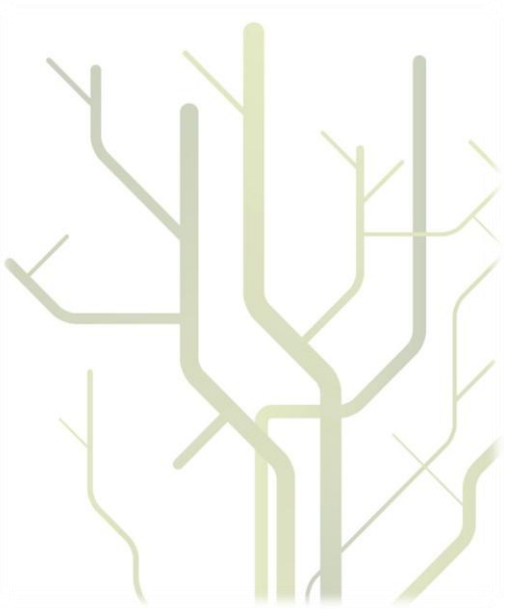

DEDICATION

With love

To My Parents

PREFACE

This thesis is submitted as a partial fulfillment of the requirements for the degree of Master of Science (MSc) at the Faculty of Mathematics and Natural Sciences, Department of Informatics, University of Tromsø, Norway. The funding for this work has been provided by The Norwegian Education Loan Fund (Lanekassen) and this support is duly acknowledged.

The thesis is intended for researchers and experts in telemedicine and eHealth who are especially interested in the African continent and how to support the developments for Telecommunication technology for health there. It is also intended for politicians, policy makers, health service providers and citizens of sub Saharan Africa (SSA) countries who wants to make great impact on the governance of their health systems.

The underlying motivation was that research on telemedicine solutions in SSA countries is almost non-existence. A thorough analysis of general application areas of satellite-enhanced services has already been conducted by Dario et al. (2005), while the specific situation in SSA was investigated by Telemedicine Task Force (TTF) on health political, administrative and application level, published as TTF report (Asamoah Odei et al. 2007). Based on this report, my research is to assess the ability of telemedicine solutions to support health system governance in Ghana and Nigeria. Governance of health systems here means developing and putting in place effective rules in arenas like public administration, civil society, policy, politics, etc for policies, programs and activities related to fulfilling public health functions (USAID 2008). This is to achieve health sector objectives.

This thesis shall create benefit for the eHealth initiative of European Commission (EC), World Health Organization (WHO), African Union Commission (AUC), African Development Bank (ADB), TTF and the African Regional Economic Communities (RECs).

I would like to express my heartfelt gratitude to my supervisors Professor Alexander Horsch and Professor Gunnar Hartvigsen, for dedicating their time to read and discuss all my writings, and for providing professional guidance and support to shape my thinking, reading and writing of

this thesis. I learned a great deal from your wealth of experience, passion for research and dedication to your responsibilities.

I am grateful to the Health Information Systems Programme (HISP) Team at the University of Oslo, Norway, for enabling me participate in the 1st International District Health Information System (DHIS) 2 implementer's workshop, held February 2011. I learned a lot from the experienced DHIS 2 implementers present, who shared their experiences and challenges. Similarly, I will not forget the practical views obtained from the category of actors involved in health governance in Ghana and Nigeria, whose interview responses enabled me observe how the healthcare system functioned in practice at the various healthcare levels.

I will like to express my warm thanks to my loving husband (Kodjo) for his love, caring, support, understanding, and patience that he provided during my study. Likewise I deeply appreciate with many thanks the moral support and encouragement of my parents and siblings. The concern of the progress of my studies pushed me to the end and I am truly grateful.

Most importantly I thank the eternal, most blessed God, creator of the universe, who fathoms all contexts. I have fought the good fight with all my might! Because You have been my strength and right.

Joanna Adobea Dawson
University of Tromsø, Norway
May 31st, 2011

ABBREVIATIONS/ACRONYMS

ADB	African Development Bank
AUC	African Union Commission
BMCs	Budget and Management Centres
CHAG	Christian Health Association of Ghana
CHAN	Christian Health Association of Nigeria
CHEWs	Community Health Extension Workers
CHOs	Community Health Officers
CHPS	Community-based Health Planning and Services
CMA	Common Management Authority
DFID	Department for International Development
DHIS	District Health Information System
DHMT	District Health Management Team
DPs	Development Planners
DPRS	Department of Planning, Research and Statistics
DPT	Diphtheria-pertussis-tetanus
EC	European Commission
ECOWAS	Economic Community of West African States
ESA	European Space Agency
FBO	Faith-Based Organisation
FMOH	Federal Ministry of Health
FOSS	Free and Open Source Software
GDP	Gross Domestic Product

GHS	Ghana Health Service
GOG	Government of Ghana
HIV	Human Immunodeficiency Virus
HIS	Health Information Systems
HISP	Health Information Systems Programme
HMN	Health Metrics Network
HMIS	Health Management Information System
ICTs	Information and Communication Technologies
IS	Information Systems
ITU	International Telecommunication Union
LGA	Local Government Area
MDGs	Millennium Development Goals
MoH	Ministry of Health
MoU	Memorandum of Understanding
NACA	National AIDS Control Agency
NASRDA	National Space Research and Development Agency
NEPAD	The New Partnership for Africa's Development
NHIA	National Health Insurance Authority
NHIS	National Health Insurance Scheme
NHMIS	National Health Management Information System
NPHCDA	National Primary Health Care Development Authority
PHC	Primary Health Care
PPPs	Public- private partnerships
RECs	Regional Economic Communities
SSA	Sub-Saharan Africa

TALI	Tool for the Assessment of Levels of Information
TB	Tuberculosis
TTF	Telemedicine Task Force
UDHR	Universal Declaration of Human Rights
UNDP	United Nations Development Program
USAID	United States Agency for International Development
WHO	World Health Organization

ABSTRACT

Rationale: Attempts to successfully develop telemedicine solutions by specifying the requirements and critical success factors of these solutions are on-going in sub-Saharan Africa (SSA) countries as a means of improving access to high-quality healthcare. European Space Agency (ESA) (Dario et al. 2005) have explored the challenges and benefits of telemedicine solutions in these regions in the domains of eGovernment such as billing and administrative data management to support the healthcare process, aggregation and reporting of administrative data including quality, clinical outcomes, improving decision making through access to information and advocacy through modern technology. This thesis builds on from the comparative analysis of the healthcare systems in Ghana and Nigeria, in order to specify the system requirements for telemedicine solutions supporting health governance in these countries.

Motivation: Relevant literature in the domains of public health and information systems (IS) which studies requirements and success factors of telemedicine solutions in SSA countries suggests specific attention to be paid to the ability of such solutions to support health system governance. This is due to the complex institutional context involving technical, legal, organizational, and financial issues to be solved which makes it difficult to transfer decision-making, planning, budgeting, management and resource allocation from the national level to the country-regional, district, sub-district and community levels (Braa et al. 2001).

Method: This thesis performs a thorough review of published evidence to acquire information on the governance structures of healthcare systems in Ghana and Nigeria as well as successful operative telemedicine applications and services in these countries. UML modeling of the structures is used to describe the processes which link the national level to the level of the (Regional Economic Communities) RECs of which these two countries are part. The open source District Health Information System 2 (DHIS 2) developed by Jørn Braar and collaborators is analyzed to assess functionalities it has to support health governance and health system management. The system is also analyzed in terms of what it stores, its extensibility and scalability by functions.

A structured interview on health system governance in Ghana and Nigeria is conducted with key respondents such as health workers, persons dealing with statistics and training, system users, Health Information System (HIS) managers and planners. The research questions are tailored towards decision making processes in the running of healthcare system from national level to community level. Issues around funds, budgets and resource allocations are discussed. Decisions made with regard to the implementation of health policies such as the implementation of new types of healthcare services (i.e. eHealth services) are also discussed.

Results: A main finding in the thesis is that the development of information systems at district and Primary Health Care (PHC) levels in Ghana and Nigeria needs to be an integrated effort across health sectors. With this focus, requirements and critical success factors of telemedicine solutions for Ghana and Nigeria have been specified by assessing the governance structures of health services in the two countries and by analyzing the DHIS 2 to identify scenarios in health-care that need telemedicine support. In the case of Ghana, the local control and empowerment of information at lower levels should be embedded into PHC. This is due to the fact that the management of the source of healthcare information is usually a top-down approach (from national level to lower level) toppled with the differences that exists in the collection of healthcare data. This causes delays in healthcare decision making and duplications and omission of key data sets for performance assessment by the government. As such, the DHIS 2, although being used for information reporting in the Ghanaian healthcare system extended in terms of functionalities it is proposed as a system to support healthcare governance. In the case of Nigeria, there exists a National Health Management Information System (NHMIS) as a management tool for informed decision making at all the levels of government in Nigeria. However, there is no clearly defined role of the different tiers of government which affects the proper functioning of the NHMIS in terms of data input and data quality. As such, integrating the DHIS 2 to be used alongside the NHMIS at the Local Government Areas (LGAs) may enhance data quality and improved information reporting in healthcare decisions.

Conclusion: Telemedicine and eHealth activity around developing countries is increasing, and this fact cannot be denied. Although such activities could be a daunting task, they are emerging as a promising means for achieving quality healthcare. The specific healthcare situations in

Ghana and Nigeria have resulted in the specification of seven requirements regarding to the utilization of a HIS (specifically the DHIS 2). This is hoped to assist in the effective governance of healthcare systems in these countries.

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CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

The possibilities for using Information and Communication Technologies (ICTs) to improve healthcare delivery is increasingly being recognized in both developing countries with weak or unstable economies and in the industrialized countries. With regard to WHO's health-for-all strategy, it recommends that the World Health Organization (WHO) and its member states:

"…integrate the appropriate use of health telematics in the overall policy and strategy for the attainment of health for all in the 21st century, thus fulfilling the vision of a world in which the benefits of science, technology and public health development are made equitably available to all people everywhere." (WHO 1998)

With respect to ICT developments in healthcare, TTF has reviewed health policies and strategies for African development of WHO, The New Partnership for Africa's Development (NEPAD) and the EU, and recognizes that ICT is an important enabler of the progress towards achieving the Millennium Development Goals (MDGs). It is noteworthy some programs which the TTF has piloted to demonstrate the feasibility of technological innovations specifically satellite technology to contribute to regional efforts to overcome health workforce shortages (Asamoah-Odei et al. 2007). Sub-Saharan Africa (SSA) has over 5000 physicians migrating from to the United States of America to further their careers, or improve their economical or social situations. This according to WHO creates unfortunate imbalances in the global health workforce. Ghana reports 478 graduates of medical schools practicing in the USA and as compared to the 1210 practicing physicians in its country; they represent 30% of the potential medical workforce in Ghana (Hagopian et al. 2004).

Secondly the fragmentation of health systems in resource-poor settings has the lowest management ratio in terms of leadership and governance worldwide, and with only 17% of its total health workforce employed as managers or support workers. This WHO acknowledges (World Health Report 2006) and reports as having serious implications to scale up health programs. Thus setting up sound policies to ensure performance would ensure proper management. Access to healthcare for rural and vulnerable communities like Ghana, South Africa, Tanzania, Nigeria and Zambia is one of the most intractable difficulties in organizing the delivery of services. This is due to the poor roads, lack of transportation and the high relative cost of taking unpaid time away from work to seek medical care. It could also be attributed to the poor roads, lack of transportation and the high relative cost of taking unpaid time away from work to seek medical care. In support of this Castro-Leal and colleagues (2000) reveal a situation in South Africa where the poorest people must travel an average of two hours to get medical care. They also found that in Ghana, cutting distance to public facilities by 50% increased the use of these facilities by the surrounding community by 96%. Approaches however are being made to solve access problems (Institute for health sector development, 2004) but the quality of care provided and the unregulated systems in SSA countries is an issue to discuss.

1.2 PROBLEM STATEMENT: WHY TELEMEDICINE SOLUTIONS FOR RESOURCE-POOR SETTINGS?

SSA consisting of 47 countries and 750 million inhabitants is one of the world's regions which suffer the highest burden of communicable diseases such as HIV/AIDS, tuberculosis and malaria. It also has the lowest workforce capacity and lowest level of healthcare capacity worldwide. Statistically reported is 25% global burden of communicable diseases with only 3% of the world's health workforce and 1% of international expenditure on health (Asamoah-Odei et al. 2007). All these reveal the fact that, generally health coverage is low and to enforce the MDGs, one has to critically assess solutions to achieving better healthcare in these regions.

Research ICT developments specifically telemedicine solutions in SSA is almost non-existence (Mbarika et al. 2005). In the developed parts of world for instance Norway, the success stories on ICT developments is noteworthy. This is attributed to the emphasis laid by policy makers to provide excellent health services to all irrespective of the scarcity of health service specialists. The benefits of the ICT developments is reflected in this country's economy as there has been a clear reduction of health care costs as well as improved quality of healthcare ranging from pro-

fessional confidence, the efficient use of specialist expertise, and patient empowerment among others (Johnsen et al. 2006). Thus an agenda for studying the adoption, requirements, development, success factors and the application of telemedicine solutions is necessary for strengthening healthcare in SSA countries.

There is also a problem achieving health for all and this is enormous in the face of 500,000 maternal deaths a year, 2.9 million people lacking clean water and sanitation, prevalence malaria, substance abuse, population aging, environmental degradation, and violent human conflict. WHO declares that "In the 21st century, health is a shared responsibility, involving equitable access to essential care and collective defense against transnational threats." (WHO, 2010) this statement necessitates the importance of global leadership, sustainable resources and collaboration among every state and civil society. It also implies the need to develop new ways of thinking, programs and approaches for optimizing health resource use, prioritizing people's well-being and solving health problems in a broad developmental context. Various programs have been initiated by the Health Foundation of the Rogosin institute of New York to develop new ways of thinking and approaches. It is revealed that even available limited resources be it preventive, therapeutic, information, talent and community are seldom fully utilized rather than often wasted. In 1991, Sixty-five (65) professionals of Ghana attended one of such programs to devise solutions to health problems and it is interesting to note that 12 projects are under way and only 1 of them is ready for national implementation (Smith et al. 1994).

In this light, telemedicine and ehealth solutions are essential for resource-poor settings to combat specialist inaccessibility issues, high infant mortality rates etc. recorded in these countries. It is noted that Ghana's infant mortality rate for instance continues to decline despite the 400 percent increase in government budget allocation to health sector over the past years (Gordon et al. 2007). Also, access to specialist advice in these communities is limited. Ophthalmic advice for instance is low in most developing countries and has been supplemented with other practitioners with eye training who often do not have immediate access to advice, diagnostic tests and peer support (Beaglehole et al. 2004; Blomdahl et al. 2001).

1.3 STUDY OBJECTIVES

My study objective is primarily to specify the software and system requirements, as well as the critical success factors of telemedicine solutions for resource-poor settings. Specific attention shall be paid to the ability of such solutions to support health system governance, e.g. by data collection; this is a critical issue particularly in countries with populations living in isolated areas.

The task of achieving this objective was performed by:

- Conducting a thorough review of published evidence to acquire information on the governance structures of healthcare systems in Ghana and Nigeria and to investigate how telemedicine solutions could reduce healthcare problems in these countries.
- Modeling of the governance structure of the healthcare systems in Ghana and Nigeria and the processes which link the national level to the level of RECs of which the countries are members by a UML-based approach.
- Deriving requirements for a system that is capable of supporting governance of healthcare systems in Ghana and Nigeria.
- Analyzing the open source DHIS 2 to examine what functionality it offers to support governance of the healthcare systems in Ghana and Nigeria; identifying what of the requirements identified in the previous step are supported by the existing DHIS 2 version; specifying necessary extension of the DHIS 2 to meet the entire set of requirements.

This work I hope will contribute to the understanding of governance of healthcare systems in Ghana and Nigeria.

1.4 STRUCTURE OF THE THESIS

The thesis is organized as follows: Chapter 2 gives insight in the governance of the healthcare systems in Ghana and Nigeria. It also explores the specific situation of telemedicine solutions in these countries. Starting out from ICT infrastructure; it then proceeds to reveal ongoing ICT development projects and evaluation criteria based on existing systems and projects.

Chapter 3 describes the methodological framework used for the research; including literature work, structured interviews, and modeling.

I provide a brief overview of the research findings in chapter 4 based on the reviewing of the published evidence on the healthcare situation, systems, governance and organization in Ghana and Nigeria. This I hope to guide the identification and formulating of system requirements of the DHIS 2 in the proceeding chapters.

Chapter 5 compares the requirements and success factors of telemedicine solutions in Ghana and Nigeria by exploring the organizational structures of the Ghanaian and Nigerian healthcare structures, governance process map of the healthcare structures and analysis the DHIS 2 functional requirements as a telemedicine solution to health governance. This chapter adds to my knowledge some technologically and logistically promising, yet under-researched areas in health services.

Chapter 6 is a discussion of my general findings. It derives requirements for a system capable of supporting governance of healthcare systems in Ghana and Nigeria, emphasizes which of the requirements identified are supported by the existing DHIS 2 and specifying necessary extensions of the DHIS 2 to meet the entire set of requirements.

Chapter 7 concludes the thesis by throwing more light into the fact that research on telemedicine solutions in resource-poor settings is both interesting and relevant to ICT policy research. It also emphasizes the fact that policy makers would be provided the basis for prescriptive direction to govern their countries in the proper use of ICTs and this will consequently create tremendous opportunities for sustainable socioeconomic development. It also summarizes the results of the structured interview.

CHAPTER TWO: LITERATURE REVIEW

The purpose of the thesis is to compare the requirement and success factors of telemedicine solutions in resource-poor settings and with three main study objectives as I have described in chapter one. This section explores health governance framework in depth in Ghana and Nigeria and specific situation of telemedicine solutions in Ghana and Nigeria, which drives my motives for conducting this study. It begins by giving some insight into general concepts and experience of health governance, explores governance structures of health systems in these countries in terms of decision-making, financing and accountability. It concludes with insights on the specific situations of telemedicine solutions in these countries and their ability to support health governance.

2.1 LITERATURE SEARCH

The search tool used for the literature search was primarily Medline and other web searches such as JSTOR, IEEE Xplore, and ACM Portal all from 1966 to 2010. An exploratory search was started by screening about 1000 potentially relevant technical evaluation articles of existing literature on the healthcare situations, governance of healthcare, and ICT developments in the health sector of Ghana and Nigeria. I also searched for various strategy and policy documents issued by the Ministry of Health and potential donor agencies such as USAID and WHO in the various countries. I searched for these relevant journals and reports using combinations of the following search terms: healthcare systems; telemedicine applications; West Africa; decision making; telemedicine solutions; projects in Ghana; healthcare organization; governance structures. The definitions for telemedicine and health governance as explained in the previous chapter, as well as some articles provided by my supervisors and resource persons guided the final selection of the articles included in the master thesis. This was achieved by the use of the database JabRef. Of all the papers, 55 of them met my inclusion and exclusion criteria. This is shown in the figure below. I also systematically searched the reference lists of included studies and relevant reviews which were of interest to my thesis.

In the journals I found, I decided on using journals which analyses various strategies and policy documents issued by the Ministry of Health in each of these countries as well as other relevant

documents circulated by potential donor agencies and non-governmental bodies on telemedicine applications. The majority of these documents were in the form of hard copies, whiles some documents were obtained electronically such as policy documents, telemedicine applications and services evaluation reports.

2.2 HEALTH GOVERNANCE FRAMEWORK

Governance is been defined by World Bank (2000) as economic policymaking and implementation, the delivery of service and accountable usage of public resources and of regulatory power. The United Nations Development Program (UNDP) also views governance as "the exercise of economic, political and administrative authority to manage a country's affairs at all levels" (UNDP 1997). The Department for International Development (DFID) in the United Kingdom Department also describes governance as "how institutions, rules and systems of the state – executive, legislature, judiciary, and military – operate at central and local level and how the state relates to individual citizens, civil society and the private sector" (DFID 2001:11). With these definitions it is noteworthy the emphasis been laid upon implantation as well as accountability. Similarly health governance requires putting in place effective rules, power, authority and decision-making in a civil society, politics, policy and public administration. This according to USAID (2008) will distribute roles and responsibilities among societal actors and shape interactions among them. Some of these rules they note focus on shaping how government institutions make policies that allocate benefits and costs whiles other rules focus on shaping how policies are implemented, government is structured and organized, and how public agencies are managed.

In health governance, three actors are identified: the state actors consisting of politicians, policymakers and government officials; the second is the health service provider which could be a public, private or a voluntary body; the third set consists of beneficiaries, users of services and the general public (USAID 2008). Figure 1 is a model of health governance, which depicts the categories of actors and the interactions among them.

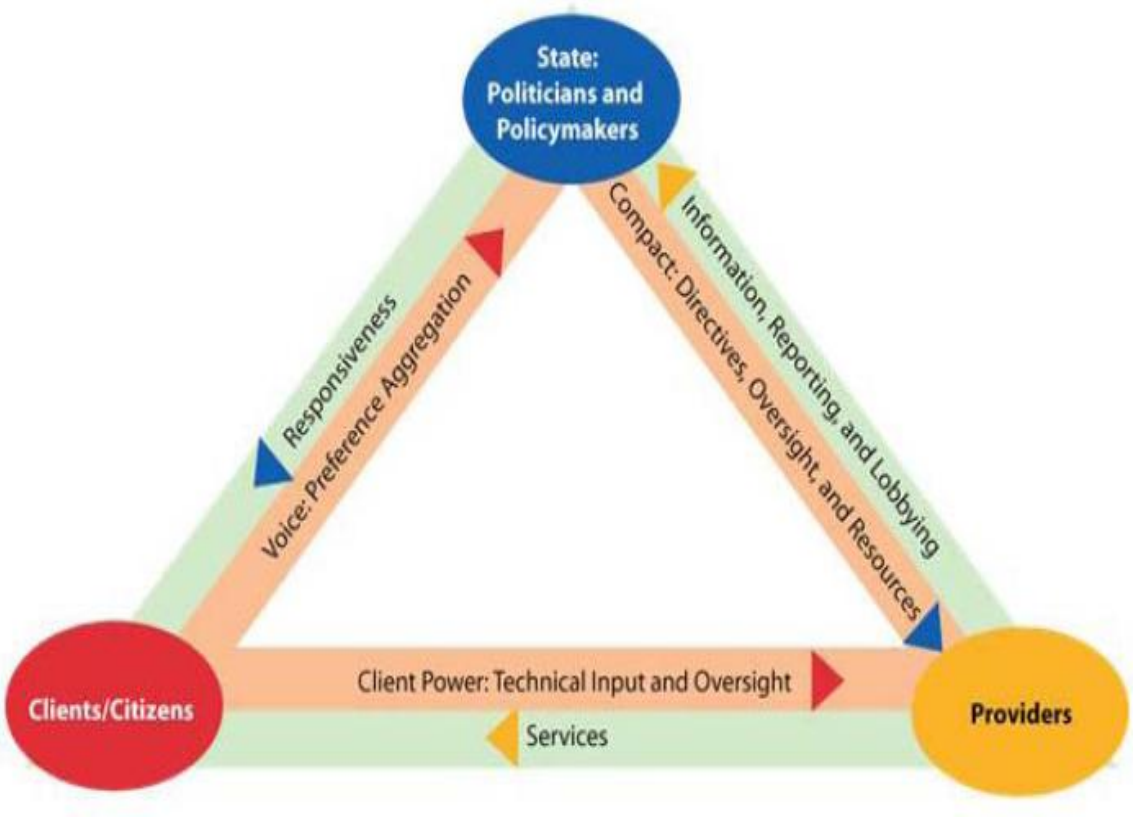

Figure 1: Health Governance Framework (Source: Adapted from World Bank 2004, 2007)

In this figure the arrows depict the extent to which the actors are related. The key feature from client/citizens to state actors shows the exercise of voice of citizens to their politicians, policy-makers and public officials. This could be an expression of need and demand through community initiatives to lobby local officials that develop expertise in budget monitoring and service delivery report cards. The state actors respond to providers needs as shown in Figure 1. The arrow "compact" encapsulates the relationship from state actors to providers. This is where policy makers specify their objectives, provide resources and support and exercise oversight relative to providers. It can be seen from the diagram that in exchange of these exercise providers is responsive to the desires and directives of the policymakers. The key feature from providers to state actors is the provision of information for monitoring and accountability purposes, the furnish of data for policymaking. Finally the heart of any health system is in the relationship between the service users and providers. Users of a service in principle convey their needs and demands, and their level of satisfaction to their providers who in turn offer quality services to satisfy this need. This is depicted in Figure 1 (World Bank 2004, 2007).

