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EXPLORING THE IMPACT AND ROLES THAT STRATEGICGOVERNMENT LEADERSHIP PLAYS IN THE ADOPTION OF EHEALTH IN LOW RESOURCE COUNTRIES: A QUANTITATIVE AND DESCRIPTIVE STUDY OF THE MEDICAL AND DENTAL COUNCIL OF NIGERIA AS A HEALTH REGULATORY AGENCY

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TITLE: Exploring the Impact and Roles that Strategic Government Leadership Plays in the Adoption of eHealth in Low Resource Countries: A Quantitative and Descriptive Study of the Medical and Dental Council of Nigeria as a Health Regulatory Agency

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Abstract

Governments of low resource countries (LRCs) have embraced and leveraged the potential benefits Information Computer Technology (ICT) brings to the healthcare sector, taking various steps to adopt and use eHealth to improve healthcare despite recognized challenges. Policy implementation is a recognized challenge in LRCs. Despite the development of policies and frameworks in these countries, many still struggle to deliver on their health goals. It is yet to be fully understood to what extent professional health regulatory agencies (PHRAs) understand their roles in effective regulation, as it would relate to medical education, professional conduct and registration of practitioners. The Healthcare workforce is one of the core building blocks of any health system and the regulation of the workforce is central to the provision of quality healthcare services. PHRAs provide strategic leadership through existing legislation, policies, and frameworks and are themselves adopting the use of ICT in a range of applications (registration and licensure processes, education, continuing professional development activities of practitioners). In 2016, the Nigerian government approved the implementation of its National ICT Strategic Framework for health. The National Information Technology Development Agency (NITDA) is empowered by legislation to provide the required leadership, governance, and stewardship in coordinating and improve upon the use of ICT in all key sectors of the country. This study was undertaken to understand the role PHRAs like the Medical and Dental Council of Nigeria (MDCN) a regulatory body for the professions of medicine and dentistry in Nigeria provides Strategic Government Leadership (SGL) in the adoption and use of eHealth tools through policies and legislation. The study also assessed the knowledge and perception of employees of the MDCN on existing eHealth policies and legislation and of their relevancy or adequacies in providing effective regulation. The study answers the research questions i) does a relationship exist between SGL and capacity for eHealth innovation and technological/ infrastructural development? ii) What are the measures taken and the importance of the security and privacy of practitioner records to PHRA? and iii) Does SGL, as demonstrated through policy development, affect the adoption and use of eHealth by employees of the PHRA? A systematic literature review was performed, and a structured questionnaire was administered to MDCN professional staff. The results were subjected to statistical analysis to investigate relationships between the dependent variable (SGL) and 14 independent variables representing the 15 constructs from the questionnaire. A regression model

found four significant predictors of the value of the dependent variable. A study of other related PHRAs is recommended to improve the suitability of the framework proposed, considering the limitations of this study.

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Dedication

I dedicate this thesis to the loving memories of my late father Lt. Col. Samuel. O. Gbenro, late wife, Chidinma E. Gbenro. My beloved and cherished mother, Mercy Gbenro, My adorable, loving wife and best friend, Ime Gbenro, our beautiful Children (Ayomide, Isabella & Michelle), My in-laws (Sir & Lady Paul. C. Mba, Late Barrister & Mrs Uko-Afia) and my siblings (Olushola, Oluwafunmilayo, Godwin, Oluwayemisi and Emmanuel)

Surely goodness and mercy shall follow me all the days of my life and I shall dwell in the house of the Lord forever. Psalm 23 vs 6

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List of Abbreviations and Symbols

i.	FMOH	Federal Ministry of Health
ii.	HMH	Honorable Minter of Health
iii.	ICT	Information and Communication Technology
iv.	LRCs	Low Resource Countries
v.	MDCN	Medical and Dental Council of Nigeria
vi.	NITDA	National Information Technology Development Agency
vii.	NPHCDA	National Primary Health Care Development Agency
viii.	NSHDP	National Strategic Health Development Plan
ix.	NSHDPF	National Strategic Health Development Policy framework
x.	PHRA's	Professional Health Regulatory Agencies
xi.	SGL	Strategic Government Leadership
xii.	UNF	United Nations Foundation
xiii.	WHO	World Health Organization

Chapter One –Introduction

1.0. Motivation and Background of the Study

Population health is known to be associated with wealth; the World Health Organization (WHO) has recognized that countries with a healthy population tend to have effective implementation of developmental programs intended to improve the quality of life of citizens when compared to countries with an unhealthy population (WHO, 2013). The Honorable Minister of Health (HMH) in Nigeria in the National Strategic Health Development Policy Framework (NSHDPF) noted that "in providing excellent and effective leadership and governance in the healthcare sector Nigeria adopted five successive national and over twenty-four sectoral health policies since its independence in 1960". *(*NSHDPF, 2009- 2015, p. 19).

Nigeria's poor health system performance is not helped by the lack of clearly defined roles and responsibilities which results in duplication of efforts and has been compounded by inadequate political commitment especially at lower levels, poor coordination, lack of communication between various actors, lack of transparency and poor accountability (NSHDPF, 2009- 2015, p. 19).

Nigeria in 2016 added the National ICT (Information and Communication Technologies) strategic framework for health to its health policies with the sole goal of encouraging universal health coverage through the use of ICT in healthcare (eHealth) delivery by 2020. eHealth, which is the use of ICT to support effective, efficient, and cost-effective healthcare, has over the last decade been employed in both low and high resource countries. This implementation the United nations Foundation (UNF) describes has been primarily in areas of disease surveillance, medication administration, immunization, reduction of morbidity and mortality for mothers and

children, healthcare education and regulation of professionals, innovation, and research (UNF, 2014, p. 9-11).

1.1 eHealth, Health Systems and Stewardship

Eysenbach (2001) recognized that the term eHealth has been defined and interpreted in many ways in scientific and academic environments. He defined eHealth to encompass not only technological development but as a developing branch of study which cuts across medical informatics, public health and business disciplines and also health services and information which are delivered through the Internet and related technologies. He also pointed out that eHealth also includes a way of thinking, an attitude, and a commitment for networked, global thinking broadly, to improve health care locally, regionally, and worldwide by using ICT.

In its 2004 Alliance for Health Policy and Systems Research Conference, WHO (WHO, eHealth report. 2004) p. 1, identified that health systems encompass all the organizations, institutions and resources that are devoted to producing health actions whose primary intent is to improve health. Health systems also noted that the four vital functions of health systems are; i) service provision ii) resource generation iii) financing and iv) stewardship.

Stewardship is the oversight role of the health system which falls to the government and encompasses having the foresight and the right direction of health policy, exerting influence through regulation, and collecting and using fundamental data. The National Strategic Health Development Plan Framework (NSHDPF, 2009- 2015, p. 20) also describes stewardship to mean ways governments mobilize and spend revenues and make regulations and policies that deal with the issue of accountability and transparency in the health system. It specifically relates to "(i) oversight (ii) financing (iii) human and physical resources (development and utilization) (iv)

improvement of performance (v) promotion of the health of the people (vi) leverage of health program implementation and outcomes".

Ehealth's ability to transcend sociopolitical boundaries holds the potential to create a borderless world for health systems and healthcare delivery. However, the policies needed to guide eHealth development are limited and are just now emerging in low resource countries (LRCs). Required to foster eHealth growth in the developing world are rational policies to facilitate patient mobility and data exchange, across both international borders and regional boundaries within countries (Mars & Scott, 2010, p. 239).

The Nigeria Health ICT framework identifies the different role leadership plays at the federal and state level of government in encouraging ICT adoption and use. The National Council of Health (NCH) under the direction of the HMH has the responsibility to provide oversight and own the health ICT vision (NHICTSF, 2016, p. 42). The composition of the NCH includes health PHRAs like the Medical and Dental Council of Nigeria (MDCN) at the federal level. Others are State Commissioners of Health and their Permanent Secretaries in the health ministries, key parastatal in the Federal health ministries (National Primary Healthcare Development Agency (NPHDA), National Institute for Medical Research (NIRMA), National Health Insurance Scheme (NHIS) and National Agency for Food and Drug Administration and Control (NAFDAC). The Department of Planning Research and Statistics (PRS) at the Federal Ministry of Health (FMOH) serves as the secretariat.

1.2. Regulation of Healthcare Professionals and Legislation

The control of health professionals in Nigeria is through self-regulation. Health regulation has been described in various ways, depicting qualities of transparency, accountability, and

standards (Quick, 2011, p. 4). The Federation of Health Regulatory Colleges of Ontario opined that the vital role of regulatory colleges is to provide the required protection of the health and safety of citizens (Bauman et al., 2014, p. 123). In both low and high resource countries, the human resources for health (healthcare professionals) are controlled by institutions set up and guided by legislation to provide control and supervision of activities of the professionals. To practice as a health professional, one must possess registration with the appropriate self-governing body. Self-regulation implies that the professions develop and monitor their respective professional codes of conduct and licensing requirements and set standards of practice, e.g., College of Licensed Practical Nurses of Alberta (Bauman et al, 2014, p. 123)

The current Organization for Economic Co-operation and Development (OECD) data identified Nigeria as the leading African source of foreign-born nurses practicing in OECD countries; and one of the three leading African sources for foreign-born physicians. The OECD also identified inadequate infrastructure, poor working conditions and poor compensation packages as contributors to the emigration from the country of a sizeable number of surgeons, physicians, nurses and other medical professionals (as cited in Eriki et al. 2015, P 3)

The migration of scarce healthcare professionals from low resource countries (LRCs) is a significant issue and challenge. “Health worker migration from resource-poor countries to resource- rich (developed) countries, also known as ‘‘brain drain’’, represents a severe global health crisis and a significant barrier to achieving universal health equity. LRCs are unable to recruit and retain health workers for domestic health systems, resulting in inadequate health infrastructure and millions of dollars in healthcare investment losses” (Mackey and Liang, 2013, p. 1).

The importance of the regulation of healthcare professionals such as physicians, nurses, pharmacists, laboratory scientists, radiographers, community health workers, cannot be over-emphasized, given the crucial roles and privileges these professionals play in the care of patients who entrust their lives to their care providers. The critical part of regulatory bodies in the health sector as described in the Medical and Dental Practitioners (MDP) Act is to protect and safeguard the survival of patients (MDP Act, 2004).

Healthcare regulators are required to provide up to date and effective regulation of practitioners who use eHealth tools such as the Internet, medical applications for diagnosis, and treatment, follow-up of patients, information sharing and e-learning. These regulators, especially in LRCs in recent times have themselves adopted the use of ICT in a range of applications. These include the registration and licensure process of qualified practitioners, training at both the undergraduate and postgraduate levels and ensuring the continuing professional development of registered practitioners. Other relevant use of ICT by regulators include data gathering, storage (electronic record keeping) and dissemination of up to date records of practitioners to stakeholders, for research purposes and also for medico-legal issues as may relate to ethics and discipline in the healthcare professions.

The political will through the provision of well-planned and thoughtful policies that would encourage the procurement, implementation, and legislation of eHealth tools by practitioners are critical to appropriately promoting the adoption and use of eHealth. The development of eHealth policies is relatively new in many developed countries (Mars & Scott, 2010, p. 242) and LRCs have been encouraged to provide strategic leadership through policy formulation and implementation. However, not much is known of how eHealth has been utilized by regulatory authorities in the healthcare sector, especially in developing and LRCs who are faced with

challenges that mitigate the adoption and use of eHealth when compared to many developed countries.

1.3. The Current State of eHealth at the Medical and Dental Council of Nigeria

This study aims at understanding the impact and roles that strategic government leadership (SGL) plays in the adoption and use of eHealth by professional health regulatory agencies (PHRAs) in LRCs. The MDCN is the leading health regulatory agency of the federal government and one of the oldest of all the 13 PHRSs (established in 1960) under the supervision of the (FMOH). Its primary mandate is to regulate and control the training and registration of registered practitioners and to discipline those who fail to maintain appropriate standards.

Since 2003, the MDCN had embarked on ICT projects to scale its regulatory activities, primarily in the registration of practitioners, with the most recent being 2016 when the HMH commissioned the development of customized software. This electronic process would enable the registration and processing of practitioners' documents, an upgrade of Internet bandwidth to serve its head office and three of its zonal offices, and digitization of 26,000 records of its over 80,000 registered practitioners. This fit was achieved through the assistance of the Center for Integrated Health Programs (CIHP) who conceived the idea and ensured that qualified and suitable vendors were chosen. The entire project was funded by the United States Aid for International Development (USAID).

Recent literature (Mars & Scott, 2010; Oladosu, et al. 2009; Luna et al. 2014; Isabalija et al. 2011; Adebayo et al. 2014; Were et al. 2014; Boore et al. 2017; Shiferaw et al. 2017; UNF, 2014; Black, et al. 2011; and Kalam, 2011) have identified challenges that impede the sustainability or scale-up of eHealth in many LRCs. These challenges (Luna et al. 2014) can be

classified into the following categories: 1) lack of resources and infrastructure; 2) lack of regional integration; 3) absence or failure in the implementation of eHealth policies; 4) lack of adoption of universal system interoperability standards; 5) uncertainty in ethical and legal considerations; and 6) lack of a trained workforce.

1.4. Policy, Governance, Stewardship, and Strategic Government Leadership in Healthcare.

Greer et al. (2016, p. 3) pointed out that "the world appears untidy with good health policies gone wrong; noting that these policies may be adopted but are most often badly executed, producing unintended effects, or fall prey to corruption and ineptitude." They noted that the problems could sometimes be political, financial, or might be in the way things are done – in governance. Policy formulation and its implementation have also been recognized as a critical challenge that many LRCs face in their ability to improve health care services and delivery (Boore et al. 2017; UNF, 2014; and Okunhon, 2016). Researchers have yet to explore the impact and roles these policies have on both healthcare practitioners and their regulators, and how health regulators can utilize their strategic leadership position.

1.4.1. Governance

Effective healthcare and eHealth also require the right management. Governance is the systematic, patterned way in which decisions are made and implemented. Governance shapes the capacity of the health system to cope with everyday challenges as well as new policies and problems (Greer et al. 2016, p. 4). Governance of healthcare involves the exercise of economic, political and administrative authority to manage the country's health affairs at all levels. It includes the formulation of national health policy and strategic health plans (defining the vision and

directions), exerting influence through regulations and advocacy, collecting and using information, and accountability (NSHDPF, 2009-2015, p. 20). Some important strategic drivers of ICT for health include political will and commitment, and health system needs and opportunities (UNF, 2014, p. 19).

1.4.2. Strategic Government Leadership

Leadership in health includes providing direction and the enabling environment for the various stakeholders to articulate the complex social processes which impact the healthcare delivery system at their level in a participatory way. This allows people's viewpoints and assumptions about their local health system and economy to be brought to light, challenged and tested and jointly developed into a mechanism for achieving positive change (NSHDPF, 2009-2015). The NSHDPF also acknowledges that it is imperative for strategic oversight to be provided through collaboration and coordination mechanisms across sectors within and outside government, including civil society. Leadership will influence action on key health determinants and access to health services while ensuring accountability.

Leadership ensures that policy formulation is deliberately structured and linked to program planning, project selection and task implementation arising from a common shared vision. In providing the right policies and governance in healthcare and eHealth, leaders and policymakers in LRCs must be strategic in the way they think, plan, and implement strategies/policies that would help bring innovative changes. Governments in LRCs must be seen to provide strategic leadership in encouraging eHealth adoption and use. Strategic leadership entails making decisions across different cultures, agencies, agendas, personalities, and desires. It requires the devising of plans that are feasible, desirable, and acceptable to one's organization and partners whether joint,

interagency, or multinational. Strategic leadership demands the ability to make a sound, reasoned decisions—specifically, consequential decisions with grave implications. (Guillot, 2003, p. 10)

Ensuring public policies support effective and equitable eHealth systems is one of the key aspects of WHO eHealth strategies (WHO, Report 2004) These strategies imply that to bring about the desired change through development of policies, the effective communication of these policies, and providing leadership and governance would be very important in encouraging the use of eHealth tools among healthcare professionals. It would then be germane that PHRAs have the right policies, mandates, and legal framework documents to effectively provide professional regulation.

Governments of LRCs need to show leadership in encouraging eHealth adoption and use. One of the key ingredients in providing strategic leadership is for PHRAs to be empowered with the right policy or legislation in place that would guide the regulatory bodies and that they can use as a legal instrument in performing their regulatory mandates. Also, PHRAs need to develop working documents that would not only sensitize the practitioners but would be working tools to be used by staff in the performance of their statutory responsibilities. Primarily, the implementation of these policies in many LRCs even though a major challenge which may lead to wasted efforts, time, and resources, with Nigeria being one of them has if strategically worked out could bring the desired positive effect.

1.5. Geographical Location of Nigeria in Africa and some Health Indices

WHO statistics puts Nigeria's population at 185,989,640. Figure 1.1 further shows the population growth of Nigeria from 2008 to 2016. Average life expectancy of Nigerians at birth in 2016 (male/female) was 55/56 years (Table 1.1).

Figure 1.1: Growth of Nigeria Population from 2008 - 2016. Source: Tradingeconomics.com: National Bureau of statistics, (20118) Nigeria. https://tradingeconomics.com/nigeria/population.

. Table 1.1: Health statistical data of Nigeria showing health indices

Total population (2016)	**185,000**
Gross national income per capita (PPP international $, 2013)	**5**
Life expectancy at birth m/f (years, 2016)	**55/56**
The probability of dying under five (per 1 000 live births, 0)	not available
People dying between 15- and 60-years m/f (per 1 000 population, 2016)	**372/333**
Total expenditure on health per capita (Intl $, 2014)	**217**
Total expenditure on health as % of GDP (2014)	**3.7**

Source: WHO:(2018) Global Health Observatory http://www.who.int/countries/nga/en/

(Int $: current US dollars)

The Atlantic Ocean in the West of Africa (sub-Sahara region) bounds Nigeria to the south, the Republic of Cameroon to its east, the Republic of Benin to its west and Republic of Mali and the Lake Chad basin to its North. It occupies an area of 923,768 sq km (356, 669 sq miles) and is the most populous black nation in the world (Figure 1.2)

Figure 1.2: Map of Nigeria showing its geographical location within the African continent
Source: WHO (2018) Global Health Observatory http://www.who.int/emergencies/crises/nga/en/

Since attaining independence from the British in 1960, Nigeria has been slowly evolving socially, politically, and economically. In the past five decades, Nigeria has witnessed remarkable transformations through an evolution of policies and reforms in her healthcare sector. Notable among these are, the National Health Insurance Act, 2004, National Health Act (NHA), 2016, National ICT Health Strategic Framework, 2016. Also, she recently developed her new NHP which is to be a revised copy of the 2004 document (WHO Africa, 2016). However, over the years these policies and reforms have failed to bring the desired benefits to its citizens despite the

laudable strides taken by the government at the federal level. Factors such as Nigeria's rapidly growing population, the paucity of funds allocated to health in its annual budget (despite being the 6th largest oil producing country in the world), poor planning and implementation, weakness in its healthcare system and brain drain of its scarce healthcare human resources continue to lead to the decline of its health indices (Welcome, 2011, p. 470).

1.6. Statement of Problem

The healthcare workforce is one of the core building blocks of any health system; others include service delivery, health information system, access to essential medication, financing and leadership/governance which ultimately leads to improved health, responsiveness, social and financial risk protection, and improved efficiency (WHO 2010) p.vi-vii. Healthcare workforce data forms a critical part of the data required for healthcare provision planning in any country. Appropriate regulation of the workforce plays a central role in driving healthcare quality of service (Prakash, 2015).

An eHealth Strategy can serve as a vehicle for planning and coordinating different national eHealth actions while still bearing in mind fundamental elements regarding regulatory, governance, standards, human capacity, financing, and policy contexts. PHRAs rely on national eHealth legislation as well as those of their professions, which would likewise be modified or drafted to conform to the expectation of the federal law. An excellent National eHealth Strategy gives rise to sets of interventional programs which the health sector could utilize to promote improved service delivery. In the absence of an overarching national level strategy, ICT initiatives are left in the hands of individual organizations without coordination and with no assurance that they are in the best interest of the unsuspecting public. The UNF indicates that a national level

eHealth strategy which the active participation of the relevant stakeholders in an effort to fill this gap (UNF. 2014) P. 13&20.

Healthcare regulatory agencies are responsible for regulating the training and practice of professionals and accreditation of the healthcare institutions where professional activities take place. Not much is known about the contribution of regulatory agencies to healthcare delivery services in Nigeria (Mora et al. 2018). With eHealth being an emerging concept in many LRCs this may also transcend the knowledge of how eHealth tools might assist health regulatory agencies in enhancing healthcare.

The responsibilities of these health regulatory agencies under the leadership of their various Registrars are similar, even though the healthcare focus of each of the professions is different (see appendix A). "Essentially, they regulate and control the education, training, and practice of healthcare professionals at the healthcare provider centers responsible for the provision of primary health care, secondary and tertiary healthcare services in healthcare institutions" (Mora et al. 2018, p. 94).

Healthcare regulatory agencies are also the "custodian of valid and valuable information with regards to the registry of professionals, their performance, good professional practice, and records of premises where professional activities are taking place" (Mora et al. 2018 p. 94). Another vital role of such agencies is identifying unethical and unprofessional practices of healthcare professionals through registering and issuance of annual licenses and keeping a registry of healthcare facilities where they are employed.

According to the UN, "the best approach to implementing eHealth at the national level is putting in place a framework of strategic plans and policies which lay the foundations for development" (UNF, 2014, p. 31-32). Strategic plans and policies should protect citizens, promote

equity, observe cultural and linguistic issues in cyberspace, ensure interoperability, and allow for capacity development so that all citizens can access eHealth solutions (Mars &Scott, 2010).

Frameworks provide guidance, set rules and clearly define the best methods or solutions to specific situations. An eHealth framework address particular concerns with the use of ICT (Information and Communication Technology) to deliver service through healthcare systems. There are numerous frameworks which could range from being general and providing comprehensive approaches to governing the regulatory environment and guiding implementations within that context, to being specific and focusing on a particular aspect of eHealth, such as data standards (UNF, 2014). The required guidance for eHealth underscores the importance of having eHealth policies that address specific eHealth issues in PHRA, including challenges such as; data governance, interoperability, privacy, and security of information of healthcare practitioners. Overcoming these challenges would not only ensure better accessibility and information sharing among the various tiers of government, healthcare institutions and the 13 PHRAs, but would provide better health and economic planning for scarce human health resources and would help justify budgetary provisions for these regulatory agencies, thereby improving their ability to meet their mandates as specified in the respective establishing legislation.

1.7. Objectives of This Study

1.7.1. General objectives

The general objective of the study is to better understand what impact and roles SGL plays in the adoption and use of eHealth policies in LRCs. In this study, the MDCN is being used as a case study to demonstrate this understanding since it is a government institution established by

legislation with a clear mandate and reliance on legislation and policies in the performance of its statutory roles.

1.7.2. Specific Objectives:

The specific objectives of this study are:

i. To determine the MDCN strategic leadership role and what possible effect these roles may have in reducing cases of medical negligence and malpractice, improve licensure activities and training of medical and dental practitioners through the use of eHealth.

ii. To understand if existing policies related to eHealth in Nigeria (National ICT for Health Strategic Framework 2015-2020, National Health Act 2014, National Strategic Health Development Plan Framework (2009- 2015), National Information Technology Development Agency Act 2007 and the MDCN Act that establishes it, adequately accommodate or encourage effective regulation by healthcare regulatory agencies in Nigeria.

1.8. Research Questions

In the process of exploring the impact and roles SGL plays in the adoption and use of eHealth in Nigeria, the study is intended to answer the following research questions:

1. Does a relationship exist between SGL and capacity for eHealth innovation and technological/infrastructural development?

2. What are the measures taken and the importance of the security and privacy of practitioner records to PHRAs?

3. Does strategic leadership, as demonstrated through policy development, affect the adoption and use of eHealth by employees of PHRAs?

1.9. The Significance of the Study

The study examines existing eHealth policy and other policy documents in Nigeria that may have encouraged or discouraged eHealth adoption and use among PHRAs and health care professionals, specifically medical and dental practitioners who are regulated by the MDCN. These policies and legislation include:

a) The National ICT for Health Strategic Framework 2015-2020; Does its architecture, based on existing laws, encourage data sharing among regulatory agencies and the FMOH? (which appears not to be the case);

b) The National Health Act 2014, with its goal being the regulation, development, management, and advancement of Nigeria's National Health System; How it can influence practice by health professionals and supporting eHealth adoption, with the National Health Research and Information System and Human Resources for Health being essential components;

c) The NSHDFP (2009- 2015), which made provision for the Strengthening of Regulatory Functions of government (regulatory agencies) through supportive supervision and generation of public health information and intelligence. However, the NSHDFP appears to be deficient in how the various regulatory agencies and multiple tiers of government should collaborate to ensure health information management. The NSHDFP also emphasizes the strengthening of the regulatory framework through legislation, with efforts put into reviewing, updating and enforcing Public Health Acts and Laws as well as revising and streamlining roles and responsibilities of regulatory institutions to align with the National Health Act. To date the various laws of PHRAs have not been reviewed since 2004, and do not adequately reflect the current realities by incorporating eHealth into its regulatory activities;

d) National Information Technology Development Agency (NITDA) Act 2007; how has the Act supported PHRAs primarily in the areas of training and provision of the right ICT infrastructures to help the PHRAs in performance of their statutory functions

e) Medical and Dental Practitioners Act Cap M8 (2004) and its subsidiary laws such as its Code of Medical Ethics in Nigeria (2008), Guidelines on Registration as a Medical or Dental Practitioner in Nigeria (2004), and Guidelines of Minimum Standard of Medical and Dental Education in Nigeria. How adequate are these legislation/policies in supporting and encouraging the use of eHealth tools to support regulator responsibilities as enshrined in its mandate?

The study will investigate the relationships between independent SGL and dependent variables (responsibilities of the MDCN; regulation of medical education, professional discipline, registration of physicians and dental surgeons, inspectorate activities of the council, data security and privacy, ICT usability, capacity for technological and infrastructural development and perceptions of Council staff as to eHealth legislation and challenges in Nigeria).

I have been motivated to conduct this study due to the challenge of poor, inadequate or sometimes defective eHealth policies in LRCs which often lead to slow, weak, or inappropriate implementation of eHealth. I want to understand how regulators might have the most significant impact in promoting eHealth through appropriate and implementable policies. Besides, I wish to understand the perceptions and knowledge of employees (management and senior staff) of regulatory agencies like the MDCN of their own legislation, mandates, and responsibilities which may encourage the adoption and use of eHealth by medical and dental practitioners and employees of regulatory agencies. The findings and results of this study are expected to provide policymakers in government agencies with valuable insights and a more reliable guide as to the importance of providing strategic leadership to overcome the challenges faced by most LRCs in the use and

adoption of eHealth. These insights are oriented to the interest of such agencies as the Nigerian FMOH and all thirteen PHRA and Non-Governmental Organizations (NGO's), Economic Planning Agencies and the Ministries of Information and Communication.

1.10. Scope of Study

The study has content, time, and geographic reach. Regarding content, the study aims to determine how best management and senior staff of the MDCN as health regulators understand their roles in providing SGL to encourage physicians and dental surgeon's adoption and use of eHealth in their practices. The geographic scope relates to the number of health regulatory agencies in Nigeria which all perform similar regulatory activities as enshrined in the legislation establishing them as either Councils or Boards.

From the establishment of the Board of Medical Examiners in 1927, other regulatory agencies evolved at different times to the present thirteen health regulatory agencies as cited by Mora et al. (2018, p. 94). The responsibilities of these health regulatory agencies under the leadership of their various Registrars are similar even though the healthcare focus of each of the professions is different. "Essentially, they regulate and control the education, training, and practice of these healthcare professionals at the healthcare provider centers responsible for the provision of primary health care, secondary and tertiary healthcare services in health institutions" (Mora et al. 2018) p. 94.

1.11. Contents of This Thesis

The study is organized into five chapters. Each chapter addresses a specific theme. The first chapter introduces the topic. Some steps have been taken to describe the concept of SGL, health regulation and eHealth policy as factors that affect effective eHealth implementation,

adoption and use in LRCs. The second chapter deals with a review of the literature regarding factors that affect eHealth adoption and use in LRCs, with SGL being the area of focus. This chapter also provides background information of the evolution and development of the Nigerian health system and the MDCN prior to attaining independence.