In the following sections the specific health situation in Ghana and Nigeria are examined in depth to enable the modeling of the governance processes in these countries in the requirement specification chapter.

2.3 HEALTHCARE SITUATION IN GHANA

To quote Kofi Anan, former United Nations Secretary General: "The biggest enemy of health in the developing countries is poverty." OECD (2008) in agreement with this makes known the high expectation for information system to serve as a vehicle for increasing efficiency and quality of health care delivery. This is due to the highly fragmented nature of health service delivery (Prichard & Hughes 1995), which is a challenge especially for developing countries. With regard to this challenge, Coiera (2003) notes the potential of information and communication technology to improve the situation. It is also pressingly important to exploit information systems to enhance efficiency, quality, equity, scope and result of existing resources given the inadequacy of health care service delivery in the developing (WHO 2008).

One may ask, "What is good health care?" Health is defined as a state of complete physical, mental and social well-being, not merely the absence of disease and infirmity." (COE 1970). It is also noteworthy that "health is a fundamental human right indispensable for the exercise of other human rights. Every human being is entitled to the enjoyment of the highest attainable standard of health conducive to living a life in dignity" (United Nations 2000). Article 25 of the Universal Declaration of Human Rights (UDHR) further indicates that "everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control." (United Nations General Assembly 2010) Therefore, the right to good health care is not only essential, but a major responsibility of the Ghanaian government.

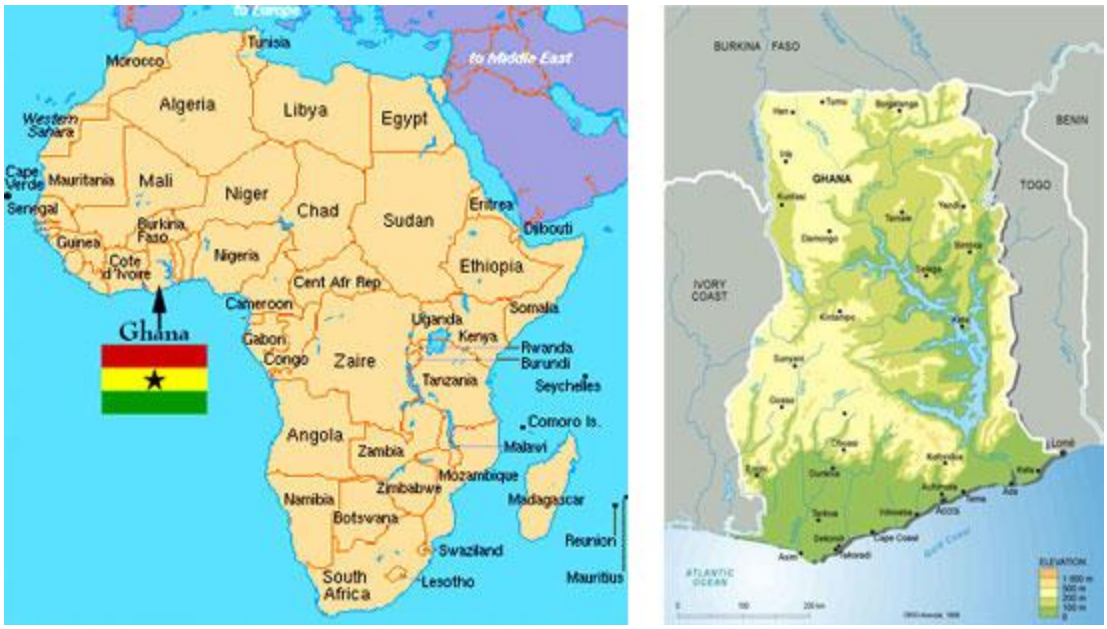

Figure 2: Ghana and its Location in the Africa Continent [1]

Ghana, the first SSA country to gain independence in March 1957, has a population of over 23 million spread over 10 regions. Although endowed with natural resources, it was estimated by the WHO in 2005, to have $2,370 GNI per capita, which statistically is 15 below the average for low-income countries (WHO 2006*a*). Maintenance and provision of basic health facilities, good nutrition, proper sanitation and enforcement of laws on occupational safety and health hazards according to the Ministry of Health (MoH) (2005) is difficult. They have also reported cases of death from preventable diseases such as malaria, which is the number one killer disease, especially amongst children and pregnant women in Ghana and others (MoH 2005). Thus, the health status of the population of Ghana as evidenced by poor nutritional standards, high infant mortality, and high prevalence of infectious and parasitic diseases is poor. In addition to this, there is inequality of health status between rural and urban areas and the different regions of the country. The World Bank in a population, health and sector review reveals a disaggregated data, which shows that life expectancy for instance is 13 years lower in the rural areas than it is in the urban area. Statistically, infant mortality is 63 per 1000 live births in urban areas as compared to 234 per 1000 in some rural areas (World Bank 1989).

1 http://www.intercordiacanada.org/index.php/what-we-do/placement/ghana/

To worsen this situation, poor financing of the health care system, inadequate health facilities, coupled with insufficient health personnel still form some of the main constraints limiting health service delivery in Ghana. It is startling that with a population of over 20 million, there are only 0.15 physicians to every 1,000 patients in Ghana (WHO 2006*a***)**. Distance is one of the key factors that can influence the utilization of healthcare in Ghana, especially for individuals in rural areas. Buor (2003) confirms this and has addressed the impact of distance on health service utilization, and how distance compares with travel time and transport cost that are related to it in the utilization of health services in the Ahafo-Ano South (rural) district in Ghana. This district covers an area of 1420 square kilometers (Ghana Ministry of Health 2000) with a population of 133 632 (Ghana Statistical Service 2002), and has only one public hospital situated at the district capital, Mankranso, six health centers and three clinics/maternity homes.
Organization of health service delivery that adequately provides quality and coverage of healthcare to its population is a challenge to policy makers in Ghana. The government of Ghana has thus considered varying degrees of reform in the health sector in response to this challenge (Agyepong 1999).

2.3.1 Healthcare System in Ghana

Two medical systems exist in Ghana and are mutually independent in context. They include traditional medicine and modern medicine (Anyinam 1989; Hevi 1989). Accessibility of health care is a major problem from Ghanaians and this is evident from the 1: 20 000 ratio of medical doctors to the population. This makes traditional medicine a better option and is evident from the 1: 200 ratios of traditional healers to the population (Patterson 2001; Tabi & Frimpong 2003). This is attributed to the fact that traditional healers provide the only affordable and accessible form of health care (Cocks & Moller 2002; Sodi 1996; Tabi 1994).

The traditional medicine is part of the Ghanaian culture. Priest and priestess of deities and gods are the most common types of healers in the traditional medical system and they mostly cure organic and spiritually based diseases (Hevi 1989). It includes herbal medicine for specific diseases, folk knowledge, traditions and values, health behavior rules and patterns, and identified personnel and structures for delivery and restorative therapy. Each of these priests and priestesses has a distinctive approach to diagnosis and therapy. Secular healers are often referred to as 'traditional pharmacists' and use herbal medicine prepared from selected leaves, roots or other parts of

plants and animals to cure diseases. There are also plant drug peddlers who travel to towns and villages. They also sell herbal medicines at workplaces, bus stops and in the streets.

The modern medical system includes government-operated/financed delivery systems for medical care provided at hospitals, health centers, clinics, health posts and maternity homes. Quasi-government-operated health services include those provided by the army, the police, and some large firms and corporations for their employees. There are also private healthcare services provided by religious missions like the Catholic Mission, the Presbyterian Church and Seventh Day Adventist Church. The government of Ghana supports these mission health services. The Ministry of Health officially manages modern medical systems, providing medical care, maternal and child health services, health laboratory services, mental health, dental health, nutritional health, environmental health and health education (Tabi 1994).

A lot of comparisons have been published with respect to the two medical systems and this instructs healing practice even in many countries. This has led Langwick (2006) to state that:

"Of course, hospital doctors typically saw patients for whom non biomedical treatments did not 'work,' because people who went from the healer's home to the hospital were generally motivated by the feeling that their condition had continued to be untenable even after the healer's treatment. Yet [Stirling, like other physicians] claimed that all healers' diagnoses and treatment were 'guesswork.' It was possible that a person's complaint might be addressed by an appropriate herbal medicine, but in Stirling's view, those rare occasions happened by coincidence or good luck, not because healers understood the natural arrangements and relations of scientific world." (2006 p.160)

The genesis of modern medicine is an issue at the heart of scholars in Ghana.
Senah (2001) has given a persuasive account of the development of modern health care system in Ghana. Educated Ghanaians--those working in urban and colony areas, and those exposed to western ideas, also have became accustomed to biomedicine and western ideas, and are more receptive to modern health care services (Patterson 1981). Colonialism enabled Gordon Guggisberg, the new governor, to design a new national health structure, which included the building of

the first national hospital, Korle-Bu Teaching Hospital, in 1923—purposely built to serve Ghanaians' health needs, and also to serve as a center for research into tropical diseases.
This colonial health project has established cost sharing in health care services; central government as the largest provider of health care service; subordination of indigenous healing systems to biomedical standards; urban-bias health care structure; and health and health related infrastructural services designed, maintained and governed by the central colonial authority (Senah 2001).

Some contributing factors resulting in the existence of the dual healthcare delivery system includes situational factors and the Ghanaian economic and financial situation.
The Ghanaian history of strong family and religious bonds makes a larger part of the population associate with a specific kind of delivery system. Working with a government institution enables one to go to the doctor first to do some tests and later to the herbalist. Others solely rely on traditional healers because they cannot pay hospital bills. Internal contextual influence such as personal belief and faith, and the belief that spiritual illness could only be cured with traditional medicine are other types of dilemma (Tabi 2003).

Health administration in Ghana is divided into three administrative levels namely National, Regional and District levels. It is further divided into five functional levels namely National, Regional, District, Sub-district and Community Levels. All the levels of administration are further organized as Budget and Management Centers (BMCs) for the purpose of administering funds by the Government and other stakeholders. There are a total of 223 functional BMCs and 110 Sub-Districts BMCs. With the headquarters of the Ghana Health Service (GHS) also managed as a BMC, there are 10 Regional Health Administration, 8 Regional Hospitals, 110 District Health Administrations and 95 District Hospitals. All of these are run as BMCs (GHS undated a).

The GHS is governed by a 12-member council and is in charge of transport, equipment and infrastructure provision and the delivering of information. It also provides support and guidance to ensure the implementation of the functions of the service. All its activities are coordinated and administered by the Ministry of Health (MoH). It submits to the minister recommendations for health care delivery policies and programs, promotes collaboration between MoH, Teaching

Hospitals and the Service and advises the Minister on posts in the service and other matters that the Minister may request. The Health Ministry is responsible for policy planning processes and information management, particularly concerning the areas of financing, human resources and infrastructure (MoH 2008).

In terms of health service delivery, the healthcare system of Ghana is organized under four main categories namely public, private-for-profit, private-not-for-profit and traditional systems (Abor et al. 2008). The operation of service delivery is mainly in the hands of GHS and it operates health delivery at the 10 regional levels. The regional level offers curative services delivered at the regional hospitals and public health services centre. Curative services are provided by district hospitals at district level usually faith based hospitals collaboration with the government health institution for health delivery. At the district and sub-district levels, traditional birth attendants and healers receive recognition. The District Health Management Team (DHMT) and the Public Health Unit provide public health services. "At the sub-district level both preventive and curative services are provided by the health centers as well as out-reach services to the communities within their catchment areas. Basic preventive and curative services for minor ailments should be addressed at the community and household level with the introduction of the Community based Health Planning and Services (CHPS)" (GHS undated b). An overview of the healthcare system in Ghana is depicted in Figure 3.

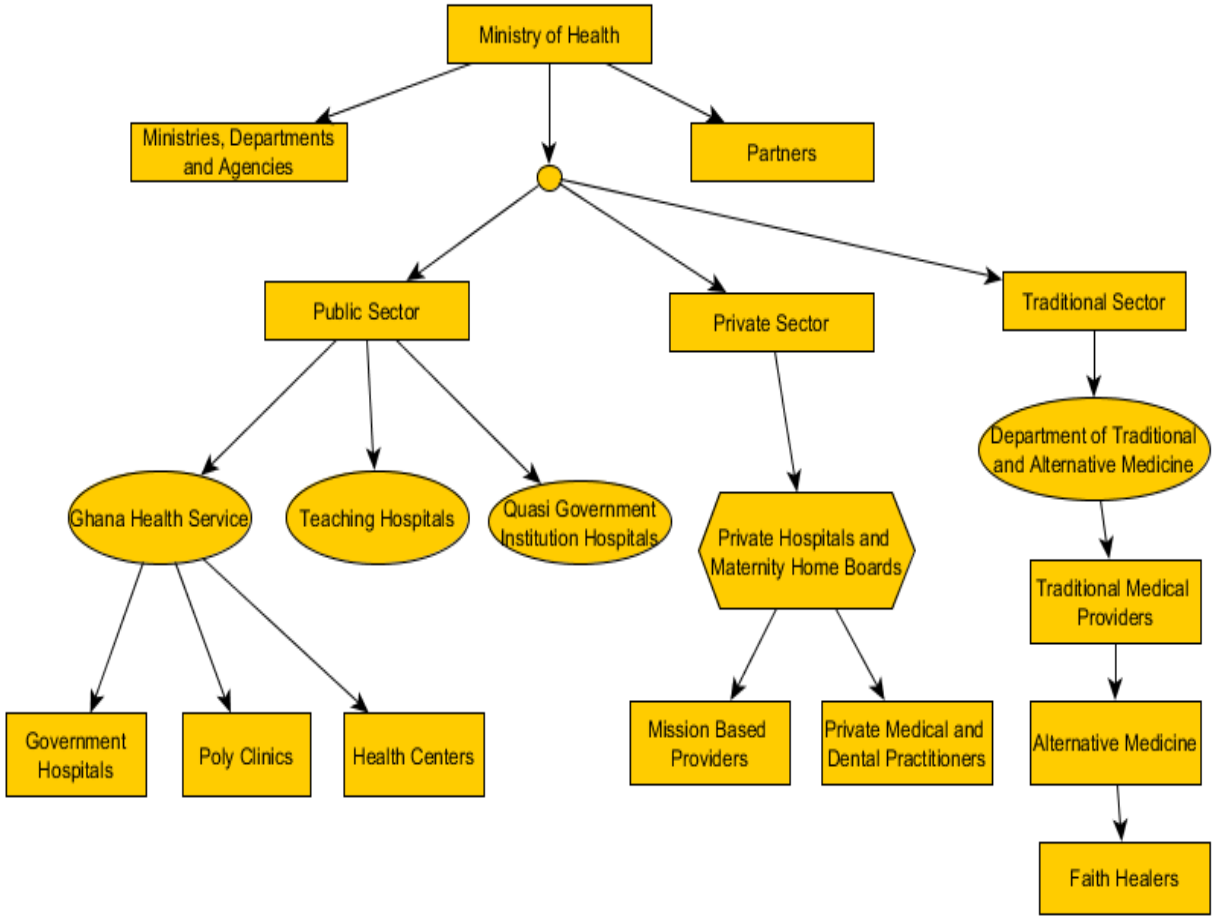

Figure 3: Health System in Ghana (Source: Adapted from Abor et al. 2008)

CHPS is a national health policy initiative adopted in 1999 to reduce barriers to geographical access to healthcare. It aims at transforming the primary health care system by a programme of mobile community-based care by a resident nurse in a community. It is currently an integral part of the Ghana Health Service Five Year Programme of Work and one of the health sector components, which aims at reducing national poverty. Traditional leaders and DHMT are expected to in cooperate CHPS into their health service delivery (Nyonator et al. 2005).

Navrongo, a district located in the Upper East Region of Ghana had an experimental trial of the CHPS initiative in 1994 and this was launched by an MoH task force (Katz & Kahn 1966; Korten 1980; Simmons et al. 2002). Results of the pilot enabled MoH to utilize nurses as service de-

livery points as compared to original health centers. The CHPS implementation process is discussed into detail in chapter four and it is interesting to note that over a 2-year period, 104 out of the 110 districts in Ghana has started CHPS.

The National Health Insurance Scheme (NHIS) operates the public health care system (Figure 3) of Ghana. It operates insurance schemed including District-Wide (Public) Mutual Health Insurance schemes in all the 110 districts in Ghana, private mutual insurance schemes and private commercial insurance schemes (Hepnet 2007). Ghana's NHIS along with the District-Wide (Public) Mutual Health Insurance schemes operates private mutual insurance and private commercial insurance schemes. This is based on the analogy that such schemes will provide Ghanaians the opportunity to join a health insurance of their choice (IRIN 2004).

2.3.2 Governance and Health Sector Organization in Ghana

According to Addai and colleagues (Addai et al., 2001; Vaillancourt et al., 2009), the health sector of Ghana has gone through different periods of change since the 1980s to date. In these periods tension is said to have existed between a policy environment aiming at financial decentralization, strengthening district health systems and integrated approach to service delivery, donor driven projects and balkanization (donors supporting specific regions). In the 1990s, these tensions the authors note lead to a progressive move to do business in a different way, aiming at a more holistic sectorial approach, using Ministry of Health (MoH) systems and strengthening institutional capacity. A process was then established to discuss and negotiate health sector priorities and interventions and thus allowing the MoH more authority on comprehensive resource allocation and utilization, including part of donor funds. The first Medium Term Health Strategy, the Five-Year Programme of Work and the Common Management Authority (CMA) were ready by the end of 1996 and this lead to the signing of a Memorandum of Understanding (MoU) between MoH and Development Planners (DPs) in April 1998. Thus the main trust was a single plan and budget, jointly supported by the Government of Ghana (GoG) and DP resources, using common systems; moving from a fragmented to a comprehensive, more integrated approach. This process of change management has been fundamental for the health sector and implemented under various degrees. Although a mutual understanding has been achieved in the Ghana health sector, the authors make known the fact that it is still constrained by some major inefficiency such as delays in funding and in reimbursements and the high prices for medicines.

The present organization of the health sector of Ghana is such that the central MoH is responsible for providing integrated health services for the country. It engages in policy development, regulation, health financing, resource mobilization and allocation, and monitoring and evaluation of sector performance. Collaborating with private sectors such as missionary and industrial organizations, the Ministry administers health programs such as medical care; communicable disease control; environmental health; health laboratory services; health education; maternal, child health and family planning, dental services; medical statistics and documentation (Fosu 1989).

The fragmentation of the healthcare system is such that it is made up of a hierarchy of institutions, which has been developed regionally, with each region having a general hospital in its capital. The regional hospitals are administered by regional medical officers and implement the policies of the director of medical services. Korle-Bu is the regional hospital for the greater Accra region. It is the main referral hospital for the country and also a teaching hospital for the Ghana Medical School at the University of Ghana (Fosu 1989). In addition to this, there are three psychiatric hospitals in Ghana, two in Accra and one at Ankaful in the Central Region.
There are also district hospitals in almost all the regions, which serve as general referral centers for problems that cannot be handled at the lower levels. It is the duty of the district hospitals to provide outpatient services and promote healthy living conditions.
Ghana also has a health post (the smallest unit of health care system) which serves as a satellite to a health center in rural areas. There are five of these health posts to a health center each with a responsibility to care for about 22,000 people and are staffed by a health superintendent, community health nurse and a medical auxiliary. In addition to the health posts, Ghana has dispensaries, local authority dressing stations and maternity clinics (Fosu 1989).

MoH is the largest provider of health services in Ghana. It owns 63% of hospitals and 70% of hospital beds in the country (Asenso-Okyere 1995). It is interesting to note the funding allocation in the Ghana health sector due to various health sector reforms over the last decade with health donors. Donors particularly are important stakeholders in healthcare provision of Ghana because their contribution represents an average of 35% of the total health budget recorded in the mid 1990s. Also MoH has not been able to meet the allocation of resources although they admit the

need for a needs-based formula to help the allocation of resources (Ministry of Health 2005). Ghana's health budget is divided into four main expenditure items: salaries, administration, service and investments (Asante et al. 2009). Resource allocation in the health sector is one of the most controversial issues in Ghana. It is important that mechanisms with which distribution of resource is based be revised to confront some of the inequities in the Ghanaian health sector. With regard to this, an exploratory design by Asante et al. (2009) which focused on the different levels of the health system and diverse stakeholders in Ghana revealed the fact that there is a need for more transparent resource allocation system in Ghana based on needs taking into accounts key issues such as capacity constraints, the equitable human resource distribution and donor-earmarked findings. In this survey however, it is noteworthy that key factors such as human resource availability, load capacity to utilize funds, donor involvement in the health sector and commitment to promote equity influence resource allocation decisions and affect equity of funding in the Ghanaian health sector.

Also, with approximately 20 million people in Ghana, and healthcare access are unequally distributed and with poorer regions in the northern parts having the poorest health status. There have also been collaborations with donors to implement considerable health sector reforms over the last two decades, and considerable emphasis on improving equity of access for the poor by reducing the financial barriers to accessing services (United Nations Development Programme 2007). However, the MoH has been unable to develop a needs-based formula for the allocation of resources despite their acknowledgement of such a formula (Ministry of Health 2005).

MoH also engages with service providers such as the GHS and the Christian Health Association of Ghana (CHAG). The GHS especially has been for many years been a strong organization responsible for public service provision and in close collaboration with CHAG. However, they have recently been complemented by the National Health Insurance Authority (NHIA). The NHIA combines regulatory functions such as accreditation (service package; resource allocation and reimbursement policy), financing (the reimbursement of claims and 'reinsurance', subsidizing the MoH for some prevention activities and investments, projects of Member of Parliament, investments in the national insurance function, overhead, etc.) and controlling (number and type of services delivered, prescription of medicines). The present law of Ghana makes it clear that the NHIA is in principle accountable to MoH but defacto NHIA seem to be accountable to the

president and parliament. This in effect reduces the authority of the Minister to ensure effective complementarities between financing and provision of services and to monitor the performance of the NHIA. It is proposed therefore that for effective delivery of service, MoH should work closely with the NHIA on policy issues regarding health financing and health insurance. In addition, it is important that all the health providers i.e. GHS, CHAG, MoH, NHIA work together at a technical level on issues such as basic package, provider payment systems, provider claim management, and control of provider and client behavior. An upcoming NHIA bill known by the Public Health Act and CMA provides opportunities to reorganize and strengthen effective coordination of health agencies by the MoH / GOG with a view to ensure that sector priorities are being met (Ministry of Health 2010).

Financing health in SSA according to Korte et al. (1992) is a critical and urgent issue. This is due to the fact that healthcare is financed mainly by public assistance systems through tax revenues and external foreign aid contributions to the national budgets. Worsening economic conditions also decreases national health expenditure in these countries in terms of budgets and absolute allocations. This Vogel (1989) notes a decline in per capita health from 5.17US Dollars to 4.70 US Dollars between 1980 and 1985 respectively. With regard to this various adjustments have been made to develop strategies for financing healthcare such as cost recovery strategies, risk sharing and rationalization of resource use. Ghana and Nigeria are no exception of these strategies in an attempt to create varied options for decision makers.

Thus equity in the allocation of resources in the health system of Ghana is an issue that also needs to be discussed. According to Asante et al. (2009), decision to allocate a resource to a particular jurisdiction is based on a number of factors, which sometimes deviate from existing resource allocation formula. In their exploratory design which focuses on the different levels of health system in Ghana and their diverse stakeholders, they also highlight the need for a more transparent resource allocation system which stresses on Jehu Appiah and colleagues (2008) argument.

Better health for developing countries has been at the heart of many researchers work like Cassels and Janovsky (1998). In an article, which they published in Lancet, investigated approaches

on how aid for health in developing countries could be distributed in the health sector. However before this can be investigated into, there is the need to know Ghana's entire health sector and organization, health policy framework, and health expenditure with regard to the management of funding projects for healthcare. In light of this, MoH has developed a medium-term strategic framework and a strong management system to allow four donors to genuinely support a sector-wide programme. A review to assess performance under this approach produced encouraging results (Cassels et al. 1998).

2.4 HEALTHCARE SITUATION IN NIGERIA

The country profile of Nigeria estimates a population of 148 million people with 49% female and 51% male (National Planning Commission 2008). This in reality is about seven times the Ghanaian population. It is noted to hold one-sixth of the population of Africa consisting of a federation of 37 states with Abuja as the federal capital territory. By the year 2025 its population is expected to rise by 200 million people (Population Reference Bureau 2007).