Existing works of literature as regards eHealth adoption challenges in LRCs are limited, particularly as they relate to eHealth policies and SGL. The third chapter explains the research design and methodology which is used in assessing the impact and roles of SGL in the adoption and use of eHealth. Here, the MDCN is used as a case study which is representative of the thirteen PHRAs in Nigeria since they all perform similar responsibilities and mainly are defined in terms of the professionals, they each regulate. The fourth chapter gives a detailed data analysis and interpretations of the data collected about eHealth policy, an experience of the regulators in the agency. It also includes issues of security, privacy and interoperability, SGL roles of health regulators and agencies, the existence of other challenges and other concerns which may affect eHealth adoption and use by the staff of regulatory agencies and registered practitioners. In the fifth chapter, recommendations and conclusions are presented on the issue under study and some useful suggestions for better eHealth policy planning, implementation by relevant stakeholders and how health regulatory agencies can leverage their existing legislation to improve enforcement, use, and adoption of eHealth in LRCs.

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Chapter Two- Review of Related Literature

2.0. Background

The health sector in any country is critical to social and economic development, with ample evidence that productivity is linked to the quality of healthcare. The World Health Organization (WHO) in recognition of the importance of technology in delivering effective healthcare, at the 115th session of its executive board (2004), noted the growth in technological excellence in low resource countries (LRCs) that have been able to develop expertise in the eHealth field. It, however, noted that these developments were yet to yield their intended benefits, and that it appeared difficult to predict the extent and rate that health systems in these countries would be impacted by such advances. Likewise, the use of technology in modern medical practice by healthcare professionals and providers of healthcare services and healthcare institutions in public and private sectors has transformed the way healthcare services are being delivered across the globe (AIMSE, 2018, para. 1). LRCs must participate in this developmental process, and eHealth innovations are the focus of potential improvements in healthcare around the globe. According to Eysenbach, (2001, P. 1) Intel, for example, referred to eHealth as a coordinated effort taken on by leaders in healthcare and hi-tech industries to fully harness the benefits available through the coming together of the Internet and healthcare.

WHO also reported that as a potential impact, "eHealth should have a positive influence or effect on health systems by bringing about improved and efficient services for all irrespective of status. It should be advantageous to health-care providers, professionals, and final users by providing superior healthcare service and health promotion". The WHO also noted that "eHealth

should also be advantageous when it has to do with health expenditure by reducing redundancy and duplication of examinations and making possible economies of scale" (WHO eHealth Report, 2004. p. 2).

Globally, there is a shared responsibility between government and private entrepreneurs in the delivery of healthcare service to the populace, in creating the enabling environment, funds, human capital development and the right infrastructure (eHealth tools). However, to a large extent the government roles is mainly regulatory, ensuring that health services are effective, affordable, and meet the expectation of those served, relying on policies and legislation to drive key health agendas and programs to improve quality of life. Regulatory health policies and legislation ought to be well thought out, planned, all-encompassing, realistic, attainable, implementable, and sustainable. According to WHO "the importance and growth of Information and Communication Technology (ICT), affecting activities of life, have in recent times brought opportunity and challenge to all countries as witnessed with the 'Millennium Development Goals' (WHO, 2004, p. 1).

In healthcare, human resources and technology (eHealth and its supporting infrastructure through ICT) are very crucial and closely tied to the development of the sector. Having a workforce that is well trained and skilled to manage technological advancement and innovation is vital to the attainment of health goals and objectives. Globally, healthcare professionals often come under mandatory regulation, as some of the regulations are directed by the government rather than through self-regulation. Professional self-regulation is mostly driven by the need to control practice, avoid political influence and to safeguard the lives of the public (Aldridge, 2008).

Healthcare regulatory goals are often achieved through establishment and passage of legislation, policies, and guidelines. Regulatory approaches vary from one jurisdiction to another,

each adopting models and methods that suit their unique environment, culture, and beliefs. In providing the required service to patients, health professionals are influenced by the type of regulation being provided by regulatory authorities, leadership and governance structures, and tools and equipment provided to enable them to perform their duties.

The last ten years have seen an increased use of eHealth tools (such as mHealth, telemedicine, medical applications, electronic medical records (EMRs)) by patients, healthcare professionals and regulators of the medical professions (Evans 2016). High resource countries of the world have led in this increased use of technology while the low resourced countries are challenged because of various factors such as inadequate infrastructure (e.g., electric power), ineffective policies and implementations, lack of funding, and poor budgetary provision for healthcare.

Policy influences the adoption and use of eHealth tools by health professionals and Professional Health Regulatory Agencies (PHRAs), and the challenge of not having well thought out and all-encompassing policies remains a considerable challenge for most low resource countries. The contributions of the effects of policy have been widely reported in the literature and continues to remain a significant obstacle for many low resource countries in catching up with the rest of the world in provision of health services in view of the benefits of eHealth (Borketey, 2017; WHO, 2004; Adebayo & Ofoegbu , 2014; UNF, 2014; Chavula & Chekol, 2010; Smith & Hanson, 2012; Mars & Scott, 2010),; Mandirola, B, et al., 2015, p. 436). These authors argue that regulatory, legal and policy frameworks are challenging to develop and implement in most countries, especially in finding clear policies and coordination between state or federal government agencies and eHealth initiatives.

To scale up the adoption and use of eHealth, various health-related bills, policies and related legislation need to be adopted before possible policy changes can occur. A noticeable gap in much of the literature and one that may have been neglected or overlooked is how various government policies and legislation encourage or discourage the adoption and use of eHealth by PHRAs (regulators). These policies, if available, can help or influence healthcare regulators in low resource countries in the performance of their statutory responsibilities. Some of the questions are yet to be fully addressed by researchers include: What types of policies or legislation are available to professional health regulators? How current are these policies or legislation to reflect current trends and realities? How implementable are these policies and legislation in line with realities in the health sector in these low resource countries and what tools are available to regulators to assist in effective regulation? .

2.1. The Objective of the Literature Review

The objective of this chapter is to identify and establish an understanding from among existing literature relating to the topic of this study; 'Exploring the impact and role that strategic government leadership plays in the adoption and use of eHealth in low resource countries.' The purpose of this literature review is also to develop a clear understanding of how the health system and PHRAs in Nigeria are structured and operate in providing strategic leadership (through legislation, policies, and frameworks) to improve medical regulation of eHealth.

Furthermore, this review gives a background of the evolution of Nigeria's health system from pre-independence to its current state and the role of PHRAs, with the Medical and Dental Council of Nigeria (MDCN) being the agency of focus. This chapter also speaks on some existing

literature involving eHealth frameworks, and implementation, challenges, human resource for health and health systems in some low resource countries. This section is aligned with the objectives of the study.

The study would aim at providing answers to the research questions:

i. Does a relationship exist between strategic government leadership (SGL) and capacity for eHealth innovation and technological/infrastructural development?
ii. What are the measures taken and the importance of the security and privacy of practitioner records to PHRAs?
iii. Does strategic leadership, as demonstrated through policy development, affect the adoption and use of eHealth by employees of PHRAs?

In achieving these aims, the literature on relevant subjects will be synthesized and reviewed descriptively. Key terms already defined in chapter one will come into play (healthcare legislation, policies, frameworks, professional regulations, strategic leadership, and the health system itself) including the study of possible links that exist among them.

2.2. Content of the Literature Review

The content includes:

i) healthcare reforms, developmental plans, and implementation of eHealth through policy, governance, and leadership in Nigeria and low resource countries.
ii) global eHealth policies in developed and LRCs.
iii) eHealth: human resources for health and challenges.
iv) ehealth in low resource countries: roles and uses of data.

v) background of Nigeria's healthcare system: its structure, and contributions to governance and leadership.

vi) governance and leadership: roles and responsibilities of critical stakeholders in the Nigerian healthcare system.

vii) reviews of some selected policies and legislation in Nigeria, and how MDCN relates to eHealth.

viii) theoretical framework.

2.3. Healthcare Reforms, Developmental Plans, and Implementation of eHealth through Policy, Governance, and Leadership in Nigeria and Low Resource Countries

In attaining the health goal of a country, the effectiveness of its health system is seen to be crucial and plays a central role (WHO 2012). While striving to improve on healthcare delivery services and set goals and objectives in the health sector, many countries that are both resource-rich and low resource embark on healthcare reforms. The literature on health sector reform is not lacking. However, there are extensive debates on how the performance of health systems are to be measured in order to assess the impact such reforms bring to healthcare delivery (Tandon et al., 2017, p. 2). The 2017 world ranking of health systems by WHO placed Nigeria as the 187th country out of 190 in the world (Tandon et al., 2017, p. 21). In a review of literature about eHealth in countries which are developing but have severely limited resources Borketey (2017), stated that inadequate eHealth strategic planning and a deficiency of international standards consume government budgets without the attainment of good results. Beginning the development of healthcare systems without ensuring a proper framework implies that implementations might suffer serious fundamental mistakes (Sluijs et al., 2006).

Prior to Nigeria attaining its independence, a 10-year developmental plan (1946–1956) was put in place with the aim of enhancing healthcare delivery. Several medical schools and institutions were developed according to this plan. By the 1980s, there had been a significant development in healthcare— over 10,000 general hospitals and several other health centers had been introduced (Welcome, 2011, p. 472).

Several health policies have been developed and implemented since Nigeria's independence in 1960 to ensure that the government gives sufficient attention to the healthcare needs of its citizens. However, many of these policies are yet to bring the desired succor to the masses. The federal government in 2004 introduced several reforms in health which saw to the introduction of several policy documents used as the basis for health provision.

To achieve success in healthcare in this modern era, a system which is well-grounded needs basic health surveillance to serve as a guide, besides adequate management coupled with strong leadership principles. Reform in the Nigeria health sector introduced legislation and policy/frameworks that may directly or indirectly encourage eHealth adoption and use. PHRAs like the MDCN rely on these in the performance of their statutory roles. These documents include: The National Health policy (Act) document which recently was revised in 2017, the National Strategic Health Plan Framework 2009-2015, the Human Resource for Health strategic plan, and National Health ICT strategic framework.

These pieces of legislation and policies were developed primarily to assist the federal government in providing strategic leadership in all matters involving health in Nigeria. While several studies have reported on many aspects of the Nigerian healthcare system, little work has been done on the aspects of disease tracking and surveillance, and Management Information Systems techniques to meet the needs of the Nigerian populace in the modern era (Welcome, 2011,

p. 471). This lack seems to be implying that a significant shortcoming of the Nigerian healthcare system is the absence of adequate management information system to track crises such as disease outbreaks and mass chemical poisoning (Welcome, 2011, p. 476).

In Nigeria, the health sector has witnessed several reforms in its policies, structure, and organization. In 2016, the Nigerian government introduced the National ICT Strategic Framework for Health (eHealth). Leadership and governance in the development of this policy was provided by the ministries of health and communication with the assistance of the National Information and Technology Development Agency (NITDA) through its enabling legislation. The intent of this policy development is to encourage the adoption and use of eHealth by all stakeholders with the aim of supporting Nigeria's drive towards attaining the World Health Organization (WHO) goal of Universal Health Coverage. Saka et al. (2012, p. 50) described Health Sector Reform (HSR) as a "sustained process of provision of health services, re-organization, management and institutional arrangements that are led by government, and designed to scale-up the performance of the health system for the better health status of the population".

Reforms in the healthcare sector are likewise not new in many low resource countries, and some areas of success, near success, and failures have been recorded in some of the healthcare projects embarked upon. However, the issue of implementation has long plagued many low resource countries, often leading to waste of scarce resources, duplication, and repetition of projects. The need for proper guidance and methodology of implementation has been identified as strategies that hold great promise for the success of eHealth in low resource countries (ITU, 2008).

Hoque & Mazmum (2014) noted that implementing e-Health in LRCs would give these countries opportunities for developing healthcare systems that can provide better and improved quality of healthcare, accessibility, and affordability. Many LRCs like Bangladesh, Nigeria,

Kenya, Swaziland, Ghana and Namibia are currently witnessing rapid advances in eHealth infrastructural development, with contributions from both the public and private sectors. Findings on the current status of eHealth in Bangladesh, as opined by Hoque & Mazmum (2014) and in many other LRCs are yet to be assessed.

In exploring the current status of eHealth in the public and private sectors in Bangladesh, Hoque & Mazmum (2014), examined the technical and managerial challenges facing eHealth projects in Bangladesh and found that despite the challenges Bangladesh faces in eHealth and its healthcare system, the country still had the ability and resources to overcome challenges of human resource, information and data sharing with the right leadership and political will. The study cited the challenge of the public (service recipient) not being aware of services provided by the government and the private sector and recommended the need for the service provider to build a quality ICT based health service that can be readily available with widespread distribution across the country.

Considerable progress and success have been recorded in implementing the use of Information and Communication Technology (ICT) to improve and strengthen health systems in both resource-rich and LRCs, in providing effective healthcare. However, what appears lacking is research on the major barriers to the implementation of eHealth solutions for LRCs (Fulgencio, 2016, p. 2).

Findings from a systematic review of evaluations of eHealth implementations in LRCs conducted by Balya et al. revealed that systems which encourage improvement in communication between institutions show promise in assisting in the management and ordering of medications and helping to monitor and detect patients who might otherwise abandon care. Likewise, the evaluations of personal digital assistants and mobile devices revealed they were effective in

improving data collection time and quality (Blaya et al. 2010). The challenge that arises from the evaluation of eHealth and health system adds to the cost of developing and implementing the systems. Some researchers have argued that these implementations should have evaluations built into the process as they would provide useful feedback to improve the projects and would also demonstrate the impact of the system in the long term. LRCs are faced with many challenges when trying to evaluate systems. These challenges include: the physical environment, power, networking, and availability of technical staff. The quality of data is a constant challenge in health projects, whether they use paper or electronic systems, so tools that can reduce errors to the minimum as well as benefiting other aspects of care are well adopted.

With the rapid growth of eHealth in LRCs, there is clearly an urgency for good evidence of its impact to justify and guide future investment of resources in such systems. Researchers (Fulgencio, 2016, Hoque & Mazmum, 2014). have also argued that, despite increases in evaluations in recent years, most large eHealth implementations have little or no evaluation data. Therefore, the need is great for an increased focus to include evaluations to be embedded as an aspect of eHealth implementations, which should be adopted by organizations implementing or providing funding support for such systems. A methodology which could be adopted is for fund providers to include resources for evaluations or to make them a requirement for implementation.

2.4. Global eHealth Policies in Developed and Low Resource Countries

In 2000 the WHO carried out the first ever overall analysis of world health systems. It utilized five performance indicators to measure health systems in its 191-member states and discovered that France provided the best overall healthcare. This was followed by Italy, Spain, Oman, Austria and Japan (WHO Report, 2000).

The WHO report identified the main reasons for the failure of many health systems to be the respective health ministry's focus on the public sector and often the disregard of frequently much larger private healthcare sector. In many countries, it has been noted that physicians work simultaneously for the public sector and in private practice. The implication of this is that the public sector ends up subsidizing unofficial private practice. With the inability of many governments to prevent a "black market" in health, the resultant effect is widespread corruption, bribery, "moonlighting" and other inappropriate practices (WHO report, 2000). The effect of these "black markets," leads to malfunctioning health systems. Many health ministries fail to enforce regulations that they have created or are supposed to implement in the public interest.

The European Commission declares that eHealth will play a vital role in structural reforms that are desirable to guarantee the sustainability of health systems while ensuring access to health services for all citizens (European Commission. eHealth Action Plan, 2012). According to Borketey, (2017), examples of eHealth technologies becoming extensively used include management systems, such as electronic health records, which permit the acquisition, transmission, and storage of patient data; communication systems such as telecommunication; computerized decision support systems comprising diagnostic support, alerts and reminder systems. Information resources like the Internet have preceded the on-going introduction of many innovative eHealth systems, for instance: broadband networks; the creation of integrated electronic health record systems; systems to electronically share digital images; and websites, which make available health information to the public utilizing the Internet (Waterson, 2014).

In LRCs, eHealth technologies have enhanced health results for chronic disease conditions such as diabetes, hypertension and heart disease (Sahu et al., 2014). The usage of eHealth is regarded as integral to solving problems facing healthcare systems today (van Gemert-Pijnen et

al., 2012). eHealth also has a strong significance in the management of healthcare services. Although there are no misgivings concerning the advantages of information technology use to health (Lasker et al., 2014), most LRCs are experiencing severe barriers to its operational implementation (Jones et al., 2014).

2.5. eHealth: Human Resources for Health, and Challenges

Borketey, (2017) noted that despite the potential advantages of eHealth, implementation of these systems LRCs are frequently reported as challenging. Implementation of electronic health records and electronic prescribing systems has lagged behind most European nations as well as the USA (Ben-Assuli, 2015), while costs related to implementing eHealth regularly spiral upward and time delays are frequent (Lau, 2014). Barriers to implementation of innovations inside the healthcare setting may come about at the individual, organizational, national, continental, and other more comprehensive levels of the healthcare systems, in addition to interacting in complex and variable ways (Sugarhood et al., 2013).

Factors that affect implementation may simultaneously be context-specific and innovation-specific. Research has described financial, social, legal and ethical barriers to implementation, impacting the individual and organizational level. They include user lack of awareness of the benefits, low eHealth literacy, lack of interoperability and a deficiency of evidence of cost-effectiveness as well as security concerns (Currie & Seddon, 2014). Recognizing and understanding barriers facing eHealth implementation becomes crucial for facilitators devising strategies and interventions to develop the extensive and effective use of eHealth, in addition to addressing blockages to implementation (Stroetmann et al., 2012).

The WHO and Adebesin et al. (2013), acknowledged the practice of eHealth as a priority skill in the improvement of human resources in health (WHO, 2013). "Human resources in eHealth need people with knowledge in medical informatics and standard terminology which is increasingly recognized as a critical piece to advance health systems to accomplish the WHO Millennium Development Goals" (Merrell, 2013). Busagala & Kawono (2013), however, argue that the increased cost of acquisition of information technology facilities, particularly at the preliminary stage, and lack of technical skills and resistance to change on the part of healthcare professionals are the main limitations to the implementation of eHealth technologies.

Anon, (2013) alludes to the fact that eHealth implementation is the key to make sure that healthcare information systems are shared among healthcare institutions for continuity of care and says that there are, however, substantial challenges that thwart widespread implementation of eHealth, especially by developing countries such as Ghana. The significant barriers enumerated by Adebesina et al. (2013) include a lack of understanding of the significance of eHealth, lack of initial ICT infrastructures, limited involvement in eHealth standards development and limited human resource capacity for standard eHealth development (Adebesina et al. 2013: Truffer et al. 2010).

Borketey, (2017) noted that a specific challenge for LRCs is ensuring that ICT are effectively mobilized to develop health outcomes and combat disease amongst the most impoverished and most isolated populations (Tanner, 2005). There is now an increased scale up in the adoption and use of eHealth in public institutions of LRCs. Currently, all public service providers are pressured to develop related processes and reduce their operational costs. Minimizing duplicate processes, reaction time and advanced decision making are part of the integral adoption progress (Oyomno et al., 2009; Borketey, 2017).

Health professionals including regulators have also been recognized to be a challenge in the implementation of eHealth. These professionals usually would be first to complain or show concern regarding any change in the system or workflow introduced through eHealth solutions. Most often these professionals and regulators are not prepared or lack capacity for the incoming process which brings about change, often as a result of lack of training programs. An important aspect of the change process and success of implementation is the active participation and collaboration of health professionals and regulators. (ITU, 2008, p. 19).

2.6. Ehealth in Low Resource Countries: Role and Use of Data

EHealth delivers new procedures for using health resources such as information, workforce, facilities, revenue, equipment, and supplies to produce requisite healthcare and services. It is anticipated that, in time, eHealth will assist in improving effective use of these resources (NPC- WHO. Chapter 3.). Mayfield, 2004 & Borketey, 2017 share similar views that in today's world, there is no tolerance for paperwork as countries are trying to switch to digital systems. With digitalization of system at key objectives, the healthcare sector can share information and patient data online, quickly and more effectively, across and among physicians and medical institutions, as well as recording and updating every patient's health history, reports and analyses.

According to Azubuike & Ehiri, (1999), eHealth means everything concerning patients or client information that is accessible online for patients and doctors. EHealth in this regard can brings an end to paperwork, records, and files that take up space in medical centers, resulting in greater monetary returns to the country's healthcare sector. This helps to eliminate the pressure of building infrastructure for record keeping which can be accomplished faster and more effectively by computers (Martínez et al., 2005).

EHealth is influential in Nigeria in monitoring the outbreak and spread of disease, disseminating health information about health-promoting and disease-preventing, training and long-distance support to healthcare practitioners (Borketey, 2017). Acquah-Swanzy (2015) evaluated eHealth record systems in Ghana where she briefly touched on factors that promote eHealth implementation at Efia Nkwanta Hospital. Also, there have been National eHealth Strategy documents and related acts which were enacted by the governments of Ghana, South Africa, Swaziland, Kenya, Uganda, Ruwanda, Tanzania and Nigeria to guide eHealth implementation in these countries (Afarikumah, 2014; Abbott et al., 2016, p. 68-70). These countries all fall into the low-income country classification in Africa according to the World Bank (see Table 2.1 below).

Table: 2.1. World Bank. New country classifications by income level: 2017-2018

Threshold	**GNI/Capita (current US$)**
Low-income	**< 1,005**
Lower-middle income	1,006 - 3,955
Upper-middle income	3,956 - 12,235
High-income	> 12,235

Source: World Bank, https://blogs.worldbank.org/opendata/new-country-classifications-income-level.(GNI = Gross Net Income)

2.7. Background of Nigeria's Healthcare System: Structure, Contributors to Governance and Leadership

2.7.1 Historical perspective

A healthcare system includes all activities, institutions, and funds whose primary purpose is to promote, restore or maintain health (Ogaii & Brisibe, 2015, p. 79). According to Scott-Emuakpor, (2010, 51:53-65) historically, western-style healthcare in Nigeria was started by doctors brought by explorers and traders to cater for their wellbeing during the pre-colonial time. Before then, healthcare consisted primarily of traditional medicine, including herbalists, divine healers, soothsayers, midwives, spiritualists, bone-setters, mental health therapists and surgeons. Church missionaries established the first healthcare services (the Roman Catholic Mission, the Church Missionary Society (Anglican) and the American Baptist Mission). History also records that the first healthcare facility in Nigeria commenced in 1880 as a dispensary in Obosi, in the present Delta state and was operated by the Church Missionary Society. The Roman Catholic Mission in 1885 built the Sacred Heart Hospital in Abeokuta in present day Ogun state, and this was the first hospital in Nigeria. The first government hospital in Nigeria was St. Margaret's Hospital, built in Calabar in 1889 (Scott-Emuakpor, 2010.51:53-65).

Scott-Emuakpor (2010) stated that the amalgamation of the Northern and Southern regions in 1914 gave rise to present-day Nigeria. Those times witnessed the proliferation of military healthcare facilities across the country, with World War I (1914-1918) being a contributing factor. Some of these facilities were soon converted to operate as civilian facilities to serve the healthcare needs of the civil population. Over time the various state governments established their own government-owned healthcare facilities.

At the turn of the twentieth century, Nigeria operated a centralized healthcare system administration controlled by the British and included other West African countries like Gambia, Ghana, and Sierra- Leone with health services expanding in parallel with industrialization. Scott-Emuakpor (2010) and Ogaii & Brisibe (2015) both acknowledge that most of the healthcare professionals at the time were medical doctors who were civil servants employed by the government. The most senior doctor was appointed Chief Medical Officer and became the principal executor of healthcare policies in Nigeria and at the same time head of the Federal Ministry of Health (FMOH). At about 1952 healthcare services in Nigeria were transferred to regional ministries of health (eastern, western, and northern governments) while still maintaining the federal structure which was mainly responsible for healthcare budgets.

According to WHO, the performance of Nigeria's healthcare system was severely undermined by nearly two decades (1983 – 1999) of military rule (NPC-WHO, chapter 3. p. 21). Between 1985 and 1993 per capita investment in health had stagnated at about $1.00 US per person compared to the internationally recommended level of $34 US per person. Before the return of democratic rule in 1999, Nigeria had, since its independence in 1960, been governed mainly by the military which operated through decrees and which did not appear to have brought meaningful benefits to the healthcare needs of the population. It was also an era of increased emigration of its healthcare human resources of mainly physicians and nurses which gave rise to the 'brain drain' syndrome as they departed for better working conditions, training, and remuneration elsewhere.

With the return of democratic leadership in 1999, Nigeria has witnessed an increase in the formulation and review of existing healthcare policies, healthcare and system reforms and enactment of legislation. Many of these activities have had direct consequences on the use and adoption of eHealth and professional health regulation (WHO, 2012, chapter 3.8. p. 28). The latest

and most all-encompassing statute was the National Health Act 2014 which describes the roles and responsibilities of all stakeholders in the Nigerian healthcare sector, funding for training and development of health professionals, and how the Nigeria healthcare system is to be organized and operated.

2.7.2. Nigeria's Current Healthcare System

Despite Nigeria's strategic position in Africa, this is not reflected in its healthcare system. The Nigerian healthcare system has numerous shortcomings. There is a shortfall of healthcare services and personnel in Nigeria, especially in rural areas (Welcome, 2011). Healthcare in Nigeria has over the recent years taken a pluralistic structure that is comprised mainly of orthodox, alternative, and traditional medical practices. Nigeria's 1999 Constitution placed health under the concurrent list, meaning that the healthcare of citizens can be regulated independently by the government at the federal, state, and local levels. Nigeria has 36 states and the Federal Capital Territory (FCT), and 774 local government area councils that are controlled by the relevant state governments. The private sector is also a significant contributor to healthcare provision in all 36 states and the FCT. However, they do not provide leadership as they are all regulated by the ministries of health of each state government. The aim of the decentralization of health services in the country is to ensure the wellbeing of all Nigerians and to promote innovation and efficiency in the health sector.

Currently, all three tiers of government (Figure 2.1) are involved, to some extent, in all the primary health system functions: stewardship, financing, and service provision (WHO 2012). The delivery of Primary Health Care (PHC) is mainly the responsibility of the local government, while secondary and tertiary healthcare delivery is the responsibility of the State and Federal governments respectively (Constitution of the Federal Republic of Nigeria, 1999).

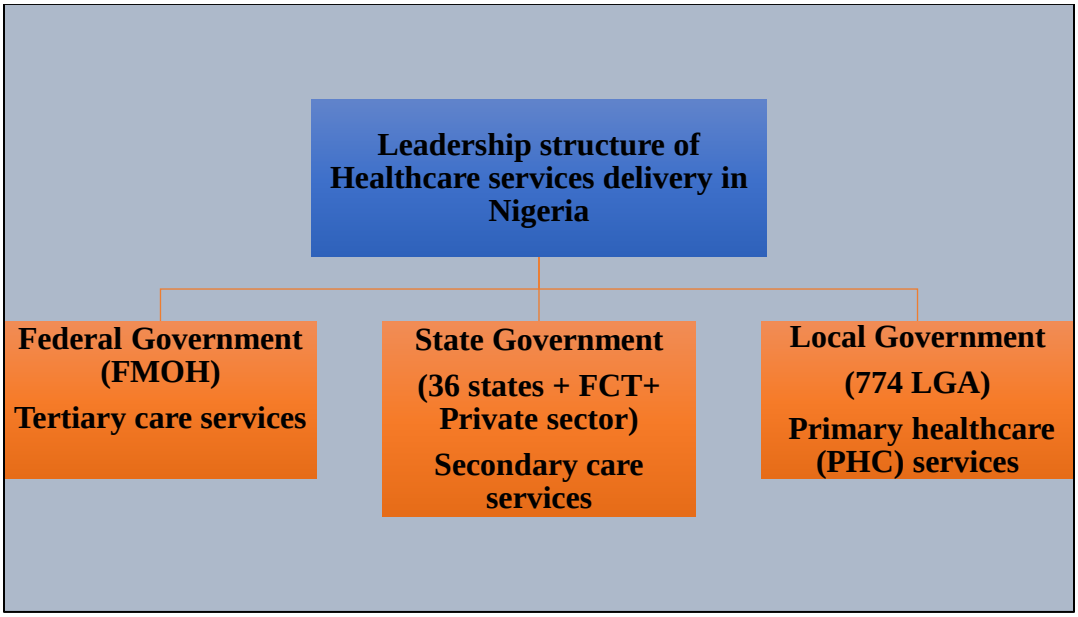

Figure 2.1: Nigeria healthcare structure and responsibilities of government. (FCT: Federal capital territory)

2.7.3. Primary Healthcare (PHC)

The 1988 National Health Policy established PHC services at the local government level. These services are administered through the wards with the objectives of improving collection and monitoring of health data, improving personnel development in healthcare, ensuring the availability of essential drugs and improving immunization programs. Furthermore, the PHC objectives also include promoting treatment of epidemic diseases, improving food supply and nutrition, improving maternal and child care and family planning, educating people on prevailing health problems and the methods of preventing and controlling them. However, this PHC government plan made little impact on the health sector, as it continued to suffer major infrastructural, funding, and personnel deficits, in addition to poor public health management

(Welcome, 2011, p. 470-8). The Nigeria health sector market study (NHSME) observe that the Local Government Area level is the least funded and organized level of government and therefore has not been able to finance properly and organize primary healthcare, creating a fragile base for the healthcare system (NHSMS report March 2015. p10).