Figure 4: Nigeria and its Location in the Africa Continent (USAID 2008)

Nigeria is diverse with more than 250 ethnic groups, 500 indigenous languages, and diverse religion including Islam, Christianity, and traditional African beliefs. In the North and South, the population is predominantly Muslin and Christian respectively. The population in the north is predominantly Muslim and Christian respectively with Hausa in the north, Yoruba in the south-west, and Ibo in the southeast as the major ethno-cultural spheres (USAID 2008).
Nigeria's annual economic growth rate from 200 to 2006 as noted by The World Bank Group (2007) averaged 2.5% yearly. They also note that the economy relies largely on the oil and gas sector, which accounts for 99% of export revenues, 85% of the government budget revenue, and 52% of gross domestic product (GDP). Secondly agriculture, mining, light industry, and banking sectors contribute significantly to GDP. However the large revenues from oil wealth and natural resources do not agree with the economic standard of the population. Nigeria stands as one of the poorest countries in the world with a GDP per capita of only about US$1,161. This means that approximately 54% of the population lives on less than one dollar per day (The World Bank Group 2007). Situations like this are likely to cause restrain on the health of individuals.

Notably the costs of healthcare to consumers is progressively increasing in Nigeria due to structural adjustment programme started in the 1980s and the current government policy of charging for healthcare in all public facilities (FMOH 2001). In addition to the poor performance of Nigerian health system, there is lack of clearly defined roles and responsibilities in health governance and this result in duplication of efforts. To worsen the situation inadequate political commitment especially at lower levels, poor coordination, lack of communication between various actors, lack of transparency and poor accountability causes restrain on the health system in terms of service delivery. Other issues include the poor regulation in the private sector, a major contributor to health care delivery due to weak capacity of State governments to set standards and ensure compliance (Health Reform Foundation of Nigeria 2006).

There is also poor implementation of policies in the Nigerian government due to unclear provision of government functions. As a result, health facilities are overwhelmed with their activities and lack clearly their defined roles and responsibilities for effective delivery of health services (Society for Telemedicine and eHealth in Nigeria 1961). This I am certain stresses the poor coordination of health services as noted in the proceedings of health reform foundation of Nige-

ria in the previous paragraph and more of health governance in Nigeria is discussed in section 2.4.2.

2.4.1 Healthcare Systems in Nigeria

The healthcare system of Nigeria consists of primary, secondary and tertiary levels of care. These levels are under the three tiers of government namely Federal Ministry of Health (FMOH), State and Local respectively. The local governments provide primary level of services (lowest level of service) through Primary Health Care (PHC) centers. The state governments are responsible for secondary level of healthcare and delivers service through general hospitals. Finally it is the responsibility of the Federal Ministry of Health to deliver tertiary care through highly specialized services in teaching hospitals and federal medical centres. The responsibilities of these three tiers of government in the delivery of health service overlap in a way. State governments provide some tertiary care through state-owned teaching hospitals, tertiary institutions also provide PHC services through their general outpatient departments' whiles the Federal Ministry of Health through National PHC Development Agency develops policies, develops PHC physical structures and supervises the operations of PHC centres (FMOH 2001).

The healthcare system of Nigeria is pluralistic with the orthodox and traditional health care delivery systems operating alongside each other and hardly any collaboration. The FMOH (2005) estimates 85.8% primary health care facilities, 14% secondary and 0.2% tertiary out of a total of 23,640 health facilities in Nigeria. 38% of these facilities they note are owned by the private sector, which provides 60% of health care in the country. Public health service in Nigeria for example is organized into primary, secondary and tertiary levels. The Constitution of Nigeria is silent on the roles of the different levels of government in health services provision however the National Health Policy ascribes responsibilities for primary health care to local governments, secondary care to states and tertiary care to the federal level (The National Strategic Health Development Plan Framework, 2009-2015). WHO (2000) highlights the deplorable state in which Nigeria's health system is in as its overall health system performance rank is 187th out of 191 member States. This is due to the poor political will, gross under funding, and lack of capacity at the (Local Government Area) LGA level. Other compounding factors to the deplorable state include physical facilities that are decaying, equipment that are obsolete, scarcity of skilled health professionals, roles of stakeholders that are misaligned weak, coordination systems are weak etc.

National Planning Commission (2008) notes that, some contributing factor to the weak health system contributes to the limited health coverage with proven cost-effective interventions. They site some examples as immunization with 23% coverage; only 12% of under-fives sleeping under Insecticide treated nets, 20% and 14% of children in urban and rural areas respectively who have fever and are treated with antimalarial at home, contraceptive prevalence rate at 15% and only 39% of women who deliver under the supervision of skilled attendants.

The public and private facilities in Nigeria provide priority health services both general and HIV/AIDS related. The service coverage by zone, rural-urban location, and socioeconomic status however potrays some inequalities. This is seen in some of the health indicators of selected priorities such as immunization coverage, maternal and reproductive health services, malaria, HIV/AIDS, and TB services. Diphtheria-pertussis-tetanus (DPT3) immunization coverage which is frequently treated as a proxy for health system performance because it necessitates three interactions with health personnel and allows distinctions to be drawn between contact with the health system (1+ dose) and effective coverage (all three doses) is extremely low in Nigeria, with only 25% of children in the age range of 12-23 months receiving all three doses. However, 43% receive at least one dose of DPT (NDHS 2003). Also, the use of maternal and reproductive health services is relatively limited. Even for those who received, the quality of ANC received shows room for improvement, with only half of recipients receiving counseling on pregnancy danger signs and only two-thirds reporting that urine or blood samples were taken (NDHS 2003). Malaria is also an important public health priority not only in Ghana but in Nigeria as well. In Nigeria this disease is responsible for 30% of all childhood deaths and over 10% of maternal deaths. Nigeria also has one of the highest TB burdens in the world with about 450,000 new cases in 2006 alone. 10% of TB cases are also co-infected with HIV. However, only 10% of TB patients are also tested for HIV, below the regional average of 22% (WHO 2008a).

Private sector in Nigeria is very heterogeneous and includes unregistered and registered providers ranging from traditional birth attendants and individual medicine sellers to sophisticated hospitals. It is interesting to note that 38% of all the registered facilities in the FMOH health facilities database are privately owned with about 75% primary care and 25% are secondary care facilities. Thus private facilities account for one-third of primary care facilities. Also it is suggested

that a little over 50% of all registered private facilities are for-profit. In the non-profit sector however, Faith-based Organizations (FBOs) such as the Christian Health Association of Nigeria (CHAN) are important service providers. This organization reports about 3,500 facilities. For-profit private facilities in the formal sector also tend to be small in size and have a greater presence in urban and semi-urban areas than in rural areas (USAID 2009).

The quality of monitoring private health sector providers by the government is limited. This is due to the fact that although the State Ministries of Health (SMOHs) issue licenses to ensure that facilities comply with regulations, enforcement activities are limited. One of such instances is that professional associations do not actively assure quality, although some chapters of the National Medical Association do have committees on ethics and discipline (USAID 2009).

2.4.2 Governance and Health Sector Organization in Nigeria

Health governance across the health sector in general is very weak with institutional arrangement for channeling advocacy and participation for instance not functioning properly. There exists significant variation on the level of effectiveness of State Council on Health across the different zones and few organizations are capable of linking members of public with service providers and policymakers. Furthermore, only a number of organizations are informed and capable of engaging with public officials in establishing policies, plans and budgets for health services.

The Nigerian health system and mechanisms for its financing according to WHO (2000) draws its origins from the colonial medical system. This is the period where services were designed primarily for public servants with preventive health care, mainly in the form of hygiene and sanitation, provided to the general population. Financing for public sector service delivery points was derived largely from the government budgets. Curative care was also largely undertaken and funded by missionaries, who established FBO service delivery units, many of them outside the capital and in areas that were not readily served by public sector services. Over the years however, the different tiers of government have been charged with the different health care delivery roles described above: the federal government for tertiary care, state governments for secondary care, and local governments for primary care services as stated in section 2.3.1

Figure 5 depicts the flow of government funding to the Nigerian health care system. It is evident from the diagram that referral linkages are not clearly defined.

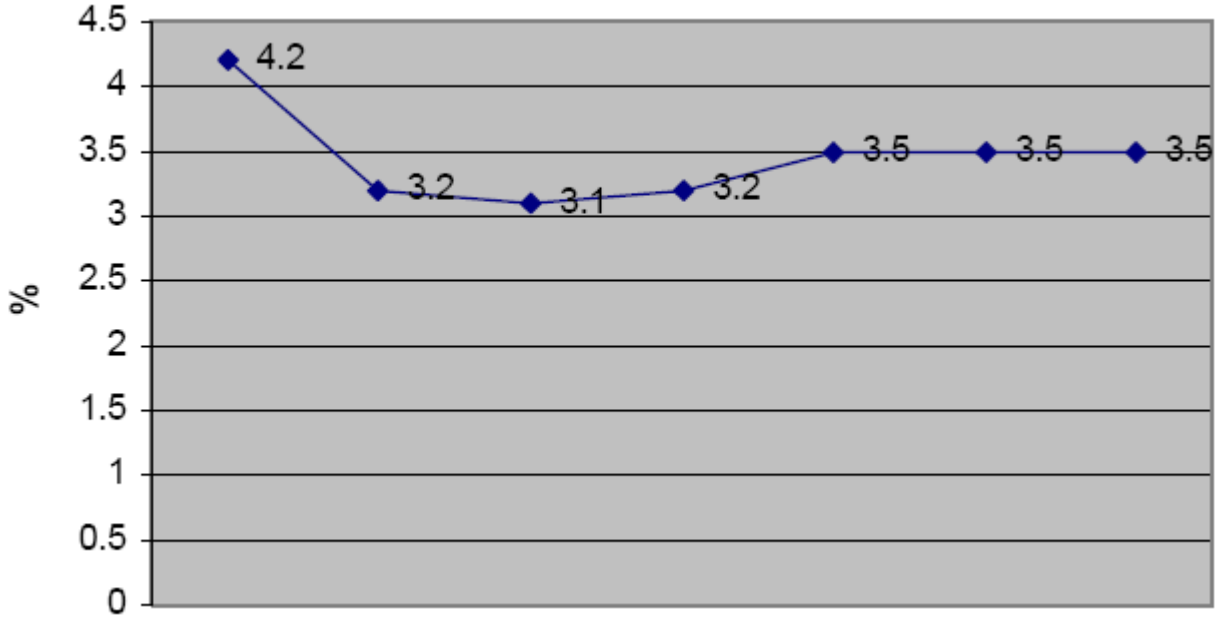

Figure 5: General Government Expenditure on Health as a % of Total Government Expenditure in Nigeria (Source: WHO, World Health Statistics, 2000-2006 Data)

From the diagram above, overall resource allocations to the health sector decreased between 2000 and 2006. Government expenditure on health as a percentage of total government expenditure fell from 4.2% in the year 2000 to 3.5% in 2004. This fall has flat-lined since 2004 (3.5%). Similarly, the total expenditure on health as a percentage of Gross Domestic Product (GDP) fell slightly between 2000-2006 (from 4.3% to 4.1%).

As previously discussed, in the public sector, different tiers of government are charged with different health care delivery functions: the federal government responsible for tertiary care; state governments for secondary care; and local governments for primary care services.
Figure 3 shows the flow of government funding to the health care system. Similarly however, funding and referral linkages have never been clearly defined within the context of this system. This makes it difficult to assess financial flows and accountability of funds for health in Nigeria.

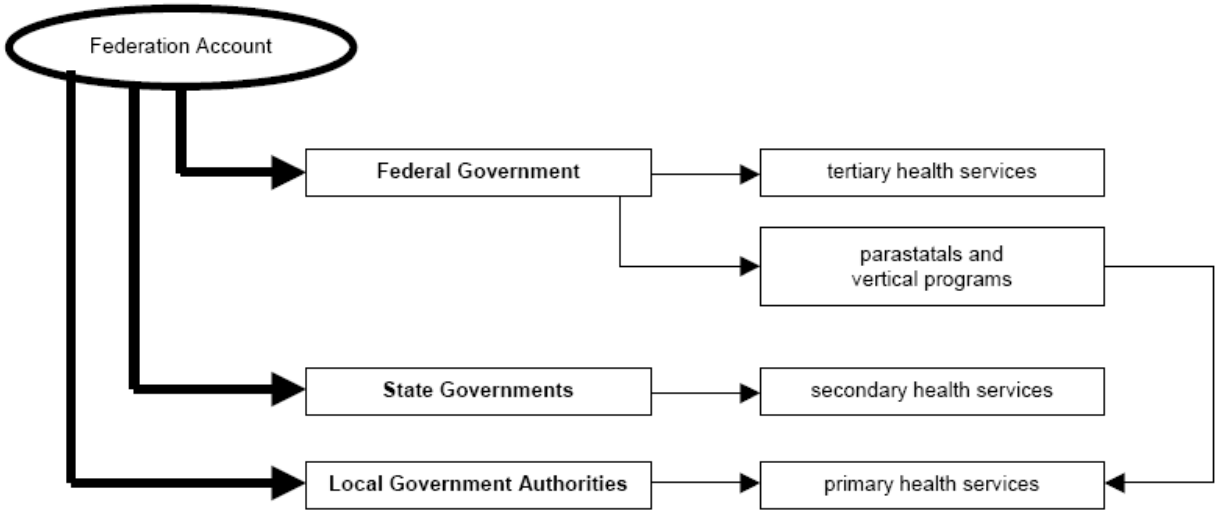

Figure 6: Government Funding Flow to the Health System in Nigeria
(Source: Adapted from the FMOH and World Bank, 2006)

Some challenges are that the data required for tracking resource flows, budgets, and expenditure by the government are often not easily available. Also the complex flow of resources from the federation accounts to operational levels of governance and their allocation to health remains largely determined by global priorities and personal considerations of leadership at the federal and state levels. Some of the sources of health care financing published by WHO (2006) include household out-of-pocket expenditures (65.9% of total expenditure), the Nigerian government at 26.1% (federal 12.4%, state 7.4%, and local government 6.4%), firms at 6.1%, and development partners at 1.8%.

More so governance in the health sector has been very challenging because of the complexity of the sector and the country's complicated federal administrative structure. In the three tier federal administrative structure depicted in Figure 3, each tier is notionally autonomous over the management of its resources. Nevertheless, the relationship between them has not been without friction in the health sector. Constitutionally, health in Nigeria is on the concurrent legislative list, which allows the federal, state, and local governments to assume varying and potentially overlapping responsibilities for policy making, regulation, and provision. The constitution's silence on the precise division of roles and responsibilities across the tiers makes for considerable ambi-

guity in the management of the health system. At both the federal and sub-national levels, the governance responsibilities are further shared between the three branches of government thus making each of their executive take responsibility for policy formulation and implementation (FMOH 2004).

The Federal Executive Council of Nigeria has developed a national health policy as part of efforts to strengthen the national health system. The aim of this policy is to expand financial options for health care and strengthen the contribution of the private sector and pre-payment based approaches for financing (Dare 2008). In addition, it seeks to engage communities and households in community-based schemes for the financing of primary care services. Public-private partnerships (PPPs) are also presented as strategic approaches for the expansion of health financing options at all operational levels

As mentioned in the previous section Nigeria operates a three tiered government-federal, state and the local government authorities (LGAs). Their relative roles in public service delivery are noted as important topics for debate in democratic Nigeria as such interesting for my academic research. In terms of governance, the federal ministry of health is assigned the responsibility of overall policy formulation, coordination and adherence recognized standards. The state government and LGAs delivers primary health services. The Constitution of Nigeria notes that the state governments are solely responsible for basic services such as primary health and education, with the LGAs assisting in the execution of these services only as instructed by the state government. It is noteworthy that public health service is delivered through a tiered package of facilities ranging from health posts/clinics (lowest rank staffed by junior paramedic and assistants), Primary Health Centres to Community Health Centres (referral centres). The LGAs owns a greater per cent (71%) of the primary healthcare facilities (The National Strategic Health Development Plan Framework, 2009-2015). Public health service in Nigeria for example is organized into primary, secondary and tertiary levels. The Constitution of Nigeria is silent on the roles of the different levels of government in health services provision however the National Health Policy ascribes responsibilities for primary health care to local governments, secondary care to states and tertiary care to the federal level (The National Strategic Health Development Plan Framework 2009-

2015). This will affect the management of health sources in individual states. Thus one needs to know the organization of the government structure with respect to health care.

A survey of 252 primary health facilities and 30 local governments carried out in the states of Lagos and Kogi sought to analyze how local governments function in the delivery of basic health services (Gupta et al. 2003). Their outlined objectives were to examine the flow of resources allocated in budgets to frontline service delivery agencies, analyze provider behavior and provider incentives in shaping outcomes at health facility level as well as and the role of local governments and community participation in determining outcomes in public primary health care service delivery. These states were selected on the basis of the interest expressed by their commissioners of Health and the contrasting service delivery between largely urban and largely rural areas. The methodology adopted to address the objectives were primary data collection administered mainly to three category of persons – one to public officials at the local government level to collect information on governance environment and public financing patterns, second to facility manager for general facility checking and services provided, and third to individual staff at the facility level for data on working environment and incentives. The LGAs according to facility-level respondents among the population of Lagos (80%) and Kogi (50%) are noted as the principal decision-makers in most areas of service delivery at the facility level as well as the main source of financing of primary health service delivery Gupta et al. (2003). Some pitfalls in terms of health service delivery in Kogi state included the large scale leakage in public resources away from original budget allocations. This was evidenced from the 42% of facility staff that had not been paid their salaries for more than 6 months in the past year. Even in cases when allocation of budget was sufficient to cover estimated actual costs, the staff-survey showed non-payments of salaries for several months in the year before the survey. The main conclusions and policy lessons of this survey indicated that the impact of governance and financing environment of public delivery of primary health services in Nigeria do not reach their intended destinations. Also it was suggested that providing citizens with greater information about their resources and responsibilities of their local representatives could empower them to hold their representatives accountable for the delivery of basic services.

Thus there is a general problem of accountability at the local government level in the use of public resources transferred from higher tiers of government thus making it necessary to strengthen local government accountability. The measure to be put in place is to provide citizens with greater information about the resources and responsibilities of their local representatives so that they are more aware and empowered to hold them accountable for any discrepancies Gupta et al. (2003). It is hoped that proper leadership and governance for health, service delivery, human resources for health, health financing, health information system, community participation and ownership, partnerships for health and research for health would help achieve the desired health outcome for the population of Nigeria. In light of this, a generic Framework has been developed to serve as a guide to federal, state and LGAs in the selection of evidenced-based priority interventions that would contribute to achieving the desired health outcomes for Nigerians.

In summary balancing equity of healthcare is essential to achieving efficiency in the provision of health services. This implies that policy makers in Ghana consider targeting of vulnerable populations and cost-effectiveness as an important criterion for priority setting of intervention in health issues (Jehu Appiah et al. 2008). The authors also stress the need for transparency and accountability in policy making. Some potential strategies have been outlined to identify the poor access, their feasibility, efficiency and equity.

Similarly meeting the health needs of the population of Nigeria according to Abudu (1983) requires a substantial financial allocation, the integration of modern and traditional medical practices and the reorganization and improved management of medical facilities. However this is not always the case in Nigeria. Planned capital expenditure for the health sector is still in the lows resulting in inadequate medical manpower, facilities and coverage of the population by modern medicine. World Health Report in 2006 highlights this fact and it is noted that spartan living conditions, non-existent rural workforce policies and strategies, and inadequate number of health staff with skills appropriate to the health priorities of rural areas are several of the many factors attributable to the steady decline in Nigeria's rural and remote health system. Also factors such as the contraction of government health spending as a percentage of GDP despite deteriorating health conditions, public health management systems that operate by default rather than by design, inadequate training of appropriate cadres of health staff, limited facilities and medications

for effective delivery of clinical services, and burnout of overworked and underpaid rural-based clinicians increase health workforce crises (Awofeso 2010).

2.5 SUCCESS STORIES OF TELEMEDICINE SOLUTIONS IN SSA COUNTRIES

Telemedicine is defined as the "rapid access to shared and remote medical expertise by means of telecommunications and information technologies, no matter where the patient or the relevant information is located." (CEC 1993). Craig and colleagues (2005) also notes its ability to provide healthcare when distance separates the provider and patients. (Craig et al. 2005). This is achieved by the use of communication technologies and electronic information. There are substantial benefits and limitations of telemedicine although it proves to be better than the conventional services in most cases.

Telemedicine is emerging as a promising means of achieving quality healthcare. Its good works can be viewed in a variety of ways. Among other benefits include improved access to information, provision to care not previously deliverable, improved access to services and increasing care delivery, improved professional education, quality control of screening programmes and reduced health-care costs (Hjelm 2005). Patients, health professionals and the population in general enjoy from all these benefits one way or the other. Telemedicine information can be accessed on the internet, homes and schools. This enables patients to understand the processes involved in their disease diagnosis to its treatments. Patients also suffering from diabetes, hypertension, emergency cases and other chronic ailments can be treated from home effectively. Health professionals are also able to serve more patients in a limited time and give first-hand information through telemedicine services. This goes a long way to reduce medical errors mostly generated in conventional services (Hjelm 2005).

The population in general also benefit from these services such as those in remote and rural areas, students, staff, family members and so on. There are also improved and assured education opportunities from telemedicine services to these individuals. Costs of care have also been reduced to these individuals due to the introduction of new technologies, and high cost patient and physician transfers is to the minimal (Benefits of Telemedicine 2009). Thus the power of information and communication technology (ICT) to transform health systems in the future is an undisputed fact.

Notably, telemedicine is increasingly being recognized in SSA regions as a means of improving access to high-quality healthcare. In Mozambique for instance, a telemedicine service has been established with the help of International Telecommunication Union (ITU) and is being evaluated to discover how information technologies can be most effectively used for expanding health services (Engelke 1998).

An exploratory survey of the applications of telemedicine in Ghana by Darkwa (2000) is one of the first study to assess the use of telemedicine in Ghana. This survey was conducted at two major medical institutions in Ghana to examine the use of telemedicine by health-care providers in the country by assessing the existing communications infrastructure, together with potential barriers to health-care providers in applying telemedicine. Majority of respondents, which included doctors and administrators, indicated an interest in telemedicine (80%) and gaining access to healthcare databases (75%). Respondents requesting for consultations over the internet were quiet encouraging (80%). Likewise teleeducation (65%) and videoconferencing (60%). From this survey specific telemedicine of interest to the respondents was teleconsultation (80%). This I am not surprised because of the weak referral systems we have in Ghana. In response to this a case study with the Ghanaian experience and deployment of telemedicine and eHealth had a first objective to strengthen referral systems. This is due to the fact that in areas where pilot testing was done, there were times in the year where one couldn't physically transport people because of bad roads during rains. Call centers in the various regions were also monitored and evaluated to review areas people called most or least. After review, rural health centers with no electricity and mobile phones are able to function effectively. Similarly at the district level, they are able to use a Vsat so the technology keeps increasing depending on the level [2].

Darkwa makes some suggestions and recommendations to support the use of telemedicine applications in Ghana. One of his concerns is that telecommunications capabilities of all major medical institutions in Ghana need to be surveyed to enable proponents of telemedicine to assess the information technologies of the institutions as well as the level of training that will be required to sustain and support infrastructure at each site. Various telemedicine programs have been evaluated in Ghana such as assessment of home management of fever among children in the Ashanti

2 http://www.sftehin.org/files/downloads/Policy.pdf

Region (Watling 1995) and an audit of web-based telemedicine in ophthalmology by Kennedy et al. (2006).

As evidence from the fact that the health sector of Nigeria is facing too much challenges in the previous section, the federal government together with the ministry of health have constituted a national eHealth Committee or Council as stipulated by resolutions of the World Health organization (WHO) and International Telecommunications Union (ITU). This is to serve as the national coordinating mechanism to develop an eHealth strategy, plan and programme for Nigeria. Other driving forces to this rationale is the fragmentation of health delivery and shortage of healthcare professionals among other issues such as the lack of resources, poor utilization of resources available, the lack of capacity to gather and process health statistics with which to target health spending and resources, etc (Health Sector Reform Program 2005).
According to Heath (2003), the history of telemedicine has proved its medically effective and its ability to generate sufficient revenue or cost savings to justify its use. Unlike Ghana with an eHealth Policy, Nigeria do not. This is attributed to the fact that Nigeria does not have a National eHealth taskforce. Thus they have less funding for eHealth services. Other deployment barriers include the sectoral set up in clinics other than integrated care for patients, the lack of motivation to invest in personal health, the unwillingness to change old procedure of care processes, and the absence of large pilot study (USAID 2009).

The shortage of medical specialists and access to medical information according to Ikhu-Omoregbe et al. (2006) has necessitated a growing interest for a cost effective and efficient telemedicine tools for healthcare delivery. Although it holds great promises in enhancing rural health delivery in Nigeria only a few applications exist because of poor frameworks for their deployment. Some works with regard to mobile telemedicine applications for tropical diseases have been started in Nigeria with the intent of providing a collaborative health care delivery and education between patients and care providers.

Also the Nigeria's Ministry of Health with the help and funding of its National Space Research and Development Agency (NASRDA) has established a nine-site telemedicine program in two Nigerian Hospitals. Maiduguri Teaching Hospital and Ibadan Teaching Hospital as well as some federal clinics throughout the country. NASRDA has additionally reached out to hospitals in ru-

ral Nigeria by providing a bus that travels to the most remote parts of Nigeria to provide primary healthcare services. Medical data from the bus are linked by a communication satellite Nigcomsat -1 to in-country hospitals thus giving patients and doctors in remote areas access to expert care (Normandin 2008).

Ozuah and Reznik (2004) assess the role telemedicine plays in the care of children in underserved communities in Nigeria and some other SSA countries. This they attribute to the shortage of pediatric specialists in these areas. It is interesting to note that monthly videoconferencing coverage has reached these areas where physicians at mentoring hospitals exchange ideas with those in rural areas. Since its inception, the programme has also provided teleconsultations and services to about18,000 children annually in these countries and on the average 50 educational videoconferences per month. About 600 educational videoconferences are conducted annually.

Mozambique has an aim to start the utilization of health information systems to support decentralization and primary care in their health sector. This is revealed in Braa's (2001) research work that sought to investigate the possibility for marginalized portions of Mozambique such as provinces and districts to make use of ICT within health care to their advantage. This project for instance revealed that entrepreneurship is critical to the success of using ICT capacity and infrastructure. Recommendations he makes such as focusing on developing educational programs and training of trainers such as physicians, masters and PhD students etc. in the field of health to use ICT for management and health care delivery.

South Africa is one of the few African countries that champions out when it comes to information use. Individual provinces, districts and national programs are systematically using information for action, with proven successful outcomes. With regard to this, DHIS software has successfully been used in the evolutionary and development of the national indicator and data sets. This DHIS enables data collection forms to be printed at each point of use, based on the current data sets. This illustrates a key characteristic of Meta data driven approach, where health professionals and not technical legacy systems are in charge when information needs are identified (Heywood et al. 2007). Thus the vision of the DHIS 2 according to Heywood is "to support the development of an excellent and sustainable health information system that enables all health workers to use their own information to improve coverage and quality of health care within our

communities." One may ask what is the long term benefit of the DHIS? It has the potential to strengthen health services and health information system because it requires coordination of reporting requirements among programme managers, and the creation of a framework for reviewing information needs over time.

Ghana and Nigeria can learn from Mozambique and South Africa's experience especially when focusing on the information needs based on data sets and indicators; attempting to standardize its health information systems (HIS) that integrates local and national needs; and when using a flexible integrated "data warehouse" at the district level.
However a lot of issues persist in the health sector in the utilization of these information systems specifically in the area of governance. It is thus important that such issues are solved adequately to bridge the health and information usage gap. Ghana has tried to reform health service at its district level. It is noteworthy the inflexibility in Central Government regulations for resource allocation and use. With regard to this, Agyepong (1999) suggests integration of service delivery at district level with more decentralized planning to make services better responsive to local needs; changes in basic and in-service training strategies; and exploration of how the public and private sectors can effectively collaborate to achieve maximum coverage and quality of care within available resources. I tried to find out how district health managers for instance cope with financing issues such as the untimely release of funds. These managers are normally from primary health care and first referral hospitals. It is however important to know how district health systems are funded in Ghana. This will thoroughly be discussed in Chapter Four.

Also, inadequate information for managerial process in the planning and management of health services in developing countries according to Heywood and Campbell (1997) has reached a crucial stage in the overall context of global recession. This they reported in a situation analysis of the existing reporting systems towards the development of a PHC information system in Ghana. In this light they developed an HMIS for PHC. The aim of the HMIS was to increase the capacity of local managers and program staff to use information to improve local decision-making and to help them take informed action in the area of planning, implementation, monitoring and supervision of health services. The implementation of the HMIS was successful and various lessons were also learnt. Most importantly, they deduced that an HMIS can produce better informa-

tion only if it is routinely used by management teams at all levels. It also provides a powerful set of tools that can be used to contribute effectively to the improvements in the health system. As to whether HMIS produced more informed decision was questionable due to the fact that decision-making was politically driven. However some notable achievements included the promotion of self-reliance, improved data relevance and accuracy, as well as strengthened supervision of health services

Exploring ways to combat health problems in Ghana and Nigeria is one of the main objectives of my thesis. These countries are chanced with many opportunities for telemedicine and ehealth services because of the significant progress in the development of information and communication technologies and knowing the requirements and success factors of these solutions I believe will guide me achieve my aim. Price Water Coopers was commissioned by ESA to undertake an independent analysis of the costs and benefits for investment in satellite-enhanced telemedicine and ehealth services to support public health policy objectives in sub Saharan Africa. They examined five thematic areas based on the context and this includes eCare in the clinic, eCare in the village, eLearning, eSurveillance and eAdministration/ eGovernance (PriceWaterCoopers 2008). After reading their report, the management of health information was of prior importance to my country. Evidence has revealed that an effectively organized, managed and targeted health information system can provide means of fighting the burden of diseases despite poor physical infrastructure, limited information, lack of health professionals, and inadequate resources (Busgeeth et al. 2004). I strongly stand on this point to research on governance of healthcare in Ghana and Nigeria and how it can contribute to making an impact on telemedicine solutions.

2.6 HEALTH INFORMATION SYSTEMS (HIS) FOR DEVELOPING COUNTRIES: THE DISTRICT HEALTH INFORMATION SYSTEM (DHIS)

Poor health conditions, delivery and management of health services to deprived regions and communities in developing countries has boosted the morale of international agencies, government authorities and researchers from different domains to develop sustainable and scalable Health Information Systems (HISs) in developing countries. As a result, a DHIS is advocated to ensure decentralized management and coordination of health services as an appropriate level for HIS development (Lippeveld et al. 2000; WHO 1994). Issues in existing information systems in developing countries such as the problem of sustainability, scalability, political visions of promoting equity in access to health services among others gives rise to a unique demand on HISs in

these countries. The Scandinavian Action Research in information systems which focuses on sustainability, political agenda and scaling of interventions drawn from experiences thus warrants special scrutiny as such research is attentive to these issues (Braa et al. 2004).

In light of this analysis of the DHIS 2, a Free and Open Source Software (FOSSS) HMIS which is developed under the initiative of Health Information Systems Programme (HISP), a global research team originating from the department of Informatics in the University of Oslo is worth assessing. As introduced in the previous section, the first version of this software (DHIS 1.3/1.4) was developed and subsequently upgraded in South Africa by HISP South Africa since 1997. It was used to capture and analyze monthly data at district, regional and provincial levels in Western Cape. Malawi adopted this software and piloting began in several other developing countries (Braa 2001).

The DHIS software was developed using Microsoft Access 97.2000/XP database management software because it has the ability to integrate with other Microsoft Office products (Excel, Word, and PowerPoint) for use in reporting. Its file structure is designed around two user-modifiable data dictionaries specifically for data elements and indicators. As noted in the previous paragraph, a key principle of the software development approach is that it should be distributed free of charge and with source code and database structure that are open to modification by any user (Braa 2001). Key modules of the version one software are outline below and upgraded functionalities to the second version are discussed thoroughly in the subsequent paragraph and chapter five.

- Report Generator also referred to as a Data Mart for storing processed indicator data. It links raw data directly from other modules to enable reports from any time period and any raw data or indicators to be tailored to user requirements. This is believed to be a powerful tool for managers and decision makers.
- Excel pivot tables to enable users to cross tabulate, filter and graph data.
- Thematic maps displayed using ArcExplorer map display software and
- A web-browser based data dictionary for storing official names and definitions for data elements

The difference between DHIS version one and two is that the first is based on functional requirement whiles the latter is based on warehousing principles. The second version which is of interest to my thesis is built on Java based frameworks, is platform independent, can run on both on-line and offline modes, is multi language enabled and integrated with various other applications such as Geographic Information Systems and Excel. It also has several modules for functions such as data entry, data quality checks, report generation etc. WHO and the HMN are currently using DHIS 2 to implement an integrated solution in Sierra Leone. Also DHIS 2 runs as a web based on a central server making use of client-server architecture and as an offline application. As a web based solution, has an advantage of being centralized to enable easy on-line updating and deployment of the application and can allow same software to be accessed through a web browser regardless of client's operating system. However, for developing countries a mix of the two is most suitable due to internet connectivity problems [3].

It is noteworthy the efforts HISP team has made to monitor the status of the DHIS so as to evaluate the degree to which a health information system is being used effectively. Specifically they use what is termed TALI (Tool for the Assessment of Levels of Information) and this tool uses a checklist approach which has objectively verifiable observations to help managers rank the effectiveness of the use of information at different levels of their health systems. They also note that although great progress has been made in the implementation of the DHIS, there are still variety of areas where the software can further be improved (Braa 2001).

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3 http://dhis2.org/doc/snapshot/en/user/html/#mod1_1

CHAPTER THREE: RESEARCH METHOD

This chapter describes the research approach used for the literature review, search strategies used to obtain published evidence, databases and search engine used, and the rationale for a structured interview on healthcare governance in Ghana and Nigeria.

3.1 SELECTION OF COUNTRIES

Sub-Saharan African countries were the regions identified as resource-poor settings. Ghana, being my home country, was selected because of the relative ease in obtaining primary information related to the thesis work. It was also realized, after thorough research, that a number of differently structured telemedicine services were being implemented in Nigeria. These services differed in the governance structure of their healthcare systems and thus presented a viable basis for comparative study.

3.2 LITERATURE SEARCH

For details on the search strategies used for the literature search, see "Literature Search," section 2.1 in Chapter 2. The selection process of the articles included in the search however is depicted in Figure 7.

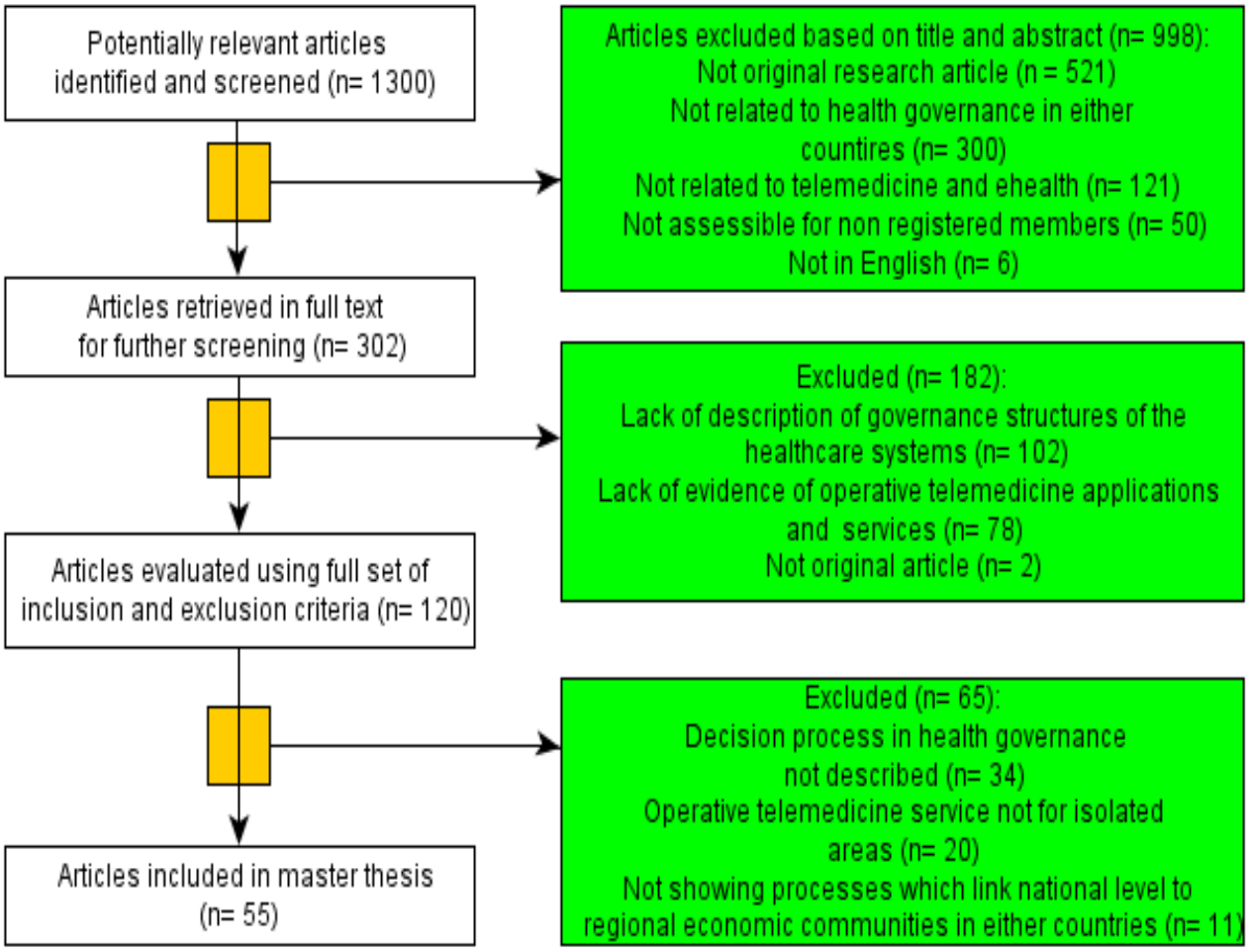

Figure 7: Selection Process of Articles Included in Thesis

3.3 APPROACH TO ANALYSIZING THE DHIS 2

Thirdly, I used an interpretative approach to the analysis of the DHIS system to help understand the socio-technical processes involved introducing it from the perspectives of the various actors involved. This approach makes the assumption that reality is subject to multiple interpretations thus cannot be studied objectively to establish a truth. According to Orlikowski and Baroudi (1991) it aims at analyzing and understanding subjective interpretations and their consequences thus seeking a relativistic, rather than shared understanding of a phenomenon. The healthcare system of Ghana and Nigeria consist of various interconnected hierarchical levels comprising of community and household, district/LGAs, regional/State, and national/Federal levels. This ac-

cording to Kimaro (2006) makes it a complex organization shaped by formal and informal institutions. Thus the interpretative approach helped me gain an in-in-depth understanding of the different formal and informal practices that are constituted in the use, analysis and flow of information from the lower to higher levels as well as the social and organizational context of health workers.

To get a bigger picture of the functionalities of the DHIS and how it could support health governance participated in an implementer's workshop held at the University of Oslo by the HISP team. Routine data from the health facilities using DHIS 2 to generate reports and encourage use of information for action were analyzed.

3.4 STAKEHOLDER INTERVIEWS

To understand the performance and constraints of the published literature used it was necessary to get the practical views of the category of actors involved in health governance and observe how the health system functioned in practice at the various levels. Thus the final method to my research approach is a structured interview of healthcare professionals and decision makers in the health sector of each of the countries to gain more insight in healthcare governance in these countries. The interviews conducted were based on formal and informal appointments (skype, email, telephone, face-to-face) with key respondents such as medical practitioners, biostatisticians, public health specialists, telemedicine specialists and special assistants to the governor. Table 1 represents a summary of the respondents and their work place. None of the interviews however were recorded due to the sensitivity of the questions.

Table 1: Summary of the Interviews Conducted, Broken Up by the Different Organizational Level

Working Level	Type of Respondents	No. of Respondents
National Level (MoH)	Personal Secretary	1
	Consultant Special Grade	1
	Public Health Specialist	1
	Chief Biostatistician	1
	Senior Statistician	1
State Level	Medical Directors	2
	eHealth Consultant	1
District Level	Health managers	2
	Health Secretaries	2
Local Government Area	Medical Doctors	2

The questions were in two sections; the first dealing with health administration and governance and the second related to the implementation of a health service. At the lower level, questions were primarily related to the control they had over funds, budgets and resource allocation; different systems/services through which planning and decisions were made; and the time gap with which a decision was made or implemented. This was to enable me understand the relationships which existed between the systems of healthcare management and political administration. For the set of questions tailored towards the implementation of a healthcare system/service I tried to know the policy binding the implementation of a new system/service and the participation of the different levels of management in the design and implementations.

To conclude with, I have summarized the set of questions for the interview in the next chapter and responses of the interview in the concluding chapter.

CHAPTER FOUR: RESEARCH FINDINGS

The aim of the thesis is to specify requirements and critical success factors of telemedicine solutions for resource-poor settings in Ghana and Nigeria with a focus on such solutions to support health system governance. Review of published evidence on the healthcare situation, healthcare systems and health governance and organization in the health sector has been discussed thoroughly in chapter two and based on the findings, this chapter is to analyze and compare the significant characteristics in the health sector of the two countries. This will provide various insights, ideas and concepts to specify the system requirements in the next chapter.

4.1 USE OF ICT FOR HEALTHCARE DELIVERY IN GHANA

Health Metrics Network (HMN) (2009) has assessed data generated from routine and non routine health information system in Ghana. They note that the national health information system does not have the capacity to provide adequate information for their assessment of the performance, monitoring and evaluation of Ghana health service. Some strengths and weaknesses are identified in the assessment of the Ghana Health Information system and various recommendations are made for further developments. Also various hindrances to the effective and long term use of information and IT in the Ghanaian health sector as discussed in the literature review such as the lack of capacity to gather and process health statistics to target health spending and resources, the shortage of healthcare professionals, weak referral systems among others confirms HMN's assessments.

Thus in supporting the development of a national HIS in Ghana establishing a national coordinating mechanism that brings together all key constituencies in health information such as the MOH, GHS, Ghana Statistical Services, research and academic bodies and disease-specific health programmes among others are some key recommendations. In line with these recommendations therefore the DHIS 2 is a system, which can support national level health information currently in Ghana, and thus examining the functionality the software has to support health governance will be discussed in the next chapters. Generally however in the case of Ghana, which has a national coordinating policy unlike Nigeria, using the DHIS 2 to implement an integrated solution is highly recommendable. This implies that the use of the software to aggregate health statistics at all levels of the Ghanaian health system from national level to district and communi-

ty level should be encouraged. The information infrastructure in Ghana thus should be flexible and easy to adapt to new unspecified requirements, applications and services of organization systems. The heterogeneity by any information infrastructure is noted by various researchers (Monteiro and Hanseth. 1995; Ciborra et al. 2000) as making it more than just 'pure' technology but rather a heterogeneous socio-technical network. With respect to the functionality of the DHIS 2, its flexibility and scalability is noteworthy.

Also HMN (2009) used six components of their framework for further assessment of the Ghanaian health information system. They included Resources, Indicators, Data Sources, Data Management, Information Product, and Dissemination and Use. Some of their main findings were that multiple information systems existed in the health sector (see Table 1), which did not communicate with each other. The existence of dual healthcare delivery system, which I mention in the literature review, is one contributing factor.
They also mention that the MoH had not established formal links to information sources outside the health sector; as such the overall performance of HIS was dependent on the abilities of individual managers rather than cooperate needs. In the national level, there was no national plan and national data repository making the policy and legal framework for the health information system weak. Lastly individuals with advanced skills in health information are very few and districts do not have formally designated health information officers. Thus human resources availability and capacity at all levels are low.

In addition to this the HMIS of Ghana information in the health sector is scattered due to the way the sector functions. There exist several service delivery points and management setups with several transaction points. These points are found at different levels, which may belong to the public, quasi government or privately owned (see Figure 3). The diversity of participants in the health industry as well as the complexity in their relationships with each other is noted to frustrate the adoption of a common standard across the sector to help the collaboration of data relevant to health developments (HMN 2009).
Table 2 depicts the architecture and system components of the HMIS.

Table 2: Health Management Information System Components and Functions
(Source: Adapted from Health Metrics Network 2009)

System Components	System Functions
1. Health Sector Administration and management system	-Policy planning, monitoring, evaluation -Resource management
2. MOH Administration management and management system	-Local administration management -Information management
3. Sector wide health information management system	-Verification -Validation -Dissemination
4. Centralized health service support system	-Public health curative services -Surveillance -Monitoring and evaluation -Drugs and Supplies Logistics -Information Management
5. Hospitals and Clinics System	-Clinical Service -Local administration and management
6. Agencies and relevant organization system	-Agency and Organization operations -Local administration management -Information management

From the table above for instance one can deduce that the system function "Local administration management" for instance is performed by more than one system component (Agencies and relevant organization system, hospitals and clinics systems and health sector administration and management system).

4.2 USE OF ICT FOR HEALTHCARE DELIVERY IN NIGERIA

Taking the Nigerian HIS for instance, although they have a well-crafted national HIS policy, there are significant divergences between policy provisions and actual practice. For example, there is a lack of clarity on responsibility for provision (printing and supply) of forms results in

frequent stock-outs of essential reporting supplies at LGA, health facilities, and health post levels and therefore impacts reporting rates and data availability. Although the NHIS provides for one harmonized reporting form for all program increasing data demands of international donors combined with poor oversight results in additional program specific forms being deployed at the facility level further weakens the system (USAID 2009).

Moreover, it is noteworthy that the FMOH has under-funded HIS activities. This is because although the government professes a strong interest in evidence-based decision making, as reflected by the creation of departments of planning, research, and statistics in all government ministries, there is insufficient resource allocation for HIS activities. This is evidenced by the frequent, recurrent stock-outs of reporting forms, uneven availability of basic ICT equipment at the lower levels of the system, weak capacity at the sub-state level to collect and utilize health data, lack of coordination of HIS activities at the central level, lack of a data-use culture (information requests are most often ad hoc), and non-alignment of policy and practice adversely affect production and use of health information.

Several other trends are discernible in the Nigerian HIS environment. This however has not been the case in the 1960s and 1970s until the creation of Parastatal Health Organizations such as the National Primary Health Care Development Authority (NPHCDA) and the National AIDS Control Agency (NACA), combined with the emergence of vertical disease control programs (i.e., polio, yellow fever, sentinel surveillance, expanded program on immunization, National Contraceptive Logistic Management System, etc.). All these weakens the HIS because each of these structures established separate information systems, with varying success and this is similar to the case of Ghana (USAID 2009). Thus the information system here in Nigeria should also be flexible and easy to adapt to new unspecified requirements, applications and services of organization systems.

The society of Telemedicine and e-Health in Nigeria drafts a policy recommendation in transforming the healthcare situation. They note opportunities for Telemedicine and eHealth during a conference themed “Deploying eHealth tools and services in the Nigerian Health System: Role of mHealth” held in lagos September 20009. However some existing problems to the successful eHealth solutions include the lack of policy, public funding, reimbursement, licensing provider, fear of malpractice among others (Society for Telemedicine and eHealth in Nigeria 2009). Clear-

ly governance of health is a hindrance to the power of ICT transforming health sectors in Nigeria. In view of the stated problems various recommendations are made. They include the formulation of policy by Federal Government to facilitate telemedicine implementations; involvement of all stakeholders in Public, Private, Academia, NGOs to telemedicine implementations; establishment of a coordinating mechanism that creates an enabling environment for the sustenance of telemedicine and ehealth; promotion of government advocacy at all levels of government to get everyone involved in the implementation of eHealth policies; and harmonization of various existing telemedicine and eHealth officers in government ministries, agencies, etc.

4.3 STRATEGIES FOR DEVELOPING AND INTEGRATING HEALTH INFORMATION SYSTEMS IN GHANA AND NIGERIA

In the literature review (Chapter 2) governance of health systems in Ghana and Nigeria is explored in terms of decision-making, financing and accountability. This reveals the need to establish working HISs in these countries to support health management. However current reporting systems for administrative positions in these countries are disintegrated and heterogeneous. Hyder and colleagues (2007) confirms that health system faces a lot of design challenges as a proportion of health system activities, significant in certain countries take place outside formal rules and national legal frameworks. In such situations it is difficult to reach actors involved or agents that influence them. Also there lack of timely and comprehensive routine health information in the public sector which makes it difficult to access formal and informal private providers (Mackintosh et al. 2005). This makes it difficult for information relevant to government issues reach national or public sector actors.

The DHIS is an example of a system that may to an extent support governance of healthcare and eHealth services in resource-poor settings. In Ghana and Nigeria, the system is hoped to further strengthen health governance and information management systems at the district level and LGA levels respectively. A main finding from the evidence gathered is that the development of ICT capacity and DHIS at the district level and LGA needs to be an integrated effort across the health sector in these two countries.