Recent literature Ogaii & Brisibe, 2015; Uzochukwu et al., 2018; Welcome, 2011, and Enabulele & Enabulele, 2016) however, reported significant progress in the use of PHC services to strengthen the health system, including improvements in the nation's health indices. The outcome of the progress recorded in the use of the PHC services led to the government establishing the National Primary Healthcare Development Agency (NPHCDA) which has employed the use of ICT in health. The NPHCDA employs the use of ICT in combating infectious diseases, monitoring and reducing cases of maternal and childhood diseases. Government policy has advocated task shifting, recruitment, and training of more midwives, traditional birth attendants and community health workers and improvement of immunization programs. The NPHCDA provides oversight for primary healthcare policy and Midwives Services Scheme and has monitoring and evaluation and ICT units (UNF 2014, p. 17).

According to WHO, a comprehensive health center should have at least three doctors and offer both PHC services and a limited number of secondary clinical services (NPC-WHO 2012, chapter 3, p. 27). There should be at least one comprehensive health center per local government area. Within each ward, there should be at least one Basic Essential Obstetric and Neonatal Care Centre staffed by medical officers or doctors on mandatory national service (National Youth Service Corp) where available; two midwives, two community health officers with nursing/ midwifery background; senior and junior community health extension workers, laboratory, and pharmacy technicians, offering essential preventive and curative services (NPC-WHO, 2012).

2.7.4. Secondary Healthcare

The healthcare governance, leadership, and stewardship at the secondary level of healthcare is the responsibility of the state ministries of health (SMOH). They provide regulation and technical support for primary healthcare services and management of General Hospitals. Tertiary and secondary health facilities should have an appropriate mix of the health workforce as prescribed by their human resource policy.

2.7.5. Tertiary Healthcare

The federal government provides tertiary healthcare services through its teaching hospitals and medical centers. The FMOH supervises activities at this level of care through its Department of Hospital Services.

To further strengthen its healthcare system and better define its health system structure and organization, the 2014 National Health bill received the assent of the President in 2016 and is now known as the National Health Act 2014. The Federal government (through the office of the Minister of Health) provides the leadership required in the health sector through its stewardship and policy direction for the country on matters relating to health. This leadership applies especially in providing a framework for standards and regulation of health services in all public and private institutions, accomplished through the body known as the National Council on Health. (NHA, 2014, Part 1(1)).

2.7.6. Provision of Health Services

In the provision of health services, the FMOH health facilities (HFs) census of 2005 revealed that Nigeria has five hospital beds per 10,000 population, in a total of 23,640 public and private hospitals (Table 2.2).

Table 2.2.: Health Facility (HF) Census 2005 –Federal Ministry of Health (FMOH) showing the number of public and private hospitals.
Source: Nigerian Health Sector Market Study (NHSMS) report 2015. Pharm Access Foundation.

Public hospitals	87.8 beds per million population
Private hospitals **(owned by individuals and cooperate organizations)**	**53.8 beds per million population**
Primary healthcare clinics **(owned by State and Local Governments)**	**85.6% of all HFs**
Secondary hospitals **(mainly Stated Government-owned health facilities with some being private health facilities)**	**14% of all HFs**
Tertiary hospitals **(mainly Federal and State Government-owned health facilities)**	**0.2% of all HFs**

https://www.rvo.nl/sites/default/files/Market_Study_Health_Nigeria

2. 8. Nigeria Healthcare Expenditures

Available data (Table 2.3) from the World Data Atlas shows that Nigerian health expenditure per capita increased from 16 US dollars in 2001 to 97 US dollars in 2015 (table 2.2) growing at an average annual rate of 17.09%. According to World Bank data, total healthcare expenditures continue to rise in Nigeria and were estimated to be US$ 18.3 billion in 2014. Government expenditures on health as a percentage of GDP (figure 2.3) is below the average for Sub-Saharan Africa. Health insurance covered less than 5% of Nigerians at the end of 2013.

Table 2.3: Healthcare expenditures for Nigeria per capita in US dollars (2005 – 2015)

Date	Value	Change, % from the previous year
2015	97	-9.32 %

2014	107	5.45 %
2013	102	11.06 %
2012	92	9.17 %
2011	84	10.33 %
2010	76	12.02 %
2009	68	-16.60 %
2008	81	20.04 %
2007	68	9.53 %
2006	62	33.01 %
2005	47	20.61 %

Source: World Data Atlas. https://knoema.com › World Data Atlas

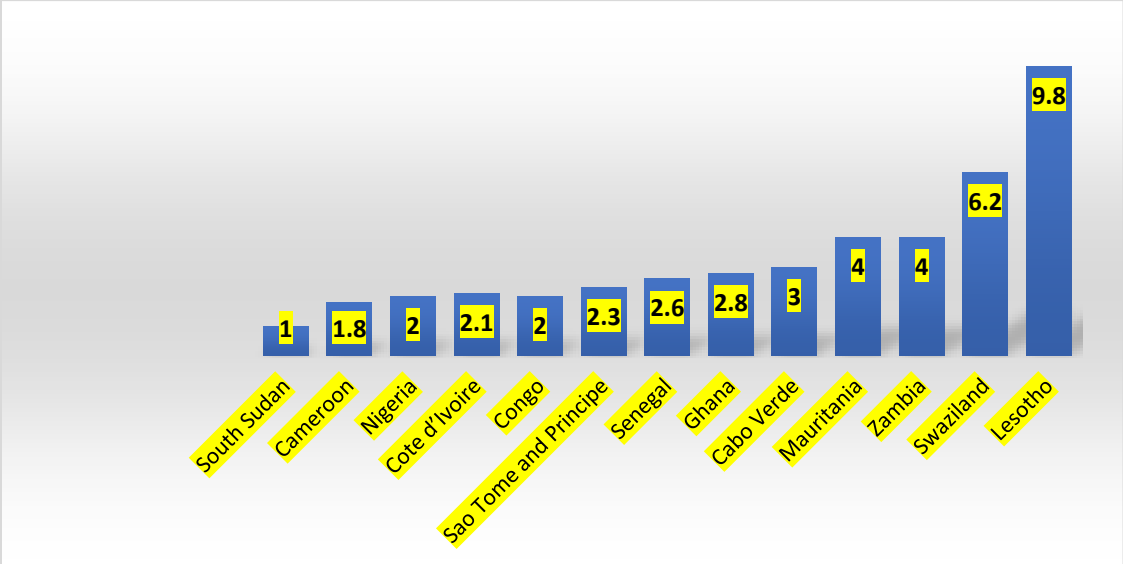

Figure 2.2: Government spending on health as % of GDP (GDP-Gross domestic product)
Source: Nigerian Health Sector Market Study Report.

2.9. Disease Burden

Nigeria is one of the LRCs that is faced with the "double burden" of a persisting high prevalence of communicable diseases and the rising prevalence of non-communicable diseases (NHSMS report 2015). Key health indicators (Table 2.4) such as maternal and infant mortality are worse than the Sub-Saharan African average, and Nigeria was not on track to achieving most of the health-related Millennium Development Goals (MDGs) by 2015 (NHSMS report, 2015).

Table 243: Nigeria Key Health indicators

Maternal Mortality Rate	**560 per 100,000 live births**
Under 5 Mortality Rate	**117 per 1000 live births**
Prevalence of HIV	**3.1%**
Estimated Diabetes prevalence	**4.04%**
Estimated proportional mortality attributable to cardiovascular diseases (CVD)	**12%**
Risk of getting cancer before 75 years of age	**10.4%**

Source: Nigerian Health Sector Market Study Report (CVD- Cardiovascular diseases, HIV-Human Immunodeficiency Virus). https://www.rvo.nl/sites/default/files/Market_Study_Health_Nigeria.

Welcome, (2011, p. 470-8) alluded to the fact that, though the Nigerian health system appears to be better organized and coordinated, the practical workings of the system are not seamless and that often there is duplication and confusion of roles and responsibilities among the

different tiers of government. The result of this is that there are weaknesses in coordinating, tracking and benchmarking performance, a view shared by Adeloye et al. (201, p. 15:32).

2.10. Governance and Leadership: Roles and Responsibilities of Critical Stakeholders in the Nigerian Healthcare System.

2.10.1. National Council on Health (NCH)

Before the creation of the National Health Act 2014, the National Council on Health (NCH) was empowered by the National Health Policy 2004. Policy formulation and leadership in the health sector has been seen as key to the achievement of health-related goals and outcomes. The National Health Act of 2014 which was approved in 2016 empowers the NCH as the highest policy/making body in the Nigerian health sector. Responsibilities of the NCH include policy formulation, protection, promotion, improvement, and maintenance of the health of the citizens of Nigeria (NHA, 2014).

The activities of the FMOH, parastatals/ agencies, state ministries of health and all stakeholders in the health sector are coordinated through the NCH (figure 2.3). Similarly, in each state, the State Council on Health is expected to bring together the state ministry of health and the local government health authorities. The appropriate government agency also regulates profit and non-profit private health institutions.

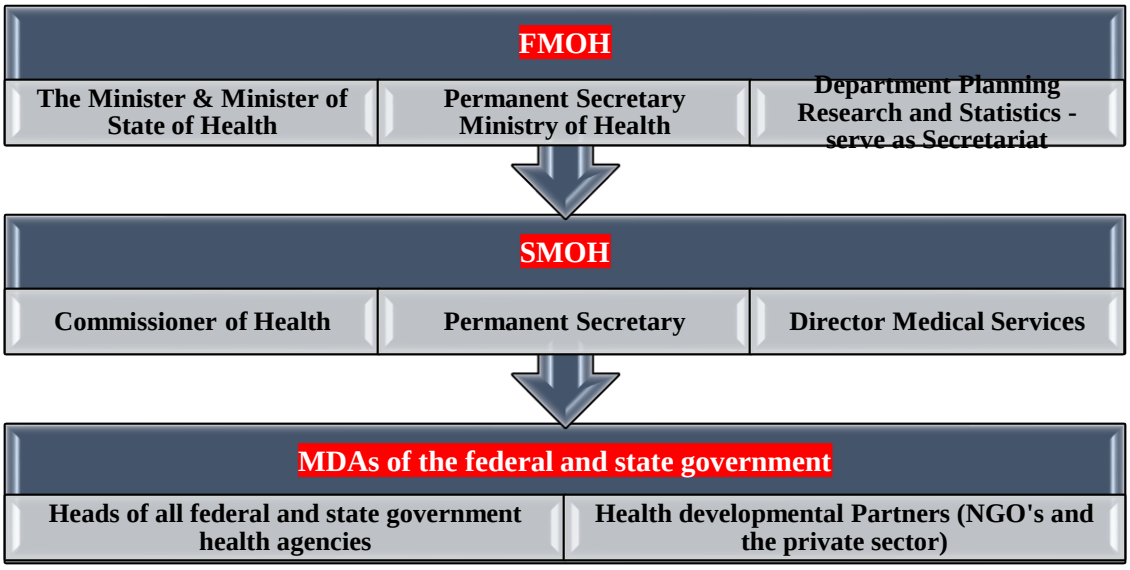

Figure 2.3: Hierarchy in the National Council on Health (FMOH-Federal Ministry of Health, SMOH-State Ministry of Health, MDA- Ministries, Departments, and Agencies, NGO's- Non-governmental Organizations.

The NCH meets twice annually to track and provide direction for the health sector. It is composed of the Minister of Health, who serves as the Chairman, the Minister of State for Health, if any, the Commissioners responsible for matters relating to Health in the States of the Federation; and the Secretary responsible for Health in the Federal Capital Territory, Abuja. The Permanent Secretary of the Federal Ministry of Health serves as the Secretary to the National Council (NHA, 2014).

The FMOH is led by a Minister appointed by the President, who is assisted by a Minister of State for Health, also an appointee of the President. The ministry has an administrative head who is the Permanent Secretary (a career civil servant). More specifically, the Federal Ministry of Health is responsible for policy and technical support for the overall health system, international relations on health matters, the national health management information system, and the provision of health services through the tertiary and teaching hospitals and national laboratories (WHO,

2012, chapter 3.2.1 p. 21). There are several departments in the ministry which specialize in different aspects of healthcare:

- The Family Health department creates awareness for mother and children healthcare.
- The Department of Public Health is concerned with the coordination formulation, implementation, and evaluation of public health policies and guidelines.
- The Department of Planning Research and Statistics duties is mainly concerned with the development of health plans and budgets. It is also involved with monitoring, implementation, and evaluation of health projects. Part of its responsibilities is serving as Secretariat to the National Council on Health and health research this it does collaborate with other agencies of government.
- The Department of Hospital Services oversees over 53 Federal Tertiary Hospitals – Nigeria's teaching hospitals, orthopedic hospitals, and National Eye Centers. The department processes appointments of Chief Medical Directors, supervises the 13 HPRAs (listed above), oral health research, develops policies on nursing, coordinates training programs for nurses and monitors the midwifery service scheme in collaboration with the National Primary Healthcare Development Agency.
- The Department of Food and Drugs Services is involved with the formulation of national policies, guidelines, and strategies on food and drugs. It also ensures that pharmaceutical serves all across the country adhere to ethical standards.

2.10.3. Agencies/ Parastatals/Departments

Good governance in the Nigerian health sector requires collaboration among key actors. As identified by WHO, "Within the FMOH and state ministries of health, the proliferation of the departments and agencies has often outlived the policies that set them up, because as policies change it is common to create new units without reflecting on the moribund departments/ agencies that still exist. It does not then come as a surprise that there exist operational challenges and conflicts in the inter-departmental/ agency working relationships. In the implementation of the Integrated Maternal Newborn and Child Health strategy, therefore, an important goal will be to improve the effective collaboration across departments, agencies and line ministries based on a shared vision". (WHO, 2012., 3.2.5). The various departments of the FMOH highlighted above supervise the activities of the various agencies including that of the PHRAs (Appendix A).

2.10.4. Relationships between Federal Health Agencies and State and Local Governments in Health Matters

There is no direct relationship between the federal health agencies and the 31 state governments and their respective local governments since the constitution of the Federal Republic of Nigeria placed healthcare in its concurrent list. However, the FMOF provides strategic leadership through the NCH.

2.10.5. Mandates, Responsibilities, and Relationships of the 13 Professional Health Regulatory Agencies in Nigeria.

The thirteen HPRAs are under the supervision of the FMOH. They all play essential roles in providing strategic leadership in the regulation of the different cadres of health practitioners under their mandate. However as mentioned in Chapter One and highlighted in Appendix A, their

mandates are all similar except for a few peculiarities which relate to the nature of the practices of these professionals. The MDCN has the mandate of regulating one of the vital human resources for health (medical and dental surgeons) and has a vital role in ensuring that the capacity and discipline of these professionals are strategically developed and harnessed towards the attainment of the goals and vision of this agency (MDP Act. CAP M8. LFN 2004, NHRSP. 2008-2012, NHP 2004 & NHDSP 2009-2015))

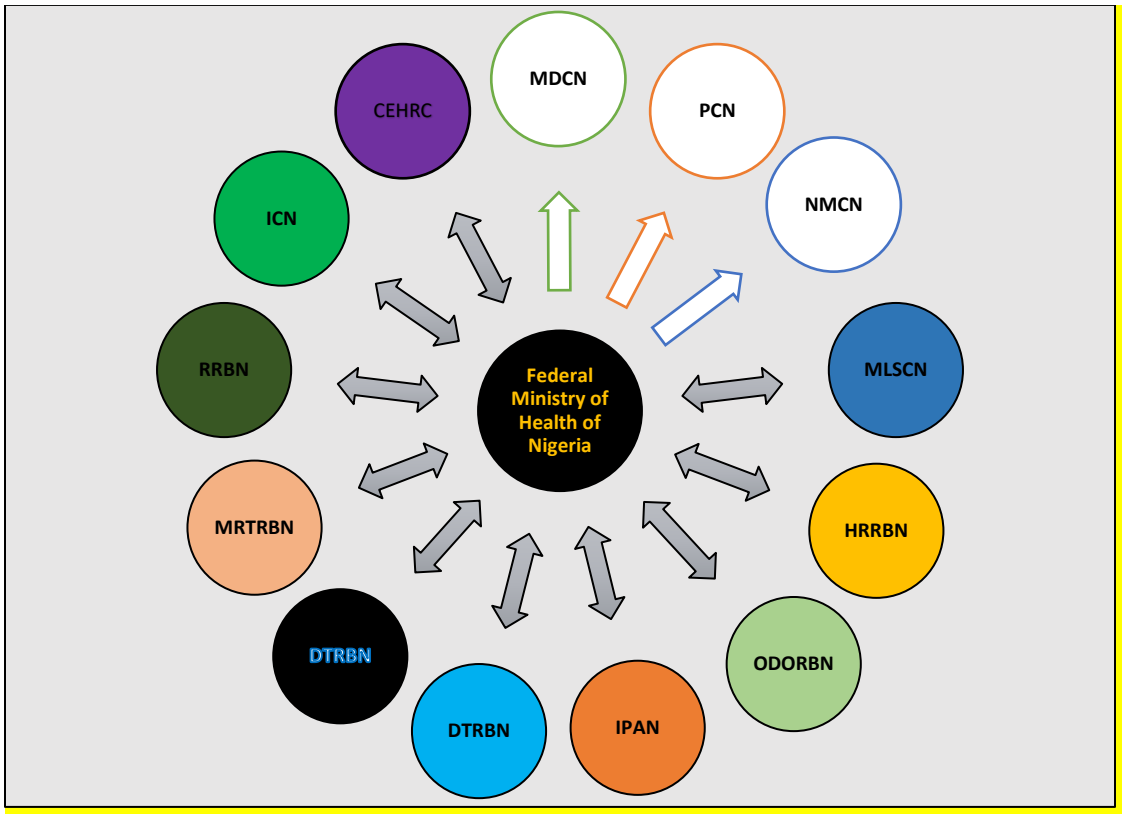

Figure 2.4: Relationship between the FMOH and its 13 professional health regulatory agencies (PHRA). Medical and Dental Council of Nigeria (MDCN), Pharmacy Council of Nigeria (PCN), Medical Laboratory Science Council of Nigeria (MLSCN), Nursing and Midwifery Council of Nigeria (NMCN), Health Record Officers Registration Board of Nigeria (HRRBN), Optometrist and Dispensing Optician Registration Board of Nigeria (ODORBN), Institute of Public Analyst of Nigeria (IPAN), Dental Technology Registration Board of Nigeria (DTRBN), Dental Therapist Registration Board of Nigeria (DTBN)Medical Rehabilitation, Medical rehabilitation therapist Board of Nigeria (MRTBN), Radiographer Registration Board of Nigeria (RRBN), Institute of Chemist of Nigeria (ICN), Community and Environmental Health Registration Board of Nigeria (CEHRB)

Figure 2.4 shows that the FMOH provides governance and leadership to all 13 PHRAs. Each agency under the FMOH has its enabling law establishing it (an Act). The Act prescribes the mandate of each agency and how it is expected to relate with the FMOH. There are some specific matters in which the Minister of Health can act independently as it relates to each agency. However, in some instances, the Minister of Health may only give general comments to guide the agency (MDP Act 2004. LFN). It is also important to state that, except for the MDCN, PCN, and NMWCN, which are councils, the others are boards which make the three councils autonomous in some of their responsibilities, like investigating professional misconduct and malpractice and discipline of erring practitioners. In such instances, the FMOH or the Minister of Health cannot give specific directives to the Councils.

2.10.6. Medical and Dental Council of Nigeria (MDCN)

Medical and Dental practitioner (MDP) Act. 2004. Section 1(2), prescribes the responsibilities of the MDCN, which among others includes; determining the standards of knowledge and skill, maintenance of registries of persons entitled to practice; and reviewing and preparing from time to time, a statement as to the code of conduct for all registered medical and dental practitioners. This responsibility is seen to be similar to that of other professional regulatory agencies in both high and low resource countries.

2.11. Review of Selected Policies and Legislation in Nigeria and the MDCN Related to eHealth (Summary in Appendix B)

2.11.1. National Health ICT Strategic Framework 2015-2020

In 2016 the Honorable Minister of Health (HMH) of the Federal Republic of Nigeria, through the NCH, approved the National Health ICT Strategic Framework 2015-2020 policy. The

HMH in the policy document remarked that Nigeria had shown advancement in the use of ICT for health evident by the use of ICT in the delivery of services to citizens. However, since the health-ICT ecosystem is uncoordinated this has resulted in an inability of citizens to benefit from this technology, resulting in wastage of resources and adverse effects in some cases. One of the critical purposes of the framework was the provision of strategic leadership in the use of ICT in healthcare delivery in the country and by professionals in the health sector. The aim was to achieve universal health coverage and other health goals and priorities (i.e. the 2030 target of Sustainable Development Goals). This document was brought about by a collaboration between the ministries of Health and Communication with the assistance of development partners in the private and public sectors.

The framework defines Health ICT as the use of health ICT and eHealth to support health and health-related fields. It is intended to serve as an umbrella to planning and coordinating different national health ICT efforts while considering other elements such as regulation, governance, standards, policy, financing, and human capacity. The WHO toolkit was used to structure and craft the ICT for the health framework (UNF, 2014, p. 15).

One of the critical outcomes of the National Health ICT vision is improved access to health services and the effective use of telemedicine and ICT for health worker training and support. Also, the framework provides seven critical components of which leadership and governance top the list regarding ensuring alignment with national health goals and priorities. A summary description of the components is shown in Table 2. 5.

Table 2.5: The 7 Components of the Health ICT Enabling Environment

COMPONENTS	**DESCRIPTION**

Leadership and Governance	Focuses on the oversight and coordination of Health ICT activities at the federal, state and local levels, ensuring alignment with national health goals and priorities
Strategy and Investment	Describes the planning for, engagement of an alignment with all stakeholders involved in Health ICT activities and procurement of financing for Health ICT. It also outlines strategies to mobilize ICT in positioning health as an investment with a good return to Nigeria economy
Legislation, Policy and Compliance	Covers national policies and legislation for Health ICT in terms of development, alignment, and regular review
Architecture, Standards and Interoperability	Describes the development and use of enterprise architecture and standards for enhanced interoperability, integration and health information exchange
Capacity Building	Details the empowerment of the health and ICT workforce to develop, use and maintain Health ICT through education and training programs
Infrastructure	Refers to the physical facilities and related assets that form the foundation for Health ICT implementations
Solutions (Services and Applications)	Reports on devices and tools utilized by end users to collect, transmit, access and maintain health information

Source: The 2012 WHO-ITU eHealth Strategy Toolkit, first printed in the report, "Assessing the Enabling Environment for ICTs for Health in Nigeria: A Review of Policies. www.unfoundation.org/assets/pdf/nigeria-policy report

The policy recommended the establishment of a steering committee to provide leadership and governance. The responsibility was ceded to both the ministries of Health and Communication. Since the approval of this framework document, it is yet to realized how other government agencies could leverage the framework to provide leadership to drive these objectives.

2.11.2. National Health Policy (NHP) 2016

Before the development of the Nigeria 2016 NHP, the country has developed and implemented two national health policies which were those of 1988 and 2004 (NHP, 2016. P. 1).

These policies were developed as a result of the evolution of the Nigeria health system and were intended to address critical challenges affecting its health system, in line with global demands. These demands were providing Universal Health Coverage to its citizens, attainment of the health-related Millennium Development Goals (MDGs) and now the Sustainable Development Goals (SDGs) of the United Nations. The United Nations 17 SDGs build on the successes of the MGCs while including new areas such as innovation, with others being climate change, economic inequality, sustainable consumption, peace, and justice, among other priorities.

The necessity of a legislative framework for health necessitated the development of the 2016 NHP, with the hope of providing an appropriate framework that would enhance the relevance of the document to the Nigerian national health efforts and make the goals of its healthcare system more achievable.

According to the Minister of Health, (NHP, 2016), the NHP 2016 took a more in-depth look at the stakeholder base and recognized their importance in the successful implementation of the Policy. The hope was that all state and non-state actors, including the private sector, will closely collaborate with relevant health authorities at the Federal, State, and Local Government levels in the implementation of this Policy, considering the general acceptance that achieving good health is a collective responsibility. The 2016 NHP is to be implemented through the development and implementation of a series of National Strategic Health Development Plans, each covering five years.

The NHP acknowledges Nigeria's challenges in its Health Information System (HIS), noting that there is fragmentation in the country's data systems, due to the emergence of vertical programs and their parallel systems. This illustrated by implementation of the DHIS2 system nation-wide: "The FMOH has established its national health management information software

(DHIS2) for routine health information. However, progress in integrating the various versions of the software by disease programs and partners is slow. The review and harmonization of the data reporting tools were carried out in 2013, but the level of compliance and implementation is still low with different reporting rates across the states. The overall completion rate of the national DHIS 2 database is just over 60%" (NHP, 2016, P. 22).

The NHP 2016 recognizes other challenges related to Health Information Systems. This includes a very weak capacity for the HIS at the sub-state level in regard to its operation at the Local Government Areas, the provision of facilities, untimely production/ reporting of routine data, inadequate utilization of data available for planning and decision making, limited information from the private sector, and little or no operational research activities. Funds allocated by Federal and State Governments to the health information system is inadequate and unable to meet its needs. This challenge resulted in the Federal Government taking the lead in directing partners on the HIS landscape, causing more fragmentation.

Regarding leadership and governance in the health system, the NHP has as its goal the provision of effective leadership and an enabling policy environment that ensures adequate oversight and accountability for the delivery of quality healthcare and development in the National Health System. Its objectives are to effectively use the platform in the health sector for the provision of strategic governance and oversight, to provide clear policy orientation for health development, to facilitate the implementation of legislative and regulatory frameworks for health development (including the NHA, 2014) and to fortify accountability, transparency and responsiveness of the national health system (NHP, 2016, P. 42).

2.11.3. National Health Act (2014)

The development and passage into law of a framework for health in Nigeria took close to a decade, followed by the eventual signing into law of the National Health Bill on October 31, 2014 (Enabulele & Enabulele, 2016). The National Health (NHA) Act 2014, provides a framework for the regulation, development, and management of a national health system and sets standards for rendering health services in the Federation. It is broken down into eight parts which clearly define responsibilities of the various levels of government and its health agencies at both the federal and state levels. That includes health establishment and technologies, national health research and information system and human resources for health among others.

According to Enabulele and Enabulele, (2016, p. 260-261) health-care systems include professionals who are pivotal and essential in providing healthcare services that can be trusted and provide the right services and quality. Health professionals are strategic to the goals of the NHA which includes regulation, development, management, and advancement of Nigeria's National Health System. In order to be successful in the implementation of the NHA and to realize its ultimate benefits of universal health coverage, and improved quality, health outcomes will be dependent on the level of perception, knowledge, and awareness that health professionals have of the NHA.

The NHA has the potential to significantly redefine Nigeria's Health System by influencing practice by health professionals, healthcare quality, and healthcare outcomes. "In order to realize the objectives and goal of the NHA, active and informed participation by health professionals is critical" (Enabulele & Enabulele, 2016, p. 264).

2.11.4. National Strategic Health Development Policy (NSHDP) 2009-2015.

The NSHDP is aimed at providing an overarching framework for sustained health development in the country and has been developed in line with available national health policies and legislation, and internationally set objectives and goals to which Nigeria is a signatory, namely: MDGs, the Ouagadougou Declaration on PHC and the Paris Declaration on Aid Effectiveness (NSHDP, p. 11).