The thesis explored the following structured questions and the response from these questions is summarized in the conclusion chapter:

- What kinds of health decisions come from the higher authority levels (e.g. Governor of State, Executive Council, Ministry of Health (MoH), Hospital Management Board (HMB), etc.)?
- How is the decision communicated/transmitted (e.g. spoken, written, telephone, etc.)?
- How long does it take to make typical decisions of different complexity and different financial or other, and how long does it to implement the decision after it has been made?
- In budgetary, resource allocation and use of funds, are there tasks that must be approved by higher authorities?
- If YES, what specifically are these tasks?
- How long does it take to provide fund and allocate resources?
- Do the lower authorities have the power to influence this process? …….. YES/NO
- Are there any administrative conflicts or barriers between the levels of healthcare (e.g. Local Government Area (LGA), District Administration, MoH, HMB, Primary Health Care (PHC), etc.)? …… YES/NO
- If YES, what are these?
- How in your opinion could these conflicts be resolved?
- Is there any special policy with regards to the implementation of new health services or health ICT (e.g. telemedicine and eHealth solutions, health management Information Systems, etc.)?
- If YES what does the policy say?
- How are the various levels of health management involved in this policy?
- What procedure must be followed to make a new health service operate at all levels of healthcare system?
- Which government authority approves such a process?
- Where does the process begin (e.g. MoH, Govenor, etc.)?
- Do you think the implementation of a State Health Information System/ District Health Information System is important for your country's healthcare system?

- Do you have any further comments with regard to health system governance in your country?

These selected questions on health system governance in Nigeria and Ghana is to reveal how health information systems could support PHC. Since PHC is the main strategy to extend the health services to the most peripheral areas in a country (WHO 1978) the district health model will be used to organize primary health services. This is regarded by various researchers (Amonoo-Lartsen et al. 1984; Tarimo et al. 1989; Newell 1989) as the most effective way to organize primary health services.

CHAPTER FIVE: REQUIREMENT SPECIFICATION

The three main requirements of the study include:

- UML-based modeling of the governance structure of the healthcare systems in Ghana and Nigeria, as well as the processes that link the national level to the level of the Regional Economic Community (REC).
- Requirements analysis using the UML-modeling of processes and use cases, as well as international requirement specification standards for software development.
- Analysis of the open source DHIS 2 developed by IFI in Oslo and collaborators.

My requirement specification uses the Volere Requirements Specification Template (Robertson et al. 2006) as the primary source for my analysis in this chapter. Other requirements I have utilized for the analysis of the DHIS 2 is taken from the DHIS 2 user documentation manual [4]. Finally, personal research work and information obtained from interactions with "resource persons" have added to the documentations of the requirement specification phase.

5.1 FUNCTIONAL REQUIREMENTS

This section involves the functional model of the governance structure of the health systems in Ghana and Nigeria.

From the overview of the health system in Ghana in Figure 9, the administrative structure of health delivery by the Ministry of Health is hierarchical and delivers health service from the capital city (Accra) to the regions, districts, sub-districts, and community. These services are delivered through a network of facilities, with health centers and district hospitals providing primary health care services, the regional hospitals providing secondary health care, and teaching hospitals providing tertiary services. This hierarchical structure I have depicted in the Figure 8.

4 http://dhis2.org/documentation

5.1.1 Functional Model of the Ghana Health Structure

I. National Level: Ghana Health Service (GHS)

The Ghana Health Service (GHS) is the public service provider of healthcare in Ghana. It shall implement national policies under the control of the Minister for Health through the Ghana Health Service Council. To ensure the implementation of its policies, it shall submit to the Minister recommendations for health care delivery policies and programmes, promote collaboration between the Ministry of Health, Teaching Hospitals and the Service and advise the Minister on posts in the Service and other matters that the Minister may request. It shall also increase access to good quality health services and manage prudently the resources available for the provision of health services.

II. Regional Level: Regional Directors of Health Services

The regional health services shall be headed by 10 Regional Directors of Health Services and supported by regional health committees and management teams. They shall consist of some Public Health Unit, Clinical Care Unit, Regional Hospitals, Training Institutions, etc. They shall offer curative services and public health services at the regional hospitals. Some of the public health services shall include the operation of the three types of insurance in Ghana namely the District-Wide (Public) Mutual Health Insurance schemes in all of the country's 110 districts, private mutual insurance schemes and private commercial insurance schemes. The regional health Directorate shall also provide supervision and management support to the districts and sub-districts within each of the 10 regions.

III. District Level: District Directors of Health Services

The district health services shall be supported by District Health committees. They shall offer curative services at the district health hospitals which will mostly consist of mission of faith-based hospitals. With the help of the District Health Management Team (DHMT) and Public Health Unit in the district hospitals, they shall offer preventive care such as surgery not available at health centers, laboratory and other techniques appropriate to the medical, surgical, and outpatient activities of the district hospital.

IV. Sub-district level

The sub-district level shall offer curative and preventive services. However, this shall be provided by health centers and as a form of out-reach services to the communities under a sub-district.

V. Community level

Through the introduction of the Community-based Health Planning and Services (CHPS), the community and household level shall provide basic preventive and curative services for minor ailments. They shall also consist of traditional healers and traditional birth attendants.

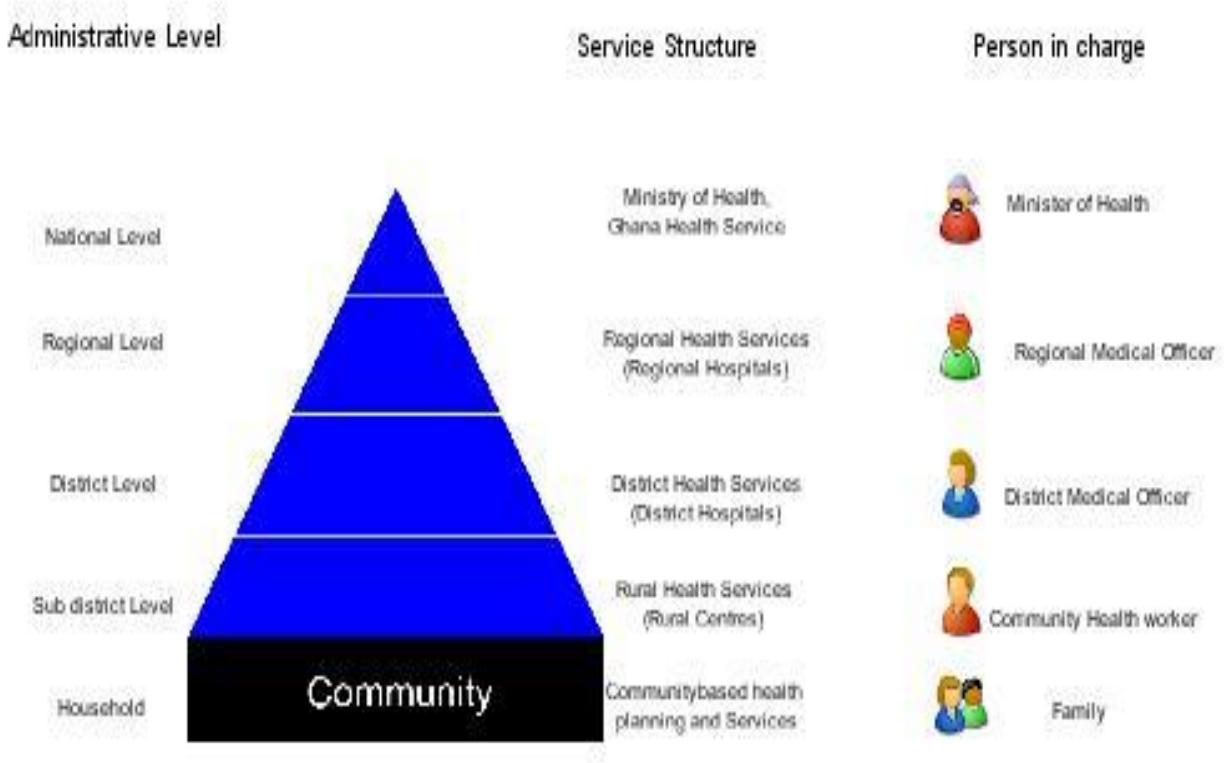

Figure 8: Organizational Pyramid of Ghanaian Health Services Structure

From the figure above, services that are provided at the community, sub-district and district levels all form primary health services which is delivered in the context of a district health system. Outreach programmes and CHPs programmes from sub-districts delivers services to the com-

munities. In addition traditional birth attendants, chemical sellers and itinerant herbalists also play a role in the delivery of services to communities.

In order to systematically enumerate the functional requirements of the structure of Ghana, I have utilized the table below to illustrate the stakeholder summary of the health system. This depicts the specific functionalities of each of these levels in the health sector in terms of service delivery.

Table 3: Stakeholder Summary of the Health System of Ghana

Stakeholder category	Role in healthcare	Action needed
Minister of Health	Policy formulation, coordination, health financing and implementation of national policies	Regulations of activities of stakeholders
Regional Health Administration	Curative and Public health services at regional hospitals	Provides supervision and management support to the districts and sub-districts within each region. Second and third point of contact
District Health Administration	Curative services at district level	Provides supervision and management support to the sub-districts. First and second point of contact on referral
Sub-district Administrative Team	Basic curative, preventive and reproductive health services	First point of contact for clients
Community health posts	Basic prevention and information	First point of contact

The stakeholder summary of the health system in Ghana reveals some of the characteristics of the Ghanaian health information system. As mentioned in Figure 8 there are five levels of health services in Ghana which has been displayed in the table above.

The Minister of Health regulates all the activities of the other levels to enable the development of policies and standards for healthcare delivery. This is achieved through sector-wide formation, evaluation and monitoring of policies, initiating legislation and the promotion of inter-sectoral collaboration in support of health objectives.

Regional health administration provides supervision and management support to district and sub-district level by performing strategic planning of needs assessment, trend analysis, the provision of in-service training and technical support. This level is also the main source of information for the national level.

District health administration provides operational planning and programme implementation organized under clinical, public health and administrative unit. They also generate specific information on financial, human resource, drugs and supplies, transport, estate and equipment.

Sub-district health administration team provides supervision, management, clinical, maternity and public health services within sub-districts.

Community health posts coordinate its activities with sub-districts by providing the team with information on health needs, service delivery, coverage and resource availability. Services however provided to the communities are delivered through outreach programmes from the sub-districts and through the CHPS programme. They also receive services from traditional birth attendants, chemical sellers and itinerant herbalists (Ministry of Health 2008).

The decision-making process to the implementation of a new health service in Ghana with reference to the table above lies in the hands of the Ministry of health. The different levels of the governance process in the Ghana healthcare system are depicted in Figure 9.

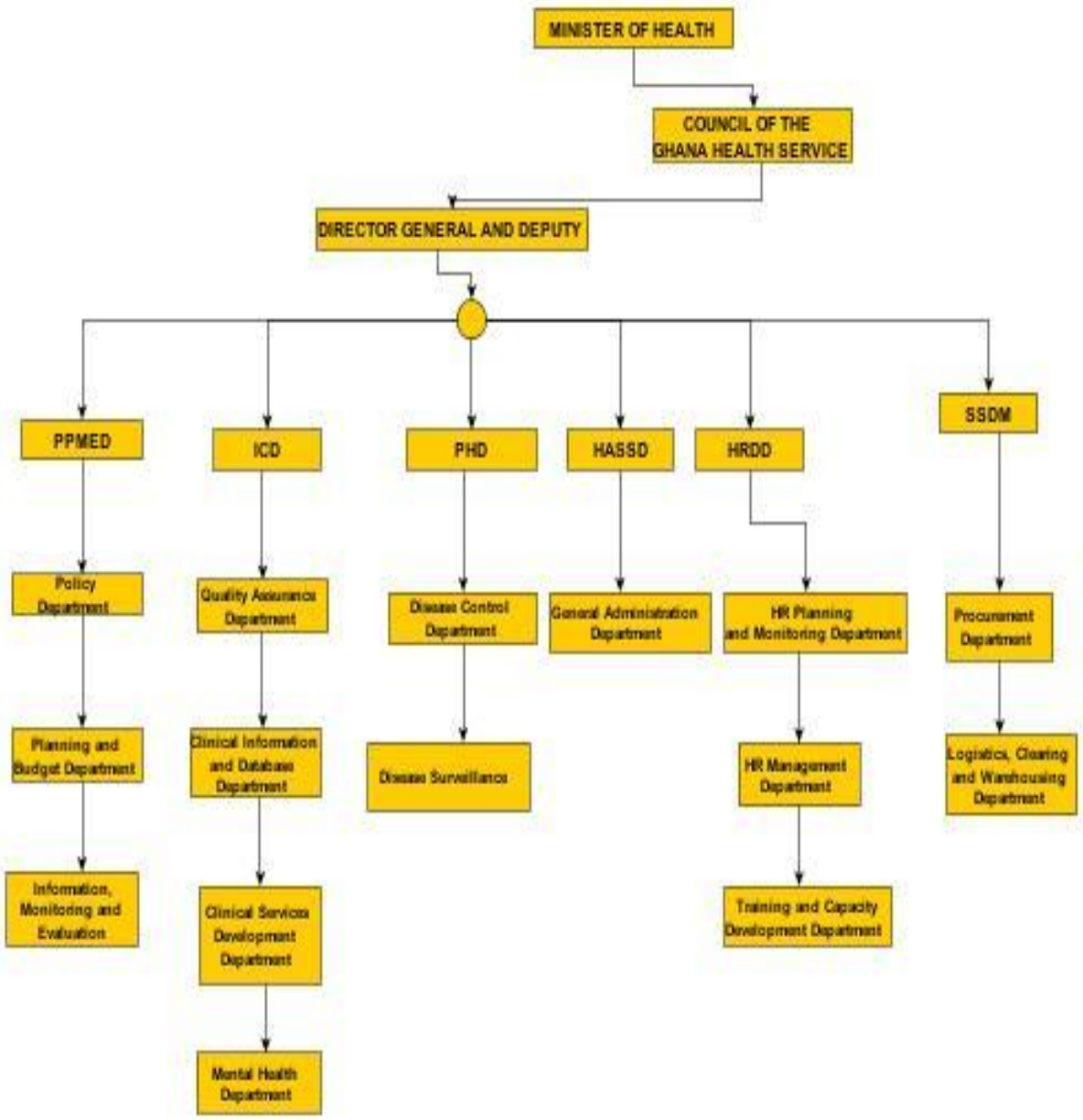

Figure 9: The Process Map for Governing the Healthcare System of Ghana

Source: Adapted from Ghana Health Service Website [5]

5 http://www.ghanahealthservice.org/index.php

I Policy, Planning, Monitoring and Evaluation Division (PPMED)

In **Figure 9**, PPMED in the GHS is headed by a Director who is the head of the division and an immediate superior who is the Director General. It has the following functions:

- It sees to the development of comprehensive operational policies, sustainable strategic plans, systems, programmes, and budgets which will cover all activities of the GHS and its partners.
- It ensures the development of an integrated Health Information System for effective decision-making performance monitoring.
- It has a purpose of assessing the operational effectiveness of government programmes, it designs and apply monitoring and evaluation.
- Finally it has a responsibility of supporting the development of new international and local products for the advancement of the objectives of the GHS.

These functions are achieved with the help of three defined departments as I have shown in **Figure 9**: Policy Department, Planning and Budget Department, Information, Monitoring and Evaluation Department.

Policy Planning: The Policy planning division has the function of collaborating with the Ministry to identify donors for the service, participating in the development of policies to govern collaboration with bilateral, multilateral and nongovernmental agencies, assessing and monitoring the progress of the government implemented policies, and to ensure easy flow of information about their policies to current and prospective donors.

Planning and Budget Department: It is the responsibility of this department to coordinate and prepare all kinds of (short, medium and long term) plans and budgets for all the levels in the GHS. Specifically they analyze trends in the allocation and disbursement of Ghana funds, synthesize the plans into an integrated GHS development plan review and develop health-financing strategies, and provide technical support for all divisions and programmes to develop proposals for funding and other resource mobilization.

Information, Monitoring and Evaluation Department: This department coordinates the development of systems for data collection, storage and analysis of the data at all the levels; coor-

dinates the publication of documents which relates to GHS activities and ensure they are properly documented for effective decision making; and assists other directorates in the setting up of a health and management information system for planning, monitoring and evaluation.

II Institutional Care Division (ICD)

The ICD is generally responsible for responsible for developing, supporting, monitoring and reviewing comprehensive clinical care services. It has various departments supporting its functionality.

Quality Assurance Department: It is the responsibility of this department to improve client-focused services, patient and staff safety, clinical practice and management systems. This is to be supported by developing and implementing quality assurance, clinical governance, infection prevention, control systems, standards and protocols in all health facilities for effective and efficient service delivery.

Clinical Information and Database Management Department: The development and implementation of clinical information management systems is the sole responsibility of this department. Specifically it monitors collects and analysis information from clinical services and makes it available to management, other divisions and stakeholders.

Clinical Services Development Department: This department coordinates, supervises, monitors and develops clinical proficiency in all clinical service areas within GHS. It also assesses institutional needs to ensure such needs are consistent with emerging national and institutional needs.

Mental health Department: It coordinates, supervises, monitors and develops facility and community based mental health services within GHS and ensures equipment needs are consistent with national and international standards.

III Public Health Division (PHD)

The PHD provides services such as maternal, adolescent, nutrition, child and reproductive health, technical support for regional public health, review of public health intervention financing and resource allocation strategies, etc. It also prepares projects and programs for local and international financing which is consistent with Sector- Wide or Multi-Sector approach. Disease Control and Disease Surveillance Departments supports the PHD functionalities.

Disease Control Department: The reviewing of public health intervention financing and resource allocation strategies is conducted by this department to see its impact on health access, quality and efficiency to consumers. The department also provides support, monitors and evaluates surveillance and disease control systems, which they have implemented for diseases (communicable and non communicable) to ensure consistency with national, bilateral and international expectations.

Disease Surveillance Department: The department is responsible for developing surveillance and disease control systems for communicable and non-communicable diseases to be implemented by the disease control department. It also supports this department with execution of its functionalities.

IV Health Administration and Support Service Division (HASSD)

HASSD ensures that there is availability of support services for delivery of GHS functions, provision and maintenance of transport, facilities and equipment and coordinates information for the design of policies and strategies. It works with the General Administrative Department with outlined functionality below:

General Administration Department: Develops contemporary administrative systems, efficient record management systems, modern and efficient security systems in collaboration with other divisions and the different regions. It also liaises with the Attorney General department to resolve day-to-day administrative legal issues.

V Human Resource Division (HRDD)

Human resource strategies for GHS are developed by this department to facilitate recruitment, training and manpower development. It also has the duty of ensuring that continuous professional development of GHS staff is maintained and develops appropriate scheme and conditions of service, which is consistent with current industry standards. The following departments are associated with this division:

HR Planning and Monitoring: It is the responsibility of this department to sustain human resource needs and capacity assessments, GHS norms, information and data base management, etc.

HR Management Department: Ensures the development, implementation and application of HR strategies. Also assist with staff recruitment, deployment, promotion, retirement, etc.

Training and Capacity Development Department: Responsible for developing in-service training of staff and administering and managing bonds in the HR Department.

VI Supplies, Stores and Drugs Management (SSDM)

This division ensures the optimal availability of drugs and equipment throughout the facilities of GHS. It also develops policies, plans, programmes and budgets to cover the procurement and supply of drugs and equipment needs within GHS. Departments include:

Procurement Department: This department serves as a liaison office with the government and international procurement agencies to develop consistent long, medium and annual procurement plan within GHS.

Logistics, Clearing and Warehousing Department: Functions of this department include controlling inventory, expediting payments of contracts awarded, procurement, logistics and warehousing, port clearance of commodities, monitoring the inflow of health sector commodities which is procured offshore as well as any contracts awarded, etc.

From Figure 10 an example of the decision-making processes that are happening on the healthcare system structure in terms of the development of a Community-based Health Planning and Service (CHPS) is illustrated below. As mentioned in chapter 2, the CHPS is a national health

policy initiative that aims to reduce barriers to geographical access to health (Nyonator et al. 2005) and this could be likened to a telemedicine solution. Also over a period of 2 years 104 out of 112 districts in Ghana has started CHPS.

Process: 1	**Process name:** Implementation mechanism
Brief description: The process for establishing a model for community health service accountability, service quality and administrative control that are integrated into traditional institutions of village governance	
Actors: Community members, Frontline service workers, Supervisors, District leaders	
Frequency of execution: Expected that delivery of quality health services will reach the most disadvantaged individuals. This will transform the Ghana national primary healthcare delivery system	
Primary path: 1. Preliminary planning 2. Community entry 3. Creating community health compounds 4. Posting Community Health Officers to community health compounds 5. Procuring essential equipments 6. Deploying volunteers	
Alternative path: none	
Exceptions: none	
Change record: Created by Joanna Adobea Dawson, 1 April 2011	

Figure 10: Definition of Process for the Implementation of the Ghana CHPS Initiative

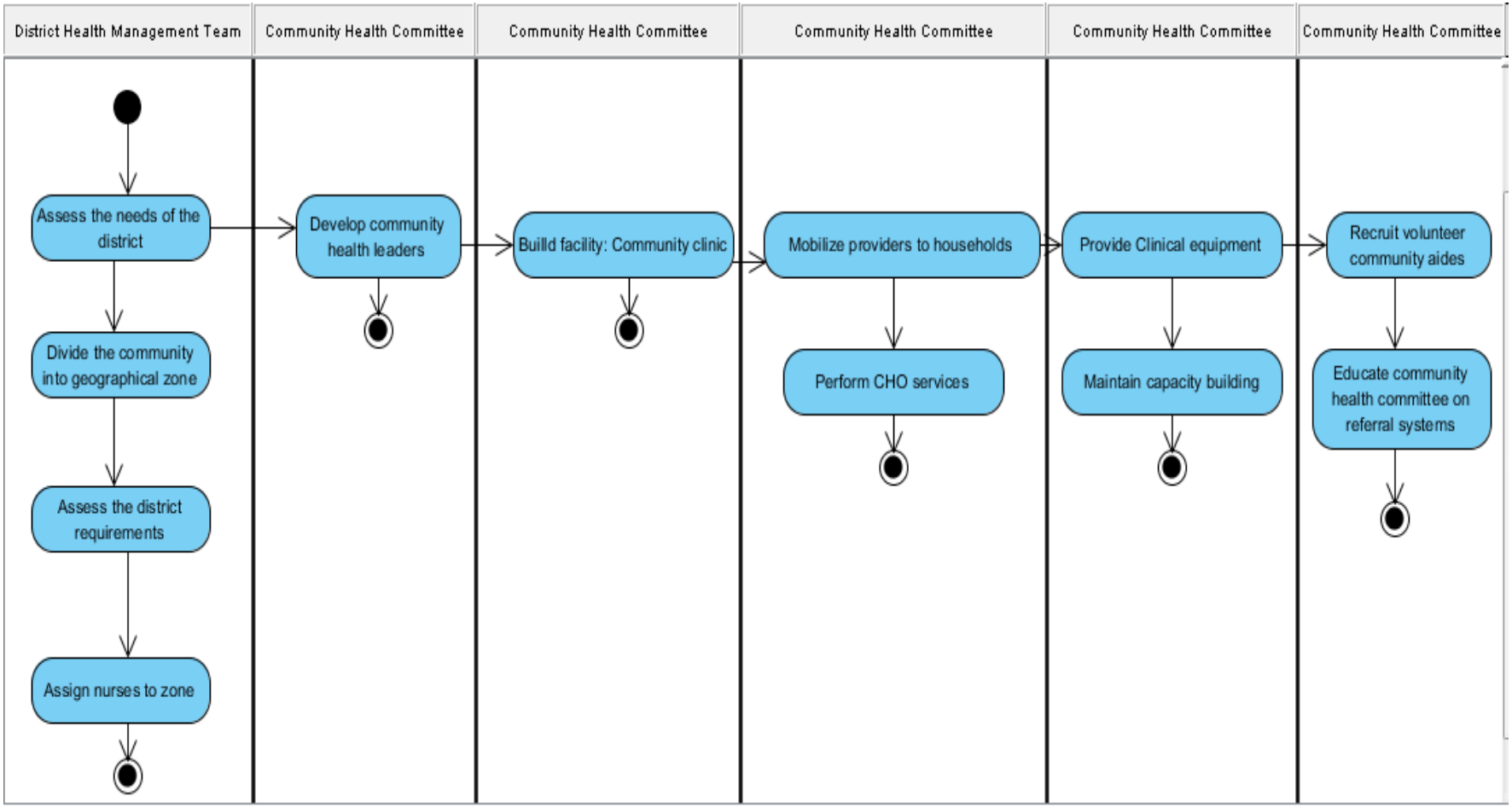

Figure 11: UML Activity Diagram for the Implementation Phase of CHPS

5.1.2 Functional Model of the Nigeria Health Structure

I Federal Level: Federal Government

The Federal government is responsible for the formation of policy, coordination, strategic guidance, supervision, monitoring and evaluation across the three tiers of government. This government is in charge of the delivery of tertiary health services, which is the highest level of health services in the country. It provides specialized health care services and full-fledged technology capacities at tertiary health institutions such as the University teaching hospitals and Federal medical centres, offers operational responsibility for disease surveillance, essential drugs supply and vaccine management.