The policy was developed to serve as a guide to federal, states and LGAs in the selection of evidence-based priority interventions that would contribute to achieving the desired health outcomes for Nigerians. It also recognizes leadership and governance as key drivers in the development of the health sector and which the Nigerian health system is lacking. Such leadership and stewardship would strengthen eHealth adoption "Based on a multidimensional assessment of the health sector, the framework identifies eight priority areas for improving the national health systems with specific goals and strategic objectives. They are leadership and governance for health; health service delivery, human resources for health, health financing, HIS, community participation, and ownership, partnerships for health as well as research for health" (NSHDP, p. 18).

Some interventions recommended in the policy to address these challenges include appropriate legislation and regulatory frameworks; generating federal, state and local government consensus through national and state councils on health. Others include effective decentralization of decision- making processes; intergovernmental and multi-sectoral collaboration and coordination of all stakeholders including Public-Private Partnerships; strengthening stewardship roles of government with proper accountability and transparency; and empowering the community and civil society as health sector watchdogs.

2.11.5. Human Resources for Health Strategic Plan (HRHSP) 2008-2012

The HRHSP plan notes that areas with the lowest concentration of health professionals have the worst health indices in the country. The need for close collaboration between the public and private sectors is identified as a way to mobilize resources to develop and retain capable and motivated health workers in the right numbers and the right distribution, essential for overcoming bottlenecks to achieving national health goals. However, the policy was not explicit on the use of technology as an option, such as telemedicine, in overcoming this challenge.

The policy program and activities provide a plan for government at all levels with a guide on how to provide the required leadership in interventions, investments and decision making in the planning, management, and development of human resources for health. The MDCN and the other twelve HPRAs play a central role in assisting the Nigeria government in the development of its human resource for health as their respective mandate empowers them with such responsibilities. The HRHSP reveals critical challenges in health workforce planning, management, and development in the Nigerian situation and how it affects the delivery of health services in Nigeria.

The intended Key Policy Objectives and Strategies for Strengthening the HRH Systems that this policy advocates include: Provide a framework for objective analysis, implementation, and monitoring of measures aimed at addressing the human resource for health crisis in the country; and rationalize and align supply of the health workforce to the priorities of the health sector. Others include the application of best practices for human resources in health management and development that would encourage the appropriate and fair spread and retention of a justifiable and quality number of health workers to ensure universal access to quality health services. Also, the policy recommends institutionalizing performance incentives and management systems that

recognize hard work and service in deprived and unpopular locations; and fostering collaboration among public sector, non-government providers of health services and other human resource for health stakeholders. The policy was not specific about eHealth adoption and use by either PHRAs or healthcare practitioners.

2.11.6. National Information Technology Development Agency (NITDA) Act 2007

NITDA is the federal government agency created to provide ICT leadership, governance, and stewardship. NITDA is involved in planning, research, development, standardization, application, coordination, monitoring, evaluation, and regulation of Information Technology practices, activities, and systems in Nigeria (NITDA Act 2007). Specifically, NITDA responsibilities defined by its enabling law include:

a) provide universal access to Information Technology and systems throughout the country, including all areas which are under-served.

b) provide frameworks to facilitate the establishment and maintenance of appropriate information technology and systems application and development throughout the country, including institutions in the public and private sectors.

c) develop policies for electronic governance and monitor the use of electronic data interchange and other forms of electronic communication transactions as a substitute for paper-based methods in government, commerce, education, the private and public sectors, labor, and other sectors where information and data exchange are required through electronic means.

d) develop framework documents to enable networking among the public and private sectors.

e) develop frameworks for the standardization and certification of Information Technology Codes Domiciliation, Application and Delivery Systems in Nigeria.

f) serve as advisers in all ICT concerns in public and private organizations.

g) motivate and encourage the use of ICT in all activities in Nigeria including the establishment of ICT parks.

h) establish and motivate the use of ICT in all aspects of life in Nigeria including the development of guidelines for setting up ICT and knowledge parks.

i) establish the right regulatory policies and incentives to encourage the private sector to invest in ICT.

j) engage in any activity that will foster collaboration at any level of governance, organization, or person in activities, which in the opinion of the agency can facilitate the attainment of the objectives of this act.

k) determine critical areas in Information Technology requiring research intervention and development in those areas, and

(l) serve as an advisory body to government on ways to encourage ICT development in Nigeria through the introduction of appropriate ICT legislation, to boost national security and vibrancy of the industry.

These responsibilities appear all encompassing and are a considerable challenge for NITDA, considering the environmental, socio-political, budgetary and infrastructural challenges faced by Nigeria as a low resource country. However, the impact of implementing this law to scale eHealth adoption and use seems not to have had any meaningful impact in the health sector, with

Nigeria still faced with issues of standardization, interoperability, data management, and ICT procurement issues, even among public organizations.

2.11.7. Medical and Dental Practitioners Act (Cap M8 LFN 2004)

The MDCN is empowered by the Medical and Dental Practitioner Act (MDPA), Cap M8, LFN 2004 and its subsidiary laws which include: guidelines on registration for medical and dental practitioners of Nigeria 2004, guidelines on minimum standards for medical and dental education in Nigeria 2004, and Code of Medical Ethics in Nigeria 2004. These pieces of legislation and policies were created with the objective of ensuring that the standards and conduct of registered practitioners are always upheld, and the lives of the public are protected.

Medical and dental regulations in Nigeria date to the colonial era. However, upon attaining independence in 1960 from the British, a department for the registration of medical and dental practitioners was created in the FMOH. Increase in medical activities in the country led to registration of many more physicians, which prompted the establishment of the MDCN through the enactment of the Medical and Dental Practitioners Act. The Act became operational from 18 December 1963 (www.mdcn.go.ng).

Since its creation in 1963, the MDPA has undergone several reviews. These were in 1988, 1992 (both times during the military regimes as decrees) and in 2004 which is the most recent. The statutory functions of the MDCN are:

i) determine the minimum standards of knowledge and skill all persons seeking to become members of the medical or dental profession must possess and reviewing those standards from time to time as circumstances may permit;

ii) leverage the provisions of the MDP Act to establish and maintain registers of persons who are eligible to practice in the medical or dental professions and also to ensure that the register is published from time to time, and

iii) editing and producing from time to time, the Code of Conduct which the Council deems appropriate for the practice of the professions in Nigeria (MDP Act 2004).

According to Ogaii and Brisibe (2015, p. 84), there exist a revised policy and several working documents for healthcare development in Nigeria; however, legislative backing of these policies has been minimal. With the MDPA and other subsidiary laws of the MDCN being overdue for review, these laws appear not to be adequate in addressing current medical and dental regulation challenges in the country. Furthermore, these laws should align with the global trend and ICT in the eHealth framework of the Nigerian federal government to encourage eHealth adoption and use.

2. 12. Theoretical Framework and Research Questions

A theory is a clear set of propositions which are seen to be logically interrelated, and which could be tested by experiment to explain in general sets of observations or occurrences (Breton & De Leeuw 2011, p. 83). This study is supported by theories which can help in providing answers to the following research questions:

1. Does a relationship exist between strategic government leadership (SGL) and capacity for eHealth innovation and technological/infrastructural development?

2. What are the measures taken and the importance of the security and privacy of practitioner records to PHRAs?

3. Does strategic leadership, as demonstrated through policy development, affect the adoption and use of eHealth by employees of PHRAs?

2.12.1. Policy and Innovation Adoption Theory

According to Kayiska et al. (2010, P. 260), the ability of African countries to deploy, harness and exploit the developmental opportunities brought about by ICTs to advance their socio-economic development processes is highly dependent on appropriate enabling environments, with suitable legal and regulatory frameworks, related applications, and proper infrastructures.

Bretonni & Leeuw, (2011, p. 82) conclude that the field is still unable to identify with any critical concepts that would clarify the policy process, and that well proven theoretical frameworks to inform research and practice have not yet been utilized. They argue that the notion of 'Healthy Public Policy' was best defined by WHO which was confirmed in the Ottawa Charter

Successfully implementing a policy begins with designing a policy that is well thought out, is a collective effort, and is all-encompassing. Bizikova et al. (2018, p. 47) argued that "Designing public policies to address comingled economic, social and environmental issues effectively is a fundamental challenge facing sustainable development policy-makers in the twenty-first century. Raising the stakes is the added challenge of doing so in today's complex, dynamic and uncertain conditions where policies that do not meet up with such conditions may not achieve their intended purpose, thus hindering the ability of individuals, communities, and businesses to cope with and adapt to change". A number of theoretical frameworks appear to provide clarity to the dynamic process of the implementation of innovations. However, little is known, of factors related to decisions to adopt innovations and how the likelihood of adoption of innovations can be increased (Wisdom et al., 2014).

2.12.2. Theoretical Frameworks of Innovation Adoption and Adoption within the Context of Implementation.

A summary of some theoretical frameworks that relate to innovation, adoption, and implementation are described in Table 2.6. The table also identifies fields these theories could serve as a best fit and countries which have adopted the theories and which LRCs and PHRAs could adapt to scale eHealth adoption and use.

2.12.3. Family of Diffusion of Innovation Model

The family of diffusion of innovations model (Table 2.6) by Rogers 2003; Oldenburg and Glanz 2008 may best fit PHRAs in LRCs, reason being that the theoretical framework cuts across many disciplines and which could be applied in the health sector and comprised characteristics which most LRCs are challenged with such as good maintenance culture, effective implementation, sustainability, infrastructural and technological development and adoption. By ensuring effective SGL is put in place and ensuring that the characteristics as proposed by the researchers which would encourage adoption and use of Innovative ideas are also given priority it is postulated that this may help the adoption, use and implementation challenges in LRCs.

Table 2.6: Theoretical frameworks of innovation adoption and adoption within the context of implementation showing various model as proposed by some researchers and which has been adopted in some disciplines and countries.

FRAMEWORKS: Adoption within the context of implementation (N = 10)	Summary of the theoretical framework	Field	Country
1. Stetler model of research utilization to facilitate evidence-based practice (Stetler 2001)	Five phases of transferring research to practice: 1. Preparation; 2. Validation; 3. Comparative evaluation and decision-making; 4. Translation and application; 5. Evaluation.	Nursing	USA

2. A process model of program change (Simpson 2002)	A heuristic framework is drawn from technology transfer and organizational behavior in related fields involving four stages of change: 1. Exposure; 2. Adoption; 3. Implementation; 4. Practice. Each stage is influenced by personal (e.g., motivation, perceived needs) and organizational (e.g., institutional support, resources) factors.	Substance abuse	USA
2. Reach, effectiveness, adoption, implementation, & maintenance (RE-AIM) (Glasgow 2003; Glasgow et al. 2003)	A design for dissemination along five dimensions: 1. Reach (to target population); 2. Effectiveness (of innovations/ interventions); 3. Adoption (of innovations represented by absolute number of staff/personnel); 4. Implementation (of consistent and accurate delivery); 5. Maintenance (of innovations/interventions as routine organizational practice).	Healthcare	USA
3. Family of diffusion of innovations models **(Rogers 2003; Oldenburg and Glanz 2008)**	Innovation diffusion as a multi-step process: 1. Development; 2. Dissemination; 3. Adoption; 4. Implementation; 5. Maintenance; 6. Sustainability; 7. Institutionalization. Core attributes of innovation affecting speed and extent of adoption and diffusion: 1. Relative advantage; 2. Compatibility; 3. Complexity; 4. Trialability; 5. Observability; 6. Reversibility.	Cross disciplines	USA
4. Ottawa Model of Research Use (Graham and Logan 2004)	Guides implementation of continuity-of-care innovations in practice settings without assuming linearity or uni-directionality of the process: 1. Assess (Evidence-based innovations, potential adopters, and practice Environment); 2. Select and monitor implementation interventions and adoption; 3. Evaluate outcomes.	Nursing	Canada

5. Evidence-Based Model for Diffusion of Innovations in Health Service Organizations (Greenhalgh et al. 2004)	A distilled, detailed model of innovation diffusion spanning the impetus of innovation, individual adoption, system readiness, dissemination, and implementation. Adopters characterized as active seekers of knowledge rather than passive recipients of innovation. Seven aspects of adopters and adoption process: 1. General psychological antecedents; 2. Context-specific psychological antecedents; 3. Meaning; 4. Adoption decision; 5. Concerns in pre-adoption stage; 6. Concerns during early use; 7. Concerns in established users.	Health services delivery	UK
6. Framework of dissemination in healthcare intervention research (Mendel et al. 2008)	Integrates diffusion process (i.e., context, stages, outcomes) with evaluation process (i.e., need-based assessment, implementation/ process evaluation, impact evaluation).	Health services delivery	USA
7. Practical, robust implementation and sustainability model (PRISM) (Feldstein and Glasgow 2008)	Synthesizes four existing models of implementation and diffusion research: 1. Diffusion of Innovations; 2. Chronic Care Model; 3. Model for Improvement; 4. RE-AIM. Considers how innovation/ intervention design, the external environment, the implementation and sustainability infrastructure, and the recipients influence adoption, implementation, and maintenance.	Health intervention	USA
8. Thematic analysis of theoretical models for translational science (Mitchell et al. 2010)	A summative theoretical model that informs knowledge development, transfer and utilization. Four thematic areas: 1. Evidence-based practice and knowledge transformation process; 2. Strategic change to promote adoption of new knowledge; 3. Knowledge exchange and synthesis for application; 4. Designing and interpreting dissemination research.	Nursing	USA
9. Conceptual model of evidence-based practice implementation in public service sectors (Aarons et al. 2011)	Advances existing conceptual model of factors (inner and outer contexts) most influential on the implementation of innovations in public mental health services for children and families. Multilevel, four-phase model of the implementation process: 1. Exploration; 2. Adoption/Preparation; 3. Implementation; 4. Sustainment.	Child welfare, public sector, social service	USA

Source: Wisdom et al (2014. P. 18). Adm Policy Ment Health. doi: 10.1007/s10488-013-0486-4. *https://blogs.worldbank.org/opendata/new-country-classifications-income-level-2018-2019. Accessed 10/17/2018.*

2.12.4. Leadership Theories

In the global context and according to the Cambridge Institute for Sustainability Leadership (CISL), 'good' leadership should ultimately be defined and judged with complex global socio-economic and environmental risks and opportunities, and the pursuit of 'sustainable development' outcomes (CISL, 2017). Some notable leadership theories provided by CISL are shown in Table 2.7.