II. State Level: State Government

The State government is responsible for the operation of secondary health facilities such as general hospitals and comprehensive health centres. These secondary health facilities provide general medical laboratory services and specialized health services such as surgery, obstetrics, gynecology and pediatrics. Facilities here serve as referral centres for primary health care facilities and each district, LGA or zone is expected to have at least one secondary-level facility. The state is responsible for training nurses, midwives and community health extension workers (CHEWs). The state government supervises the LGAs in their financial and management roles of PHC.

III. Local Level: Local Government Area (LGA)

The LGAs provide the essential elements of PHC by offering basic health services and managing the PHC facilities. This facility is usually the first contact with the health system and includes health centers and clinics, dispensaries, and health posts. They offer preventive, promotive, curative and pre-referral care and is typically staffed by nurses, Community Health Officers (CHOs), CHEWs, junior CHEWs and environmental health officers.

IV. Private Sector: Private Health Care

Private sector plays a large role in the provision of health services in Nigeria. Together with FBO facilities they perform their functionalities. They include physician practices, maternity homes, traditional medicine practitioners, informal medicine vendors, clinics and hospitals providing mostly preventive and health promotion services.

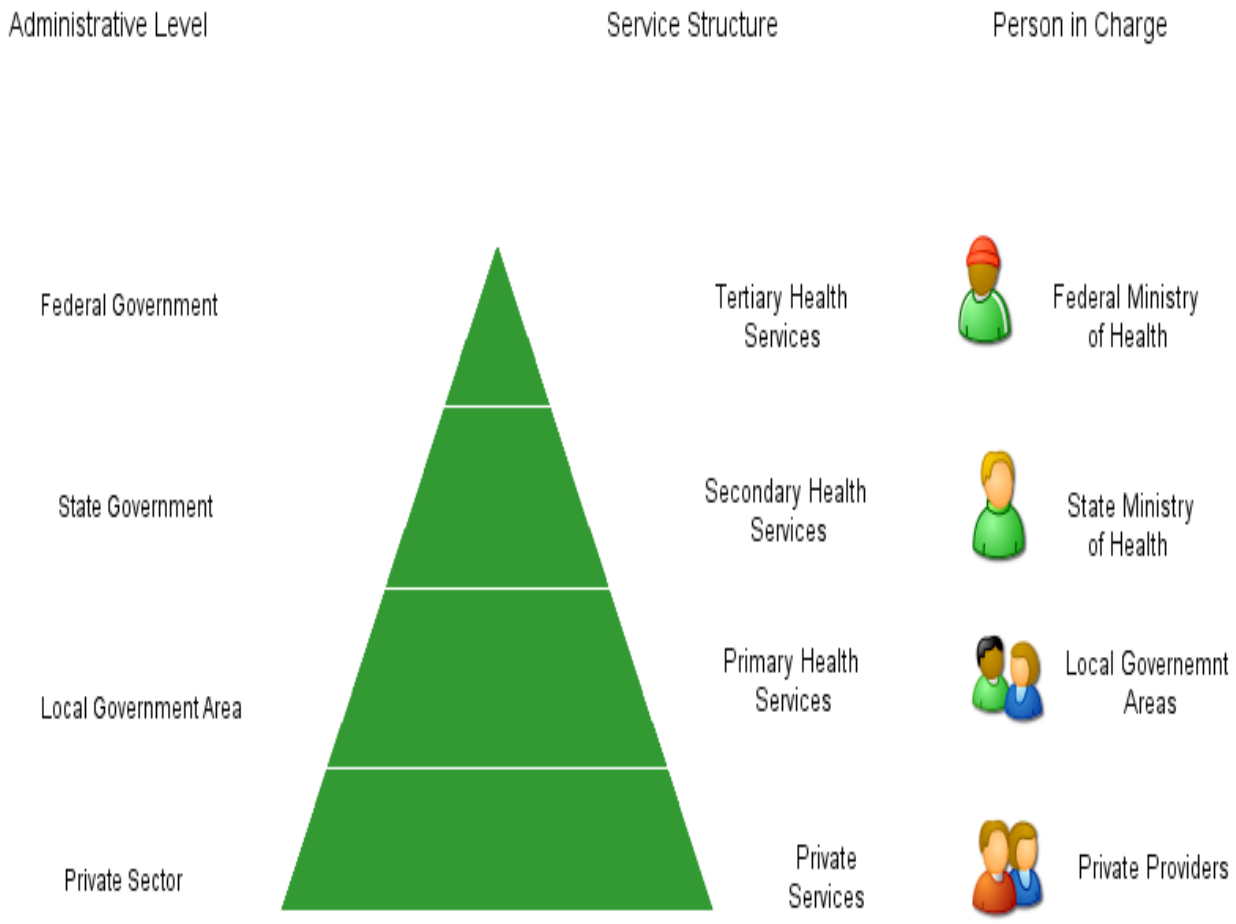

Figure 12: Organizational Pyramid of the Nigerian Health Services Structure

From the figure above, decentralized health structures of the federal government are in the states, and those of the states are in the LGAs. Some states however build and operate tertiary facilities/specialist hospitals.

As stated in section 2.3.1, the constitution of Nigeria is silent on the different roles of the different levels of government in health service provision and this make me unable to comment on the stakeholder summary of the health system in Nigeria as I have for the Ghana health system.

Also, the process map for governing the healthcare of Nigeria I am unable to comment because of the lack of clearly defined roles and responsibilities, inadequate political commitment especially at lower levels, poor coordination between various actors, lack of transparency and poor accountability (The National Strategic Health Development Plan Framework 2009). In addition, Health Sector Reform Programme (2005) and past health policies and programmes has aimed at enhancing leadership and governance for health but there is lack of strategic direction and inefficient health care delivery system

Consequently PHC which forms the bedrock of the Nigerian national health system is in a prostrate state because of poor political will, gross under funding, lack of capacity at the LGA level, which is the main implementing body (WHO 2000). Private sector (major contributor to healthcare delivery) is poorly regulated due to weak capacity of the state government to set standards and ensure compliance. Thus I am unable give examples of decision-making processes happening on the healthcare system of Nigeria as I have done in the case of Ghana.

5.2 ANALYSIS OF THE DISTRICT HEALTH INFORMATION SYSTEM (DHIS) 2

The section details the functional aspects of the DHIS 2 developed by IFI in Oslo and collaborators.

I. Data entry module: Registers data manually in the DHIS 2 database

II. Custom data quality checks: Sets up custom expressions and run checks that validate data to improve the accuracy and reliability of the data in the system

III. Indicator definitions: Indicators are flexible formulas based on captured data entities and provides informative values for reports

IV. Report tables: Configurable table outputs of data showing raw/ aggregated and indicator data for quick view of data

V. Chart with trend lines: Three-dimensional integrated bar and line charts with trend-lines based on indicator data

VI. Dash board with live charts: Gives an overview of your most important charts and quick access to your favorite reports and GIS views

VII. GIS thematic map: Integrated GIS client with thematic mapping. Lets you define custom legend sets and save favorite map views

IX. User management and access control: Control who has access to what using a fine-grained privilege system for user roles and users.

5.2.1 Event Listing and Use Cases

In order to systematically enumerate the functional requirements, I make use of an event list that consists of all activities that take place in the usage of the DHIS 2 as well as possible inputs and outputs in the system.

Table 4: Event List

Event Name	**Input/Output**	**Summary**
Enter Data	Aggregated patient data	Registers data for organization unit, a period and a set data elements
Check data quality	Customization of data	Run checks on customized data through validation rules for analysis
Define indicators	Indicator type e.g. %	Provides informative values for reports
Run Report Table	Raw, aggregated or indicator data	Generates basic report export-able to pdf, excel, CSV, Jas-per, etc
Generate chart with trend lines	Indicator values	Generate three-dimensional integrated bar and line charts with trend-lines based on indi-cator data
Generate Dashboard	Live Charts	Gives an overview of the most important charts and quick access to favorite reports and GIS views
Generate GIS thematic map	Thematic map	Customizes reports based on report tables visualized as charts and tables
Check user management and access control	User personal information	Manages who has access to what using a fine-grained pri-vilege system for user roles and users

The use case diagram below depicts the DHIS 2 software functionalities and possible interactions with the administrative level of the governance structure of Ghana health care (Figure 8) at each level.

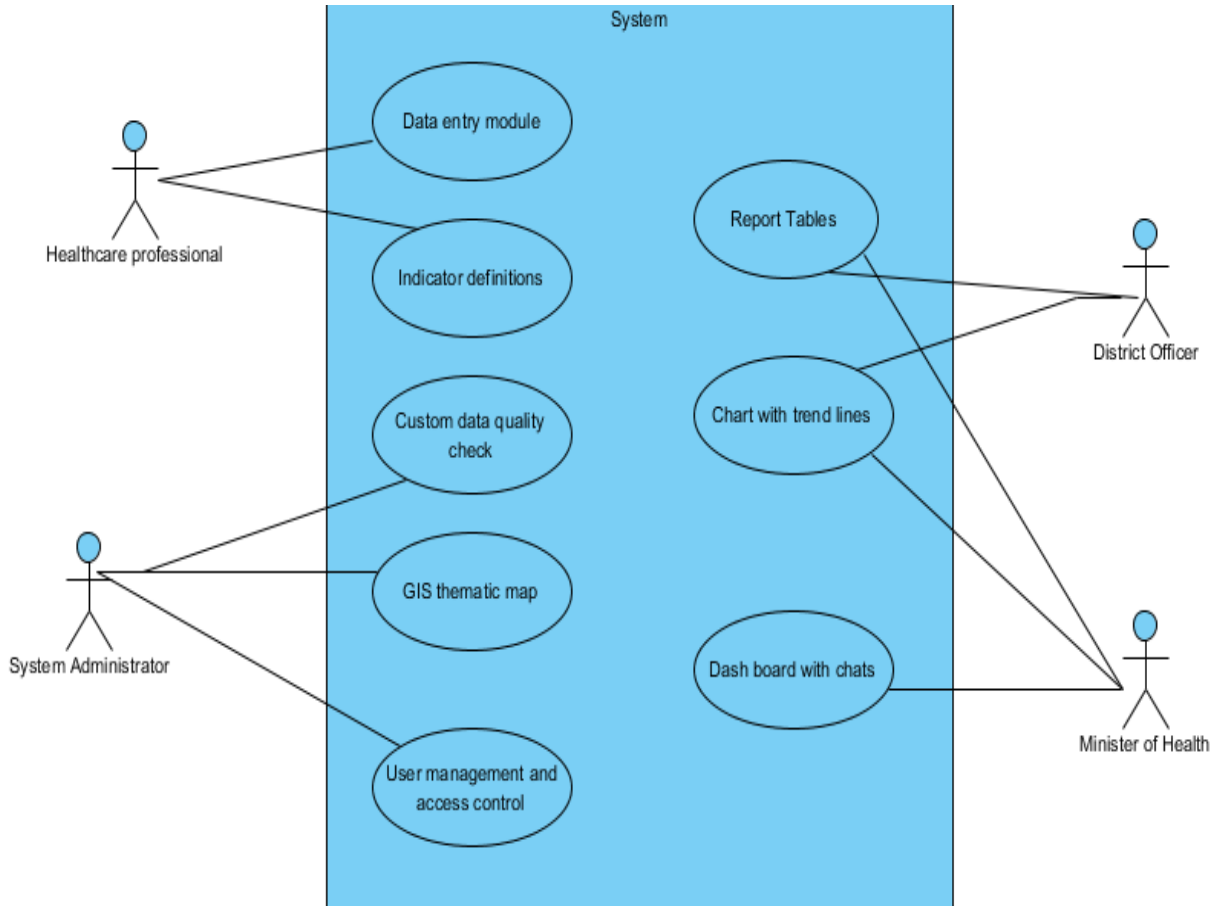

Figure 13: UML Use Case Diagram for the DHIS 2 Framework

The UML diagram in Figure 13 is a visual aid for the boundaries and functionalities of the system. A description of the events is given in Table 4 as formal and detailed descriptive requirements.

Use Case 1: Data entry module (Actor: Healthcare professional)

1. Choose services
2. Click on data entry option on drop down menu

3. Locate organization unit
4. Select data set from drop down list
5. Select period to register data for
6. Choose data entry form type
7. Enter data
8. Run validation check
9. Click on the complete button to register form as complete

Use Case 2: Custom data quality check (Actor: System Administrator)

1. Choose services
2. Select Data Quality menu
3. Select validation rule analysis
4. Enter start and end date for which data should be included in analysis
5. Choose between including all validation rules or all validation rules from a single group
6. Choose between including the selected organization unit only or the selected organization unit with all children in the analysis
7. Select organization unit
8. Click validate

Use Case 3: Indicator definitions (Actor: Healthcare professional)

1. Choose maintenance
2. Select data elements and indicators
3. Perform add, delete, modify and view extra information operation

Use Case 4: Report tables (Actor: Minister of Health; District Officer)

1. Select Services
2. Click Reports menu
3. Choose Report Table
4. Click on the Green and white arrow which is the first symbol in the operations list based on report you want to view
5. Click the button Get report to generate an html view of report

6. Export report to desired downloading format by clicking Excel, CSV, PDF, Jasper, JRXML

Use Case 5: Chart with trend lines (Actor: Minister of Health; District Officer)

1. Select Services
2. Click Reports menu
3. Choose Charts
4. Click on the Green and white arrow which is the first symbol in the operations list based on chart you want to view
5. Chart is displayed in a new view
6. Save chart as image by clicking on chart and selecting Save As
7. Store chart on local computer for later use

Use Case 6: Dashboard with live charts (Actor: Minister of Health)

1. Long on to system
2. View dashboard

Use Case 7: GIS thematic map (Actor: System Administrator)

1. Select service
2. Click GIS menu
3. On the polygon layer panel select desired indicator/dataelement-period-map combination in the left side menu
4. Click either boundary or level to open organization unit selection window
5. Organization units automatically appear on map if database has coordinates for them

Use Case 8: User management and access control (Actor: System Administrator)

1. Select Maintenance
2. Click on user
3. Choose Add new button
4. Enter user details
5. Click on Add to add new user

CHAPTER SIX: RESULTS

The purpose of the thesis is to specify the requirements and critical success factors of telemedicine solutions for Ghana. This is to be achieved by assessing the governance structure of health services in these two countries, and the analysis of the open source DHIS 2, to establish specific situations in healthcare that needs telemedicine intervention. This chapter is to derive requirements for a system capable of supporting governance of healthcare systems in Ghana and Nigeria, identify what of these requirements identified are supported by the existing DHIS 2 and specify necessary extensions of the DHIS 2 to meet the entire set of requirements if possible.

6.1 REQUIREMENTS FOR A SYSTEM THAT WILL SUPPORT HEALTHCARE SYSTEMS

6.1.1 Case of Ghana

Requirement F1: Decentralization of health services and HIS

Decentralization of information management and decision making roles in the health sector to district, sub-district, community and household as compared to the existing centralized hierarchical structures for organizing and managing health related issues including management and use of associated information is one philosophy. Although Ghana has an organized decentralized health system that is functional certain challenges inhibit the effective functionality of the health system which makes it critical to specify some system requirements. This one of the respondents (senior statistician/computer scientist) from my interview confirms and adds that standard procedures need to be put in place to have an organized system.

The decentralization process however according to Rondinelli et al. (1989) requires laws, regulations and directives that clearly outline the relationships between central and local government and administration, the allocations of functions, the authority, roles and duties of officials at the local level and their limitations.

A challenge in primary health care according to Opit (1987) is the analysis and use of information immediately at the same level where it is collected, which is termed “local information to support local action”. Thus in the decentralization philosophy, the local control and empowerment of information at lower levels should be embedded into primary healthcare. A critical look

at the data capture forms from Ghana (see Appendix 2) confirms this analysis as most of the generated forms were obtained from the districts and regions. Also it is known that in the area of health data, lower levels of health services tend to need more detailed data than higher levels to support their day-to-day activities. Braa and Hedberg (2002) give a scenario where a health facility will need a register of local tuberculosis patient to ensure proper treatment of each patient as compared to the district who will need the number and percentage of patients fully cured in their overall management their tuberculosis program and coordination of work between health facilities.

Interestingly the DHIS 2 is designed to be in consonance with the decentralization paradigm the solution. Its input and out output surfaces can be flexibly customized for a specific country's usage. Since it allows a logical database structure to correspond to actual organizational reality, health ministry organizational structures can be easily incorporated accordingly in DHIS 2 for data management, processing and information generation, and reporting.
One principle of the CHPs is that its dissemination activities are incorporated in the district and community levels. Thus these levels are the focus of decentralization of the DHIS 2 and to facilitate local ownership and use of data. This approach is to eliminate the one-way reporting of information from the top down organization structure of the health system in Ghana. This is due to the fact that there is limited amount of supervision and feedback from higher-level authorities which has a potential to discourage analysis and the use of data for local management activities. This raises another requirement, which is discussed in the next paragraph.

Requirement F2: Integration of information infrastructure at all healthcare levels

Secondly many problems emerge from the existing information infrastructure in the healthcare system of Ghana. Each of these levels has different data collection systems, which lead to duplication and omission of key data sets for performance assessment by the government. In addition to this, the public sector solely develops data collection tools for the management of public sector information with minimal or no engagement with other health care providers. This could result in poor coordination of the different levels of health. As the management of primary source

of information goes a long way to affect informed decisions to be made at management level, it is important that inaccuracies in information reporting be tackled. It is thus important that reported health sector information fully and accurately describes health and health systems status of the country.

Below is a summary of the different existing reporting systems in each of the five levels of healthcare in Ghana obtained from the MoH HMN (2008).

Information reporting at community level

A community level has a responsibility of maintaining community health register, which consists of vital events such as birth and deaths and the clinical and public health activities of the Community Health Officer. Every community maintains and regularly updates a register of vital events. A member of the community is appointed by a recognized community leader to compile entries into this register in addition to being the custodian of the register. The community register is then made available to the Sub-district Health Team during the first week preceding ever quarter, through the Community Health Officer or the member of community elect.

It is the responsibility of the Birth and Death registry of the Department to regularly review tools used for vital registration and to ensure that structures for vital registration exist with well trained community members to regulate it.

The Community Health Officer is responsible to compile monthly report based on an approved format to indicate all clinical and public health activities undertaken during the month such as cases seen and treated, cases referred, children immunized and other preventive and health promotive undertaken during the month.

Within each community, there are other providers such as Midwives and Traditional Birth Attendants, Community Based Disease Surveillance Volunteers in addition to a Community Health Officer all of whom report health events to the Sub-district Health Teams.

Information reporting at sub-district level

Sub-districts consist of a health center, clinics and maternity homes, which are both publicly and privately owned, service outreach points, Community Based Health Planning and Services Compounds, Chemical Sellers and Traditional Healers. Sub-district health teams are responsible for

the provision of services here and responsible for the implementation of health programmes in their catchment area.

Every sub-district maintains inventory of all health service providers and drug outlets within their catchment area. This is updated every year. It is the responsibility of the Sub-district health team to appoint a focal person to be responsible for the collation of all the reports. He/she performs data entry and ensures that providers listed in inventory are given necessary tools and well trained in their reporting duties.

Within forty-eight hours of seeing patient all the existing clinics and other service providers complete a notifiable disease form and compile returns based on the agreed format to be submitted to the Sub-District Health Team at the end of every month.

Based on submissions by all service providers, the sub-district health team submits to the District Health Administration weekly report on notifiable diseases and monthly returns.

Information reporting at District level

At the district level, the District Health Administration has the overall responsibility for the performance of health service. Budget and Management Centers exist within each of the district who reports health service performance to the District Health Administration to be analyzed and put together as district reports.

Another reporting functionality of the district level is the analysis of resources distributed, monitoring of programmes implemented, following up on health events and research activities, etc.

The district level is the hub of data collation, storage, and analysis and dissemination activities. It is the first referral point in the health care delivery system provides specialist support to the Sub-districts and other clinics in the district and has a number of privately owned facilities such as pharmacies, laboratories and diagnostic services. It also coordinates the District Mutual Health Funds and operates the National Health Insurance Scheme.

The District health administration keeps inventory of all services provided within the district and updates this every year. Thus service providers submit reports based on agreed formats to the District Health Administration at the end of every month.

A district health officer who is appointed by the District Health Administration maintains a database on all services and services providers, district reports submitted to generate periodic district performance reports.

Information reporting at the Regional Level

The District Health Administration sends reports and information from all Budget and Management Centers within the region to the Regional Health Administration. Each region has a regional health information office managed by a qualified health information officer and supported by a technical team consisting of statisticians, biostatisticians and data managers. This office maintains an electronic repository of all reports submitted to the region to generate periodic regional performance reports.

The office also maintains an inventory of all health providers in the region and updates its information on annual basis.

The office also compiles health information on district by district basis, provides support to facilities at the district level in building capacity for data collection, storage and reporting. It reviews information-gathering activities at the region to improve them.

Information reporting at the National Level

This level maintains a national Data Repository, which acts as a centralized database. At regular intervals, reviews of the standards of health data, coding, reporting and transmission of data are conducted to ensure they are in line with new standards. The need for reporting at this level is driven from the administrative requirements that need to be fulfilled.

With all the different reporting levels, MoH (2008) notes that one major problem is the lack of policies and legislations to protect privacy in the use of health data as well as the lack of a uniform multipurpose data standards to meet the needs of the diverse groups that record and use health information. There is therefore the need to define a robust system capable of using information technology to store and exchange health information.

Some considerations in the use of the DHIS 2 in accordance with Braa et al. (2003) future health information systems requirements which could support the governance of healthcare system in this aspect is that security mechanisms must be put in place to avoid the misuse of patient data by both domestic and foreign governments, business purposes and criminals. Thus one instance is to make patient data non identifiable at the point of data entry. In addition to this security measure, techniques for authenticating requesters of health information, implementing proper access con-

trols and maintaining adequate audit trails for monitoring access to health data but be put in place. The DHIS 2 system already have a functionality which performs user management control checks as a means to control who has access to a specific data.
Also medical and public health concepts, ontologies, terminologies, communication and messaging protocols must be based on Open Standards to bring administration simplifications in terms of decision-making.

6.1.2 Case of Nigeria

Evaluating the quality and performance of PHC systems according to Adindu et al. (2006) depend on the information system's capacity to generate reliable and accurate information, within social, cultural, and economic context. Nigeria runs a federation system, which is highly decentralized with the three tier level of government being autonomous. Thus certain services are reserved for the federal while some are taken up by the states and LGAs (district). This makes it difficult to specify system requirements binding all three levels of government. Responses obtained from interview also reveal the fact that in the health sector of Nigeria there is no special policy with regard to the implementation of a new health ICT. However, they note that the implementation of a State Health Information System is critical to the realization of Nigeria's vision20:2020 in the health sector. Specific system requirements for ICT implementations are discussed in the following section.

Requirement F1: Decentralization of health services and HIS

With reference to the decentralization philosophy discussed for the case of Ghana, pages 71– 72, Nigeria needs this approach to govern their healthcare system. This is due to the fact that as confirmed from stakeholders in the interview, responsibilities of each level of care are not clearly defined; there is no legal backing to administrative functions and responsibilities; and all the three tiers of government work parallel in healthcare governance although they work towards achieving a common goal.

Requirement F3: Clarification of the roles of the levels of governments

There exist a National Health Management Information System (NHMIS) as a management tool for informed decision making at all the levels of government in Nigeria [6]. It also includes a national population and household census, a vital events registry, a disease registry, epidemiological surveillance surveys, community surveys and a financial reporting system (Akpan et al. 2004). This means its stores data obtained from all primary, secondary and tertiary levels of healthcare. Currently this system reports untimely and poor quality data returns. This can be attributed to the fact that roles of the three tiers of government in terms of health governance not being clear. Thus a policy, which clarifies the existing roles of the levels of government, is first and foremost needed.

Requirement F4: Automation of the NMIS using the DHIS software

The NHMIS is the routine data component of Nigeria's health information system. It covers a comprehensive lsit of components such as laboratory, family planning, antenatal care and pregnancy outcome, etc. However according to Akpan et al. (2004) it does not meet current data management needs of the system. A typical example they give is the fact that although it collects data on the number of clients accepting oral contraceptives, it does not collect information of the type of contraceptives. This is necessary so that the LGA can provide supplies to meet client demand.

It is important that existing information systems are worked within instead of creating parallel ones. The DHIS can be used to manage data collected by the NHMIS. With its functionalities as described in Chapter 5, it could be used to support the NHMIS by automating indicator calculations and reporting. Most importantly its usage can decrease the time lag in data transfer in the presence of interconnectivity in the NHMIS data collection process. Figure 14 depicts the general process of data collection in the NHMIS.

6 http://www.who.int/countries/nga/areas/health_information/en/index.html

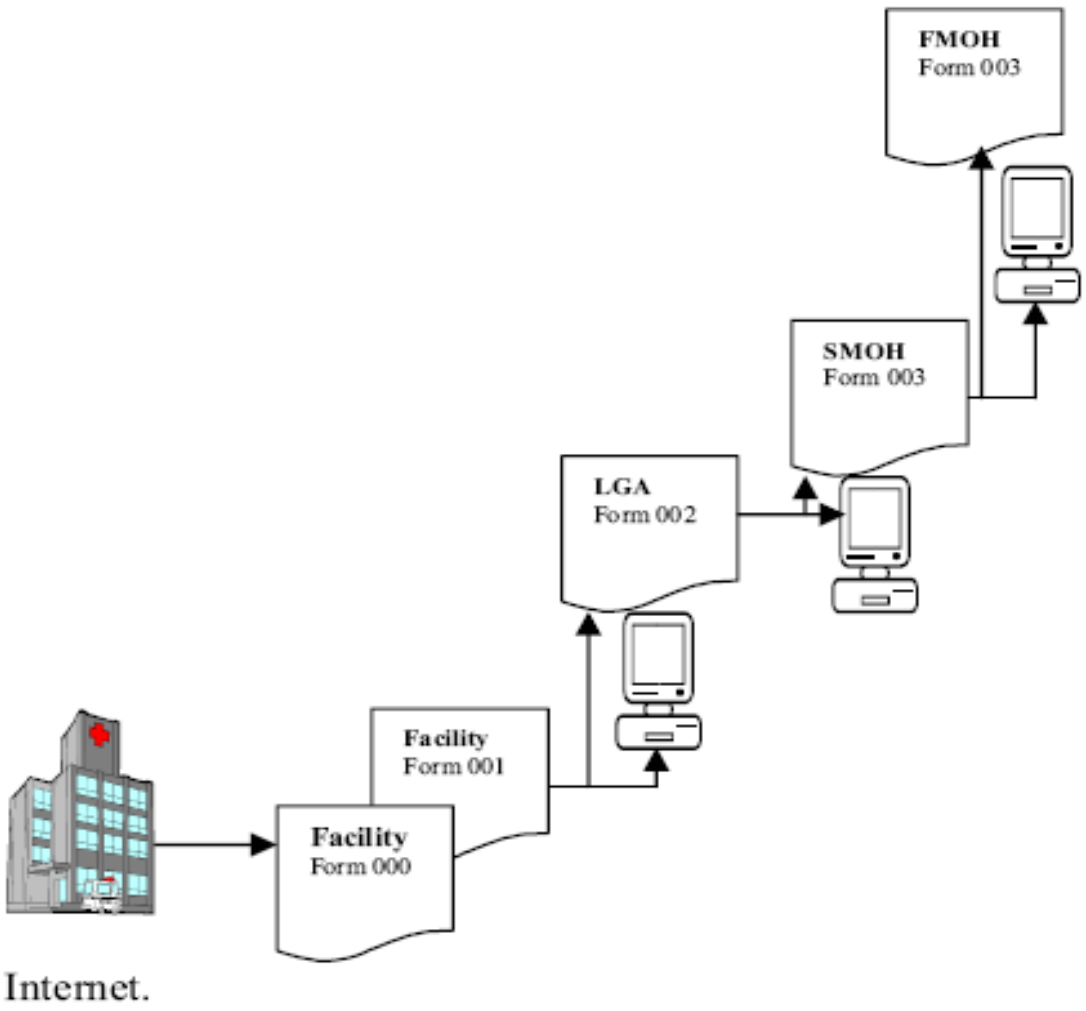

Figure 14: The NHMIS Data Collection Process (Akpan et al. 2004)

The data collection process is such that at the facility level which is the lowest entry point of the system, patient data is collected in logbooks by staff on a daily basis, summarized on a monthly basis in a facility level form as shown as Form 000. It is duplicated by hand as Form 001 and submitted to a designated Staff at the LGA level as Form 002. The LGA staff prints a summary form (F002) and sends a hard copy to the Department of Planning, Research, and Statistics (DPRS) staff at the State Ministry of Health (SMOH). The data received (Form 003) is summarized and sent to the FMMOH on a semi-annual basis.

Requirement F5: Periodically evaluating and updating information systems

This requirement includes both the Ghanaian DHIS 2 and Nigerian the Nigerian NMHIS. Information systems collect too many variables, which makes it too cumbersome and time consuming to complete. Thus a periodic update and evaluation of such systems will enhance decision-making in the healthcare sector.

Requirement F6:Development of joint activities among different levels of healthcare system

Occasionally, it is necessary that each of the levels of government in the individual countries develop joint work plans specifically at the lower levels (district and LGA level) of healthcare. As most of the source of data is obtained from this level, joint work plans will provide a platform to explore common challenges and design practical solutions in healthcare systems, and spark the interest of all the levels to monitor data collection and quality. Especially since decision-making lies solely in the hands of higher levels, lower levels will be motivated to ensure data source is reliable.

Requirement F7: Funding and provision of infrastructure for data management and information systems

Responses obtained from the stakeholder interviews shows that funding to support information systems activities is available. Such funds are needed to train staff in the usage of information systems as well as provide necessary logistics support for full deployment of information systems. Also basic infrastructure for data reporting at the different levels such as computers, printers, electricity are most times not available to facilitate timely report of information for effective decision-making. The NHMIS data collection process (Figure 14) for instance shows a lack of computers beyond the FMOH and SMOH levels and the systems hardware.

A summary of the system requirements for Ghana and Nigeria is depicted in Table 5.

Table 5: Summary of System Requirements for Ghana and Nigeria

Country	System Requirement
Ghana	Requirement F1: Decentralization of health services and HIS Requirement F2: Integration of information infrastructure at all healthcare levels
Nigeria	Requirement F1: Decentralization of health services and HIS Requirement F3: Clarification of the roles of the levels of governments Requirement F4: Automation of the NMIS using the DHIS software
Both Countries	Requirement F5: Periodically evaluating and updating information systems Requirement F6:Development of joint activities among different levels of healthcare system Requirement F7: Funding and provision of infrastructure for data management and information systems

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION

7.1 CONCLUSION

The aim of the thesis is to specify software requirements and critical success factors of telemedicine solutions for SSA countries with the ability of such solutions to support health system governance. As the effective delivery of healthcare is unarguably one of the most fundamental needs for SSA, telemedicine solutions in such region is required to 1) better support the provision and management of health delivery services 2) strengthen health administrative management and technical capacity to utilize routine health information for effective decision making processes. Numerous studies support this view by adding the need for telemedicine solutions in SSA because it is the region with the lowest level of economic, technological and internet development in the world (Odedra et al. 1993; Petrazzini et al. 1999).

This need Navarro (2001) notes is influenced by the choices made by political actors and how leaders and managers exercise authorities. The linkages in Figure 1 if operational and effective is expected to enhance interactions among state actors, providers, and citizen/clients to produce good health governance and fulfill governance principles of accountability, open policy process, state capacity, and engagement of non-state actors as described as inherent bottlenecks in health governance of Ghana and Nigeria. However structural and procedural reforms to increase accountability (political, performance and financial), transparency and to reduce corrupt practices play an important role at improving health governance. The responses obtained from the stakeholder interview are summarized in pages 86 – 94 in support of this concluding remark.

During the 1st International DHIS 2 Implementers Workshop, which I attended in the University of Oslo, the HISP team in Oslo tried to create an enabling environment for HISP team members and DHIS users to share experiences for mutual learning. New development with the DHIS 2 was brought to light as well as basic training on the use of the software for beginners i.e. data entry, report generating, etc. This interactive workshop helped me to an extent in the design of

the questionnaire for the structured interview with regard to the implementation of a new health system. Responses obtained from Ghanaian and Nigerian stakeholders in the health sector showed that the implementation of a National Health Information System ensures that there is uniform standard applied at all levels of the health service. This is to enable data aggregation and comparison across all levels of the health system. I also gained further understanding into some of the challenges relating to the existing usage of the DHIS 2 such as reasons for the lack of skills, producing timely reports at the various health levels, etc. Thus exploring the functionality of the open source DHIS 2 software developed by IFI in Oslo (Jøn Braa) and collaborators is an information system which supports health governance. This is because it reflects the relationship between health information systems and health policies / governance in my chosen countries. The open source is operational in several African countries like Sierra Leone, Zanzibar, Zambia and Tanzania to support telemedicine.

A summary of my findings related to the structured research questions are outlined below:

I Case of Ghana

What kinds of health decisions come from the higher authority levels (e.g. Governor of State, Executive Council, Ministry of Health (MoH), Hospital Management Board (HMB), etc.)?

Higher authority levels formulates policy, monitors and implements these policies, initiates legislation and promotes inter-sectorial collaboration in support of health objectives. Specific policies include the Management and provision of health services, policy on Human Resource Planning and Management and the Procurement of goods and services.

How is the decision communicated/transmitted (e.g. spoken, written, telephone, etc.)?

Decisions taken at higher levels are communicated in written policy directives and operational guidelines.

How long does it take to make typical decisions of different complexity and different financial or other, and how long does it to implement the decision after it has been made?

It depends on the urgency of the situation. If an issue of is of utter most importance, it takes a week or two. Otherwise it takes about three months or more. For instance a financial issue may take a few days to make the decision and the implementation would be as soon as possible after that. However if it is about a policy on treatment, it will require more research and evidence and this may take about two years or more depending on the issue.

In budgetary, resource allocation and use of funds, are there tasks that must be approved by higher authorities?

There are tasks that need approval by higher authority. These tasks are allocated depending on the level of authority.

If YES, what specifically are these tasks?

At the national level, the financial director see to the disbursement of funds to the regional financial officer and he in turn hands over the responsibility to the district financial officer, and finally to the facility financial officer. For example, the MoH receives funds from the Ministry of Finance and allocates to the Ghana Health Service (GHS). The GHS then makes allocation to the regions and districts directly and transfers the funds to them.

How long does it take to provide fund and allocate resources?

Depending on the availability of funds it could take a week or two. Otherwise it takes two to three months.

Do the lower authorities have the power to influence this process? ……. YES/NO

Lower authorities do not have the power to influence the provision of funds and allocation of resources.

Are there any administrative conflicts or barriers between the levels of healthcare (e.g. Local Government Area (LGA), District Administration, MoH, HMB, Primary Health Care (PHC), etc.)? ……. YES/NO

Ghana has no administrative conflicts or barriers between the levels of healthcare because there exist a healthcare system which is decentralized.

If YES, what are these?

No comments

How in your opinion could these conflicts be resolved?

No comments

Is there any special policy with regards to the implementation of new health services or health ICT (e.g. telemedicine and eHealth solutions, health management Information Systems, etc.)?

There is a special policy with regards to the implementation of a new health service or health ICT.

If YES what does the policy say?

The policy indicates that any health services or system can only be introduced into the health sector only if it conforms to the goals and strategic objectives of the MoH and GHS, and be seen to contribute towards its achievement.

How are the various levels of health management involved in this policy?

This policy directive is decided at the national level and implemented at the regional, district and facility levels.

What procedure must be followed to make a new health service operate at all levels of health-care system?

It must be discussed and accepted by the MoH and the GHS at the national level. Thereafter the GHS directorate will develop and implement a roll-out plan.

Which government authority approves such a process?

The MoH and GHS approve such a process.

Where does the process begin (e.g. MoH, Govenor, etc.)?

The process begins at the MoH.

Do you think the implementation of a State Health Information System/ District Health Information System is important for your country's healthcare system?

Yes. A National Health Information System ensures that there is a uniform standard applied at all levels of the health service to enable data aggregation and comparison across all levels of the health system.

Do you have any further comments with regard to health system governance in your country?

The Ministry of Health is the Government body responsible for health policy formulation in the country. The Ghana Health Service is the main agency for the provision of health services at the district level in together with the Christian Health Association of Ghana.

II Case of Nigeria

What kinds of health decisions come from the higher authority levels (e.g. Governor of State, Executive Council, Ministry of Health (MoH), Hospital Management Board (HMB), etc.)?

Higher authority levels make policy decisions and implement them, National Strategic Health Development Plans, Annual Implementation Plans, Budgetary allocations, is responsible for disciplinary actions, and recruitments.

How is the decision communicated/transmitted (e.g. spoken, written, telephone, etc.)?

These decisions are communicated usually written in hard copies in the form of circulars, Gazettes, Notices, Government white papers and distributed to relevant authority. These copies are most of the time not available for the public.

How long does it take to make typical decisions of different complexity and different financial or other, and how long does it to implement the decision after it has been made?

A lot depends on the complexity of the decision. If the decision is binding on the federal alone, it may take few weeks. However, if a typical decision is binding on the other tiers of government, it may take few months to make a decision and implement it. Implementation of the decisions however is almost immediately if a decision has been made. Implementation of decisions with financial implications however takes longer times due to delay of budget approval.

In budgetary, resource allocation and use of funds, are there tasks that must be approved by higher authorities?

There are task that needs higher authority to approve them.

If YES, what specifically are these tasks?

Expenditures for instance that is greater than certain amount of figures like 50 million **Naira** (333 **US Dollars**) needs approval. Process is that the resource envelope has to be approved by the National Assembly. This is done yearly through the Medium term expenditure Framework that provides policy and strategic direction for annual budget preparation. The Medium Term Sector Strategy (MTSS) process determines what each sector may prioritize and budget appropriately.

How long does it take to provide fund and allocate resources?

Such decisions go through due processes. The provision of fund and allocation of resources may take 3-6 months despite approval. For recurrent expenditure, once the warrant to incur expenditure is approved, the decision is immediately. For capital expenditure, it may take 1-2 months.

Do the lower authorities have the power to influence this process? ……. YES/NO

Lower authorities rarely have the power to influence the decision process.

Are there any administrative conflicts or barriers between the levels of healthcare (e.g. Local Government Area (LGA), District Administration, MoH, HMB, Primary Health Care (PHC), etc.)? ……. YES/NO

Although every level of healthcare is defined and work towards achieving the same goal, there exist administrative conflicts and barriers between them.

If YES, what are these?

The responsibilities of each level of care are not clearly defined. Also there is no legal backing to administrative functions and responsibilities. This issue has been addressed in the recent National Health Act and the bill is yet to be passed. This is left for the Federal Ministry of Health.

How in your opinion could these conflicts be resolved?

The passage of the Health bill into law will help to considerably remove these constraints. Also having a policy document stating each role of the different levels of healthcare could resolve these conflicts.

Is there any special policy with regards to the implementation of new health services or health ICT (e.g. telemedicine and eHealth solutions, health management Information Systems, etc.)?

There is no special policy with regards to the implementation of a new health service or health ICT in the health sector. However there exist a national IT policy and ICT4D Strategy.

If YES what does the policy say?

Although no special policy exists, there is a general concern to implement a Health Information System for the categorization of diseases among the Hospital Management Board. Hospitals are now duly informed and education programmes are in progress. Areas of concentration need to be rectified.

How are the various levels of health management involved in this policy?

The various levels of health management are involved because the national council on health must ratify before it is presented to the legislature for legislation.

What procedure must be followed to make a new health service operate at all levels of health-care system?

A memo is generated and considered first by the Top Management Committee of the Federal Ministry of Health. If approved, the memo is taken to the National Council of Health (NCH) for approval. Once this is approved by the NCH, the new health service can operate at all levels. Advocacy and Education of stakeholders on the new health service at all levels is also essential for the service to be operational in the healthcare system.

Which government authority approves such a process?

The NCH which is the highest advisory and policymaking body on health approves such a process.

Where does the process begin (e.g. MoH, Govenor, etc.)?

The process begins at the Ministry of Health either at the State or Federal Level.

Do you think the implementation of a State Health Information System/ District Health Information System is important for your country's healthcare system?

The implementation of a State Health Information System/District Health Information System is critical to the realization of Nigeria's vision 20:2020 in the health sector.

Do you have any further comments with regard to health system governance in your country?

Nigeria runs a federation system. This system is highly decentralized with the three tier level of government being autonomous. Thus certain services are reserved for the federal while some are taken up by the states and LGAs (districts).

Many problems exist in the healthcare system. Manpower problems and brain drain (nurses, doctors, pharmacists, etc) are typical examples. This affects the workload at all levels of healthcare.

Infrastructural facility problems such as electricity affect service delivery. Various investigative materials are not readily on ground such as X-rays, Ultrasound machines etc. Laboratory investigations also lack equipment most of the time. Remunerations are low.

7.2 RECOMMENDATION

The comparative study on software requirements and success factors of telemedicine solutions in Ghana and Nigeria revealed that local analysis and use of information at district and LGA levels were crucial to improved health service provision and health management. The development of district health information systems was found to be a primary health care approach to strengthen HISs in these countries.

For policy formulation, it is necessary to develop health information sectors within an integrated approach to ICT. This is because the health sector extends to the most peripheral levels of the society thus effective use of information is crucial to PHC delivery and health management. A routine reporting system from district and LGA levels also posts health information to national level and federal ministry of health in Ghana and Nigeria respectively.

As the use of information technology and the exchange of health information increases, concerns arise as to the protection of personal health information since the exchange of information increases considerably. It is therefore necessary that strict privacy and security rules be defined in the formulation of national policies to ensure appropriate disclosure of health information.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE FOR ASSESSING HEALTH SYSTEM GOVERNANCE IN GHANA AND NIGERIA.

Questions on Health System Governance in Ghana and Nigeria

Structured interview prepared by Joanna Adobea Dawson (3rd May 2011).

Date and start time of Interview: ……..

Duration of interview in minutes: …….

Name of interviewer: ..... (Joanna Dawson)

Communication technology: …….

Name, prename of interviewee: ……

Profession of interviewee: ……

Workplace/Institution of interviewee: ……

Role/position of interviewee in the workplace: ……....

Email address of interviewee: …….

Section one: Health Administration and Governance

1. What kind of health decisions come from the higher authority levels (e.g. Governor of State, Executive Council, Ministry of Health (MoH), Hospital Management Board (HMB), etc)?

2. How is the decision communicated/transmitted (e.g. spoken, written, telephone, etc)?

3. How long does it take to make typical decisions of different complexity and different financial or other, and how long does it to implement the decision after it has been made?

General answer (if possible): Example 1: Example 2: Example 3:

4. In budgetary, resource allocation and use of funds, are there tasks that must be approved by higher authorities?

4.1 If YES, what specifically are these tasks?

4.2 How long does it take to provide fund and allocate resources?

7. Do the lower authorities have the power to influence this process? …….. YES/NO

8. Are there any administrative conflicts or barriers between the levels of healthcare (e.g. Local Government Area (LGA), District Administration, MoH, HMB, Primary Health Care (PHC), etc)? …… YES/NO

9. If YES, what are these?

10. How in your opinion could these conflicts be resolved?

Section two: Implementation of a Health Service

11. Is there any special policy with regards to the implementation of new health services or health ICT (e.g. telemedicine and eHealth solutions, health management Information Systems, etc)?

12. If YES what does the policy say?

13. How are the various levels of health management involved in this policy?

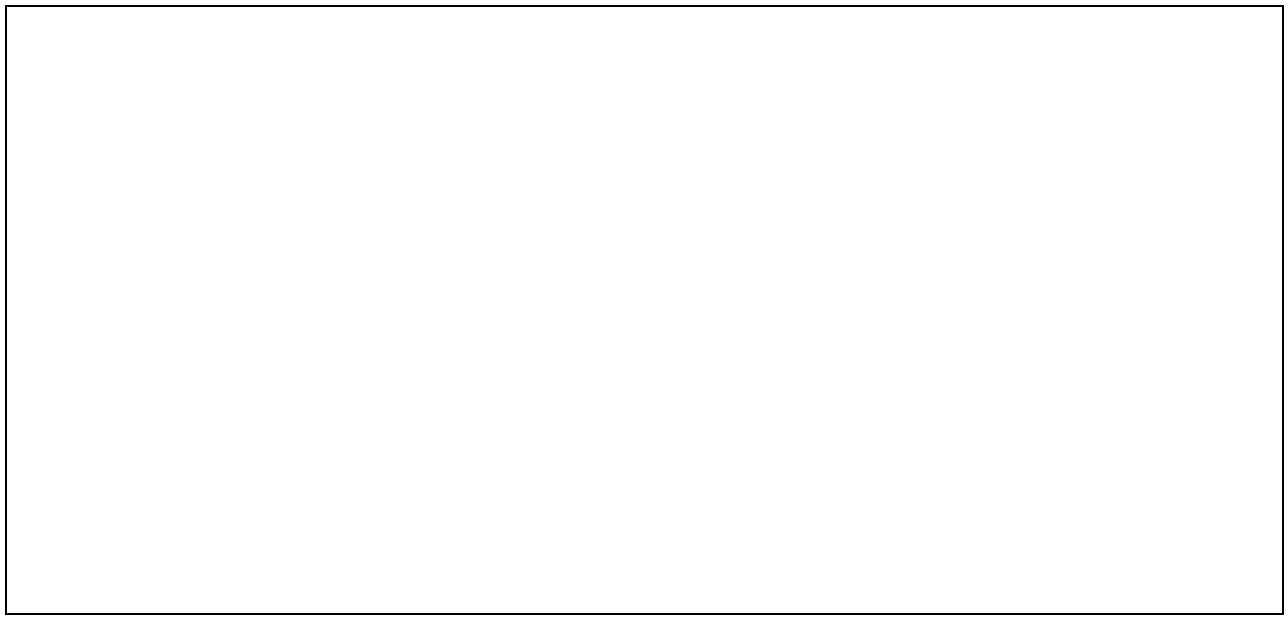
14. What procedure must be followed to make a new health service operate at all levels of healthcare system?

15. Which government authority approves such a process?

16. Where does the process begin (e.g. MoH, Govenor, etc)?

17. Do you think the implementation of a State Health Information System/ District Health Information System is important for your country's healthcare system?

18. Do you have any further comments with regard to health system governance in your country?



THANK YOU

APPENDIX 2: GHANA DATA COLLECTION FORMS

Form 1:

STATEMENT OF OUTPATIENTS
GHANA HEALTH SERVICE

Institution..... District: ..... Region: ....20...

AGE GROUPS	INSURED PATIENTS				NON-INSURED PATIENTS				TOTAL	
	NEW		OLD		NEW		OLD			
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Under 1 Year										
1 – 4 Years										
5 – 9 Years										
10 – 14 Years										
15 – 17 Years										
18 – 19 Years										
20 – 34 Years										
35 – 49 Years										
50 – 59 Years										
60 – 69 Years										
70 Yrs & Above										
Total All Ages										

SUMMARY OF OUTPATIENT MALARIA CASES	MALE	FEMALE
Number of Patients **below the age of 5 years** reporting with Malaria		
Number of Patients **5 years and above** reporting with Malaria		

.....

Medical Officer In-Charge

- *To be dispatched not later than the first Tuesday of the following month to the District Director of Health Services.*

06/07

Form 2:

STATEMENT OF INPATIENTS
GHANA HEALTH SERVICE

Institution: ..... District: ..... Region..... 20.....

AGE GROUPS	INSURED PATIENTS				NON-INSURED PATIENTS			
	ADMISSION		DEATH		ADMISSION		DEATH	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Under 1 Year								
1 – 4 Years								
5 – 9 Years								
10 – 14 Years								
15 – 17 Years								
18 – 19 Years								
20 – 34 Years								
35 – 49 Years								
50 – 59 Years								
60 – 69 Years								
70 Yrs & Above								
Total All Ages								

SUMMARY OF INPATIENT MALARIA CASES	MALE	FEMALE
Number of Patients below 5 years of Age **Admitted with Malaria**		
Number of Patients 5 years and above **Admitted with Malaria**		
Number of Patients below 5 years of Age **Dying of Malaria**		
Number of Patients 5 years and above **Dying of Malaria**		

.....

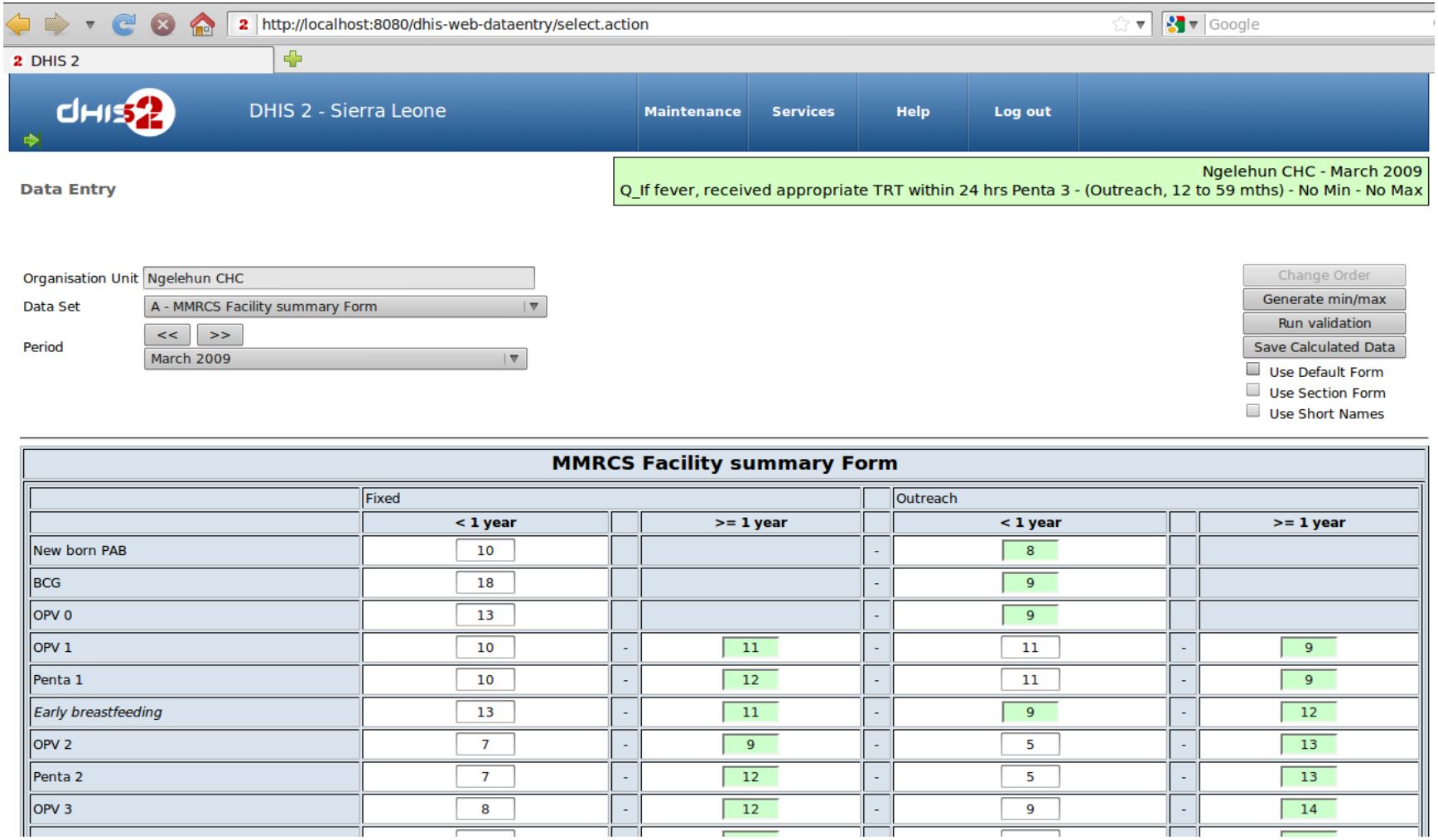
Medical Officer In-Charge

- *To be dispatched not later than the first Tuesday of the following month to the District Director of Health Services.*

06/07

APPENDIX 3: FUNCTIONALITY HIGHLIGHTS OF THE DHIS

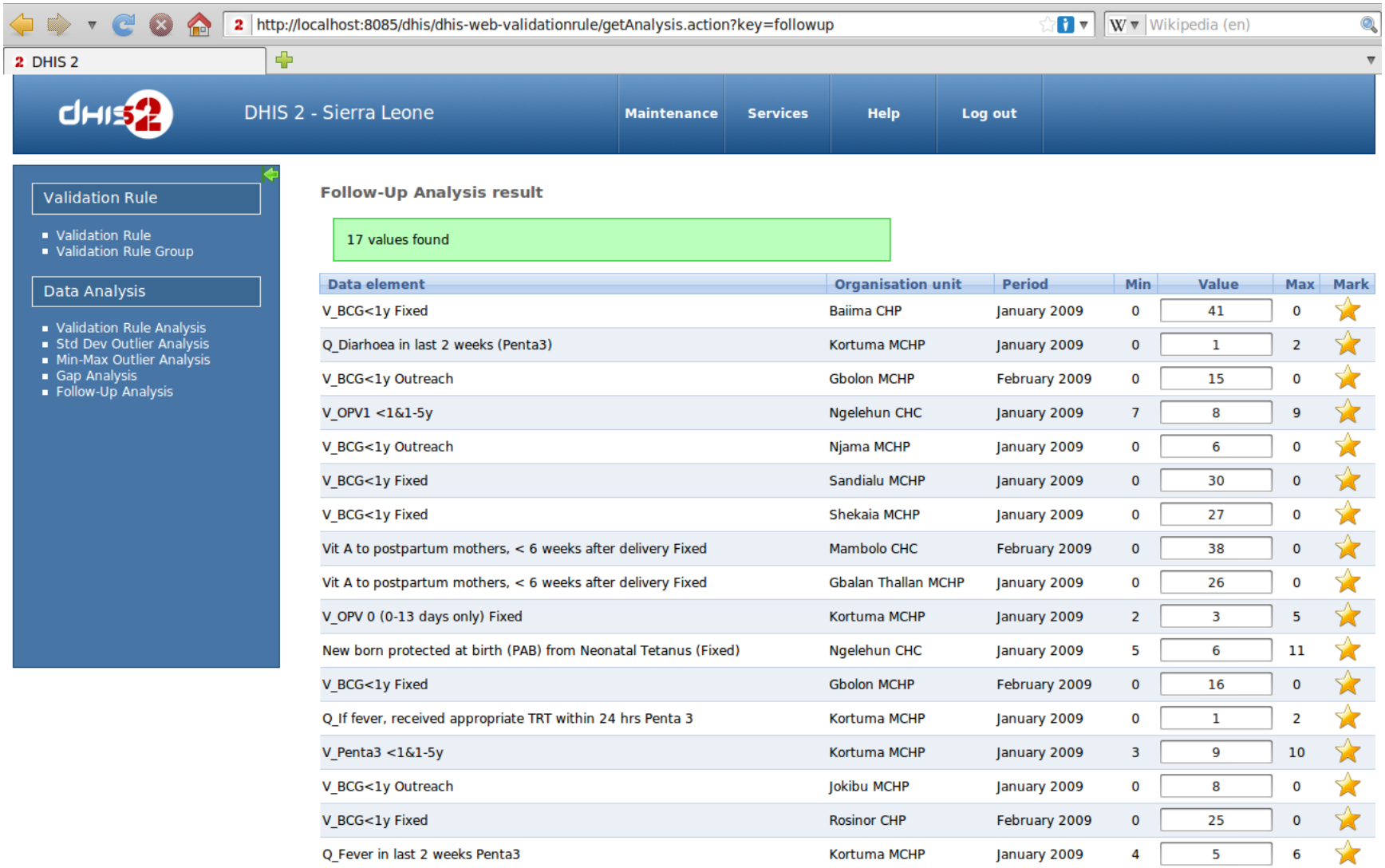
Function 1: Data Entry Module



MMRCS Facility summary Form

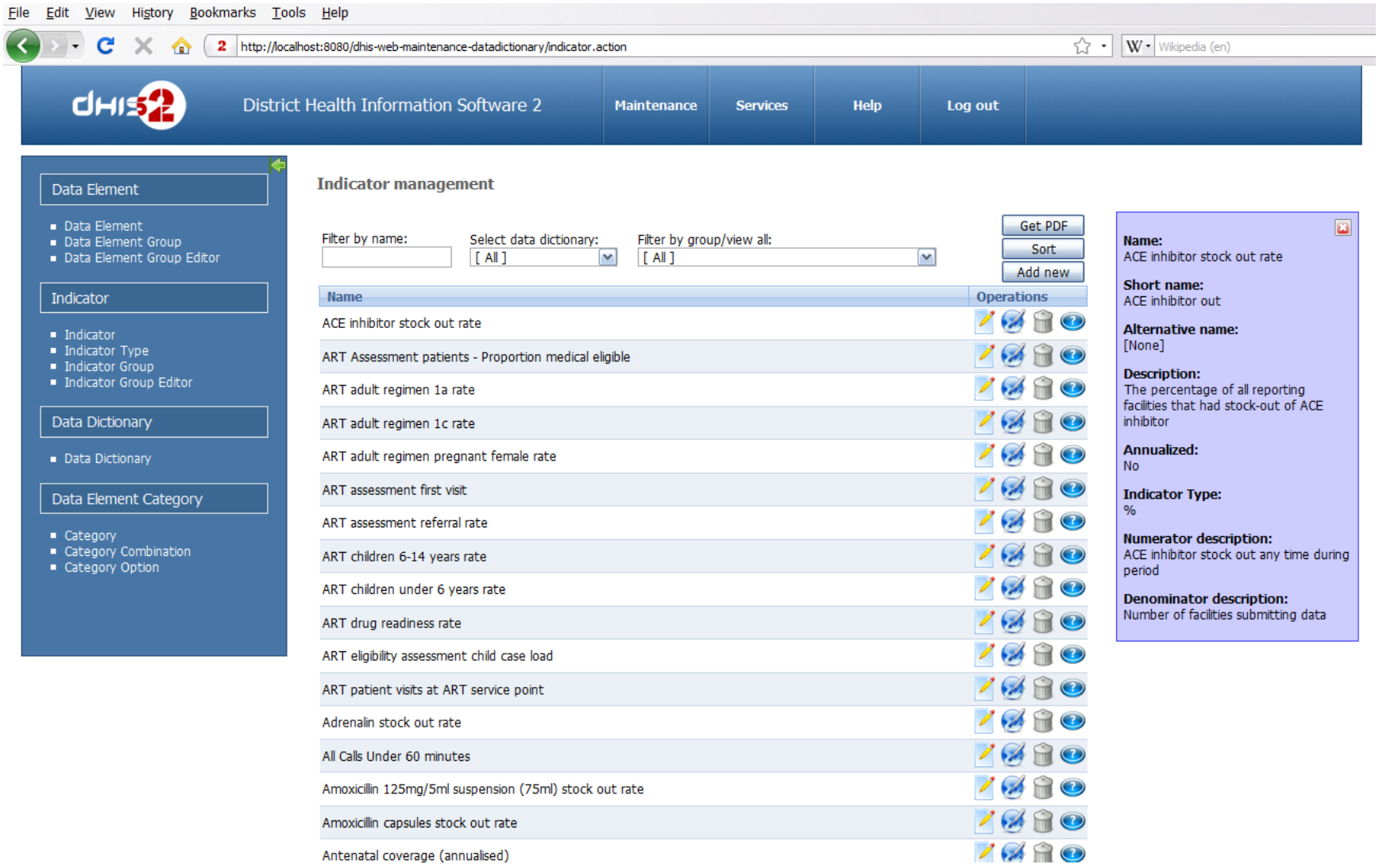
	Fixed				Outreach		
	< 1 year		**>= 1 year**		**< 1 year**		**>= 1 year**
New born PAB	10			-	8		
BCG	18			-	9		
OPV 0	13			-	9		
OPV 1	10	-	11	-	11	-	9
Penta 1	10	-	12	-	11	-	9
Early breastfeeding	13	-	11	-	9	-	12
OPV 2	7	-	9	-	5	-	13
Penta 2	7	-	12	-	5	-	13
OPV 3	8	-	12	-	9	-	14

Function 2: Custom Data Quality Check

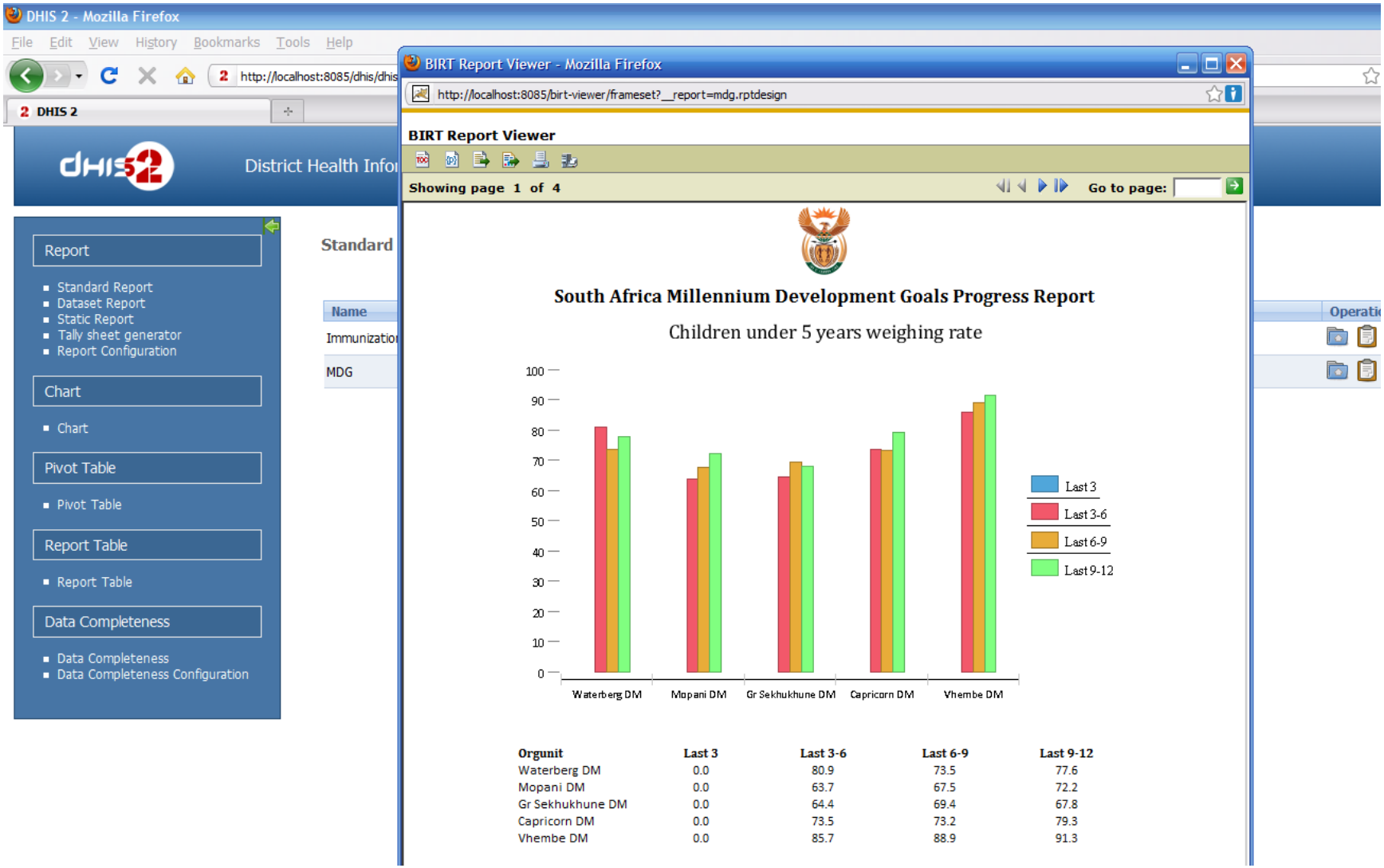


Data element	Organisation unit	Period	Min	Value	Max	Mark
V_BCG<1y Fixed	Baiima CHP	January 2009	0	41	0	
Q_Diarhoea in last 2 weeks (Penta3)	Kortuma MCHP	January 2009	0	1	2	
V_BCG<1y Outreach	Gbolon MCHP	February 2009	0	15	0	
V_OPV1 <1&1-5y	Ngelehun CHC	January 2009	7	8	9	
V_BCG<1y Outreach	Njama MCHP	January 2009	0	6	0	
V_BCG<1y Fixed	Sandialu MCHP	January 2009	0	30	0	
V_BCG<1y Fixed	Shekaia MCHP	January 2009	0	27	0	
Vit A to postpartum mothers, < 6 weeks after delivery Fixed	Mambolo CHC	February 2009	0	38	0	
Vit A to postpartum mothers, < 6 weeks after delivery Fixed	Gbalan Thallan MCHP	January 2009	0	26	0	
V_OPV 0 (0-13 days only) Fixed	Kortuma MCHP	January 2009	2	3	5	
New born protected at birth (PAB) from Neonatal Tetanus (Fixed)	Ngelehun CHC	January 2009	5	6	11	
V_BCG<1y Fixed	Gbolon MCHP	February 2009	0	16	0	
Q_If fever, received appropriate TRT within 24 hrs Penta 3	Kortuma MCHP	January 2009	0	1	2	
V_Penta3 <1&1-5y	Kortuma MCHP	January 2009	3	9	10	
V_BCG<1y Outreach	Jokibu MCHP	January 2009	0	8	0	
V_BCG<1y Fixed	Rosinor CHP	February 2009	0	25	0	
Q_Fever in last 2 weeks Penta3	Kortuma MCHP	January 2009	4	5	6	

Function 3: Indicator Definitions

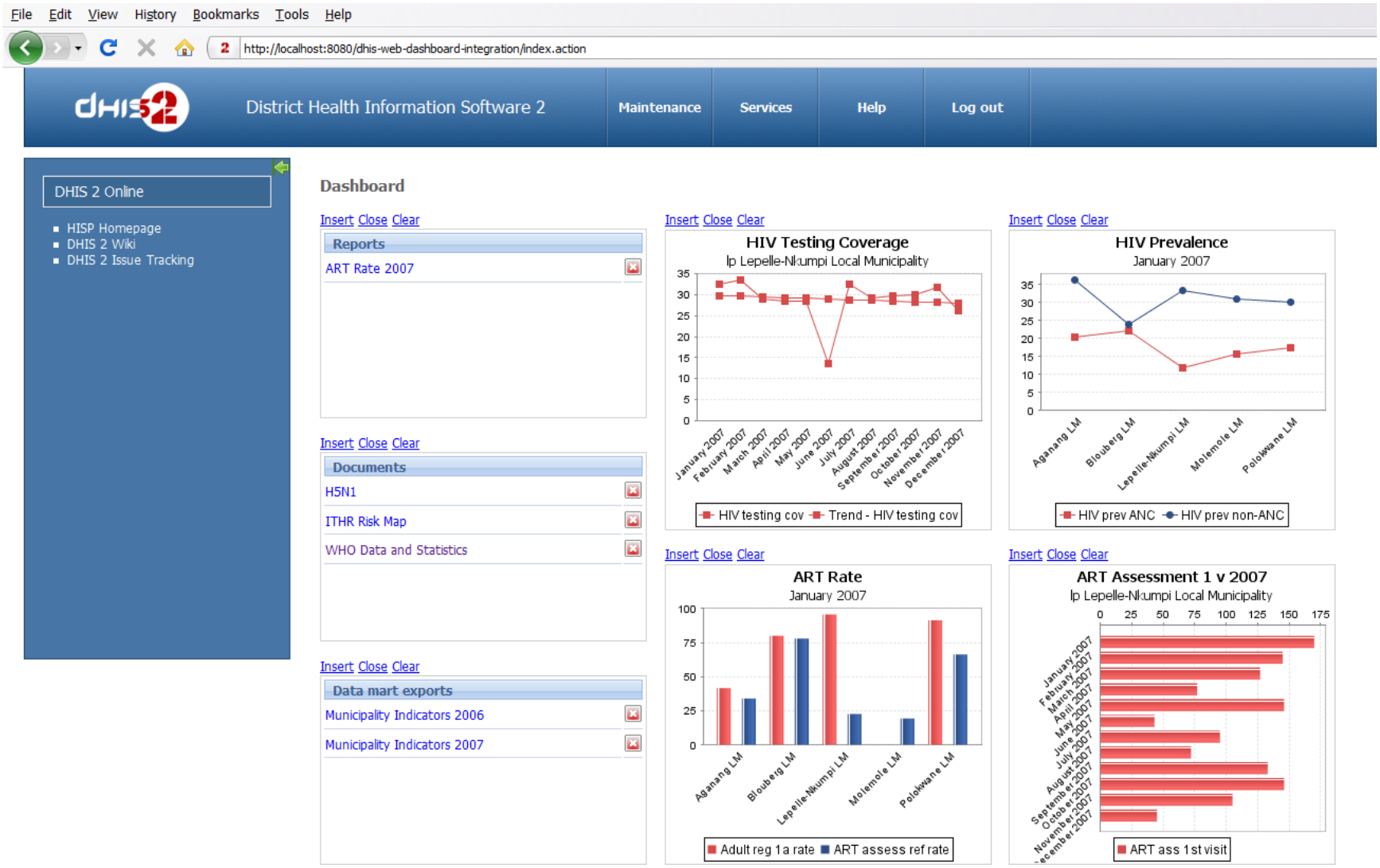


Function 4: Report Tables

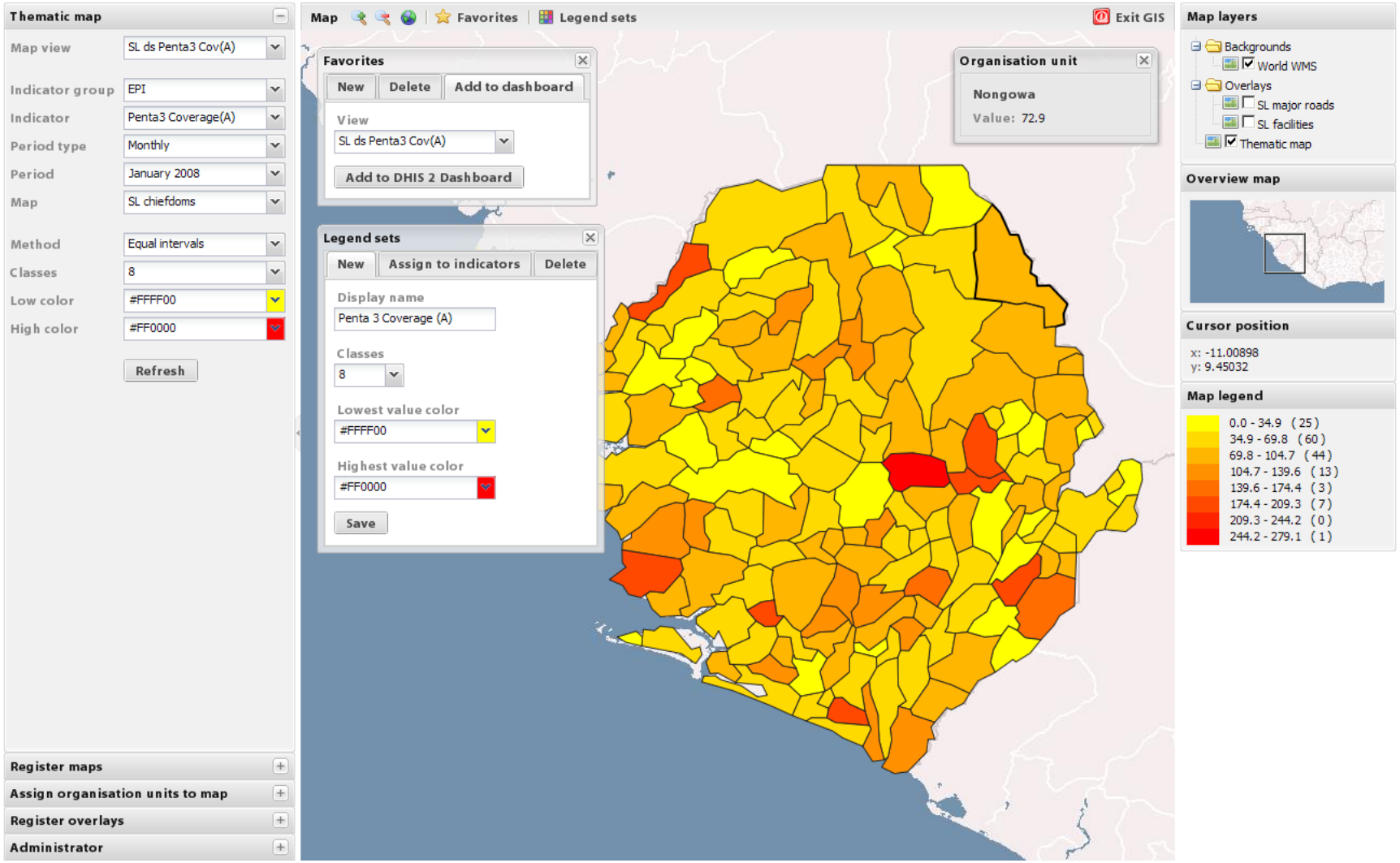


Function 5: Chart with Trend Lines

Function 6: Dashboard with Live Charts



Function 7: GIS Thematic Map



Function 8: User Management and Access Control