Table 2.7: CISL Classification of leadership theories as proposed by CISL

Theory/school	Description
Great Man or Trait school	Celebrates outstanding individual leaders (in the heroic tradition) and studies their traits or characteristics to understand their accomplishments as leaders.
Behavioral or Styles school	Describes leadership in terms of people- and task orientation, suggesting that different combinations of these produce different styles of leadership.
Situational or Context school	Emphasizes the importance of context in shaping leaders' responses to be more relationship or task motivated, or more authoritative or participative.
Contingency or Interactionist school	Proposes that leaders' influence is contingent on various factors (like positional power), which in turn determines appropriate leadership styles.
Transactional or Transformational school	Contrasts leadership as a negotiated cost-benefit exchange and as an appeal to self-transcendent values of pursuing shared goals for the common good.

Source: University of Cambridge Institute for Sustainability Leadership (CISL). https://www.britishcouncil.org/sites/default/files/final_leadership_literature_review.pdf. Accessed 08/22/2018

Leadership has to do with the behavior of an individual or group that influences others towards the attainment of goals that are shared. Al-Sawai, (2013), belongs to the school of thought that leadership role involves influencing group activities and coping with change. This shares the view that the challenge when considering leadership of healthcare professionals is that most theories developed did not consider the healthcare sector, and that most of the thoughts of these theories were related more to the business setting and then applied to healthcare. Published research to which he further alluded did not provide substantial evidence that there exists a strong association between leadership initiatives and improvements in patient care or organizational outcomes when applied in the healthcare setting (Al-Sawai 2013).

The CISL made a distinction between political and policy leadership and defining political and policy leadership; The CISL review understands 'political' leadership as more than the preserve of politicians with formal power. on the other hand, it refers to the political context in which leadership is exercised, with a specific focus on delivering public value. 'Policy' leadership relates more to the development of policy which connects to the delivery of public value. The definition of 'administrative' leadership refers to the leaders of public agencies, who might be responsible for carrying out policy, as well as recommending and shaping actions. Actors within the system may be involved in political, policy and administrative leadership in a variety of ways (Ensley et al. 2006).

CISL gave nine recommendations of which recommendation five directly addresses this thesis, on how government through its agents of staff should act in leadership positions especially in fostering good relationships among the individual staff of the organization and also in collaborating with stakeholders. By so doing CISL believes would encourage eHealth use and adoption thereby making the relationship among key players right and lead to the ideas, policies

and implementation processes given the desired attention which would be impactive on their responsibility as regulators in the health sector (Table 2.8).

Table 2.8: The nine CISL recommendations of good leadership

S/N	**Recommendations**
1:	'Good' leadership should ultimately be defined and judged in relation to these complex global socio-economic and environmental risks and opportunities, and the pursuit of 'sustainable development' outcomes.
2	Good' leadership will require the cultivation of a 'global' and a 'systems' mindset, developing skills of open-mindedness, inclusivity, long-term and systemic thinking, and navigating complexity without trying to artificially reduce it.
3	'Good' leadership should be understood, not only in terms of outcomes (e.g. sustainable development) but also in the motivation and character of leaders, bearing in mind that certain traits are valued more by different genders and ages.
4	'Good' leadership is also defined in terms of its process – who is involved, who is empowered – and the values underpinning such decisions. It should take care not to focus unduly on individuals with formal power, but also consider the role of followers, and distributed leadership
5	'Good' leadership in a political or policy context would benefit from applying the three tests of public value, legitimacy, and capability. In terms of the specific skills required by those seeking to bring about change, a focus on the role of policy entrepreneurs could be instructional.
6	'Good' policy and political leaders need to develop the ability to 'read the context' so that they understand the most pressing challenges and likely opportunities.
7	Some basic foundations of good leadership can be drawn and conveyed from the international literature while tailoring examples and aspirations to suit each cultural context
8	A hybrid model of leadership development is likely to add most value – focusing on knowledge, values, and skills – although there may need to be some adaptations as some nations are further than others along the prescriptive-interactive-experiential learning spectrum.
9	Development of a leadership competency framework would provide a structured approach to leadership development for the British Council, but it should also seek to develop the underlying mindsets, motivations, values, and character that will encourage young leaders to strive for positive global impact as the goal of their leadership efforts.

Source: University of Cambridge Institute for Sustainability Leadership (CISL). https://www.britishcouncil.org/sites/default/files/final_leadership_literature_review.pdf. Accessed 08/22/2018.

CISL recommendation five states that: many benefits would be derived from applying the three tests of public value, legitimacy, and capability which would result in 'Good' leadership in a political or policy context. Regarding the specific skills required by those seeking to bring about change, a focus on the role of policy entrepreneurs could be instructional. Findings from the policy and political literature also emphasize the importance of context. Described in the literature by the

University of Cambridge Institute for Sustainability Leadership (CISL) are contextual factors such as political ideology, economic crisis, historical events, and international agendas which all impact upon how a policy actor might act promptly. Note that these characteristics contribute to why the external environment in all leadership development is a priority. Despite this variation, however, charismatic/values-based leadership (strongly linked with transformational leadership) is universally preferred.

2.12.5. Proposed Theory for Low Resource Countries

From the preceding, theories of policy and innovation adoption would appear to provide strategic leadership in the direction of policy development and implementation for developing and LRCs. This would create a suitable environment for infrastructural development and innovation applications through the use of eHealth tools to deliver efficient and cost-effective healthcare delivery while also ensuring that the right legal and regulatory frameworks are in place.

From table 2.6, the 'family of diffusion of innovation models' as proposed by Rogers 2003; Oldenburg and Glanz 2008 would appear to suit this study and one that could aid the adoption and use of eHealth in PHRAs in LRCs. The advantage of this model over others the study found is that the model cuts across disciplines and has attributes of innovation. That could be applied to health regulatory institutions. This would be a multi-step process involving; i. Policy development; ii. Dissemination; iii. Adoption; iv. Implementation; v. Maintenance; vi. Sustainability; and vii. Institutionalization.

2.13. Summary of literature review and knowledge gap

There appears to be a clear understanding of eHealth and innovation, its benefits, and challenges in LRCs. Healthcare governance, leadership, and stewardship in the Nigerian healthcare system were also largely well reported as evident by the existence of a substantial

number of policies and legislation in the Nigerian health sector dating back to pre-independence. These could be leveraged by relevant stakeholders in health to encourage eHealth adoption and use. However, understanding how best to streamline and implement these policies and legislation remains an uphill task for the relevant government agencies.

Many of the policies relating to eHealth or Health Information Systems appear not to be specific to the mandates of PHRAs as they appear rather general or implied, with most of the legislation and subsidiary laws of the specific PHRA deficient as to regulating practitioners and health facility users of eHealth tools. Factors such as lack of political will, healthcare placed in the concurrent list in the Nigerian 1999 Constitution, conflicting legislation and mandates especially among the PHRAs who have similar mandates and interprofessional rivalry, and poor budgetary allocation to health and system interoperability infrastructural challenges have been debated as factors that would discourage eHealth adoption and use. Furthermore, an observed challenge is the drought of available literature on Nigerian PHRAs, their activities and how they inter-relate with each other. Research and documentation of relevant statistical data are to be encouraged among PHRAs to build a healthy population of literature that could be relied upon to advance eHealth development in LRCs.

This study is critical in identifying the impact and roles strategic government leadership would play in eHealth adoption and use by PHRAs in LRCs, specifically the Medical and Dental Council of Nigeria. In doing so, the study may help to fill the gaps in the literature concerning the impact and roles strategic leadership in PHRAs can play in encouraging eHealth adoption and use among employees of these agencies and also practitioners in LRCs. These can support government efforts in the provision of universal health coverage efficiently and effectively, with PHRAs developing policies for using eHealth tools to deliver their mandates and responsibilities.

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Chapter Three - Research Design and Methodology

3.0. Introduction

This research is a combined descriptive and quantitative study using survey techniques based on a formal literature review. According to Kelley et al., (2003, p. 261) descriptive studies are used to estimate specific parameters in a population (e.g., the prevalence of infant breastfeeding) and to describe associations (e.g., the association between infant breastfeeding and maternal age). Green (2006), notes that the purpose of a literature review is to report the current knowledge on a topic objectively and to base this summary on previously published research. To provide a better understanding of the research topic and potential answers to questions a systematic review of literature was performed.

The literature review involves identification of inclusion criteria as well as criteria for exclusion of publications (journal articles, books, reports), identification of search words, and search engines to be used.

3.1. Ethical Consideration

Ethics permissions included authorization from the McMaster Research Ethics Board (MREB) to conduct the study, approval from authorities of the MDCN to contact participants, and assigning a recruiter from among employees of the MDCN. Issues of privacy and confidentiality of the participant's information were addressed including mode of data storage, duration of storage and usage. Ethical clearance was obtained from the MREB and permission for the study was obtained from the Registrar/CEO of the MDCN before actual data collection. The respondents were informed of the objectives of the study, benefits, duration of data and personal information storage, before requesting their consent. The data were collected in a manner that ensured confidentiality of the respondent.

3.2. The Methodology of the Review of the Literature

The search for literature began with a general review of the topic and a history of the Nigerian healthcare system. This was then narrowed down to a systematic review to be able to provide answers to the specific questions about government leadership in healthcare legislation and policies.

A systematic literature review approach was employed in this study. According to Neale, (2009, p. 51) "a systematic literature review employs the use of existing articles to process information, it is completed by figuring subjects giving rise to results in which opinions are shared, accountable and relied upon as proof-based facts for policy-making and practice."

3.3. Data Collection and Search Strategy for the Articles

A descriptive survey method was used in the study incorporating existing materials and previously developed questionnaires which share some similarity. The articles used for this research work were one hundred and sixty-five (165) in number. The search strategy was completed using Google Scholar and PubMed. A total of twenty-seven (27) publications were accessed from organization and government websites with the aid of *Google*. The McMaster library portal was also used to complete the search and access full articles after reading their abstracts.

3.4. Keywords Searched, Inclusion and Exclusion Criteria

The keywords used in the search for the articles includes; eHealth, information communication technology (ICT), adoption, framework, healthcare regulation, healthcare policy

implementation, innovation adoption, healthcare workforce, health systems, governance, strategic leadership, professional health regulation and low resource countries, and Nigeria.,

Furthermore, in conducting a literature search, the researchers would often have to state their inclusion and exclusion criteria (Table 3.1) for the study.

Table 3:1 Inclusion and exclusion criteria for the literature search

Inclusion criteria	Exclusion criteria
Articles are written in the English language	Articles not written in English
The title fits according to the research questions	Articles published before 2007
Articles published after 2007	
Articles that refer to health policies and legislation	
Articles that discuss Health systems in developing and/or low resource countries	
Articles that refer to eHealth, Health Information Systems Management or ICT	
Articles that discuss professional healthcare regulation	
The article that discusses leadership, stewardship, and governance	

The steps involved in searching the databases are shown in Figure 3.1. These processes were archived with the aid of the outlined search words and established criteria as stated above:

The total articles that appeared from the search engines used (Google Scholar and PubMed) were 272 altogether. When the inclusion/exclusion criteria were employed this pruned the number of articles to 156 and 18 for Google Scholar and PubMed articles respectively. A further reading

of each article gave rise to 165 relevant articles used for the study (Google Scholar = 155 and PubMed =10).

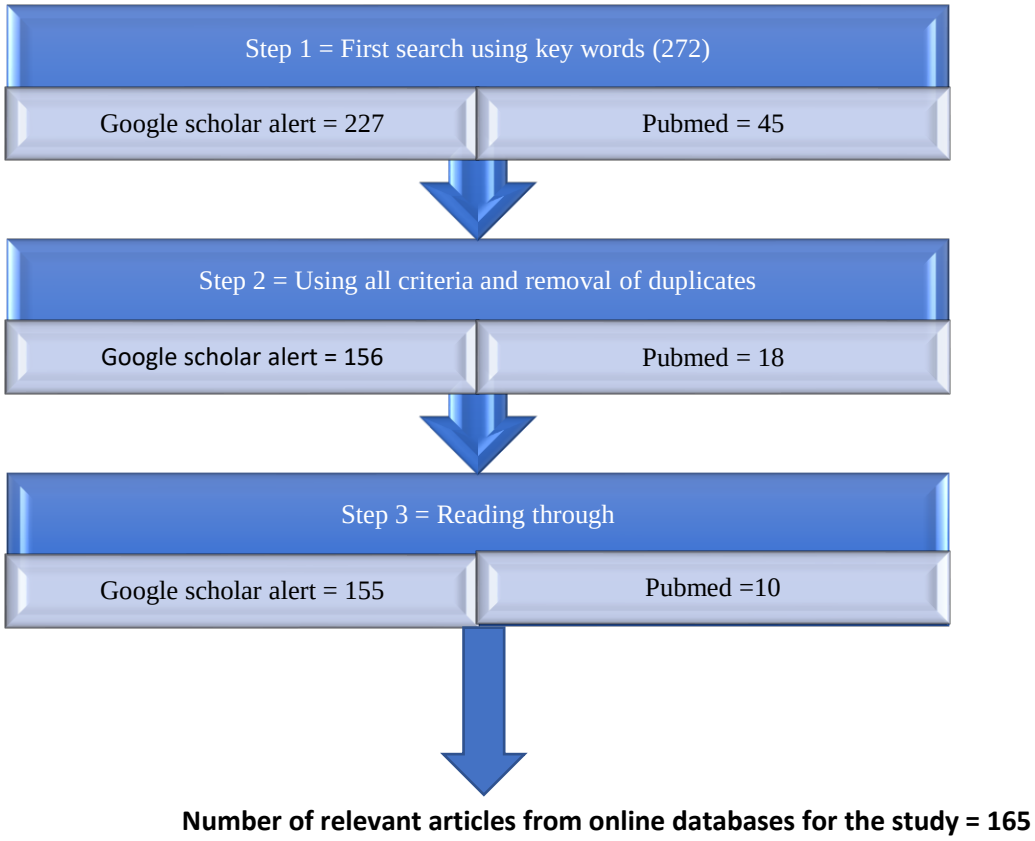

Figure 3.1: Shows steps involved in search strategy of articles used in the study

Aside from the 165 articles accessed from the two online search engines, 27 other materials were found to be relevant for the study. They are comprised of, books, organizational policies and legal documents which were obtained from the organizational websites and from the *Google* website (Grey literature). From the total of 165 articles that were relevant for the study, 22 of the articles had duplicates which were discarded. (See figure 3.2 for the PRISMA chart). The graphic below is short of the 165 papers that met the inclusion criteria, since those not mentioned in this section appear and are major contributors in the other chapters of the thesis.

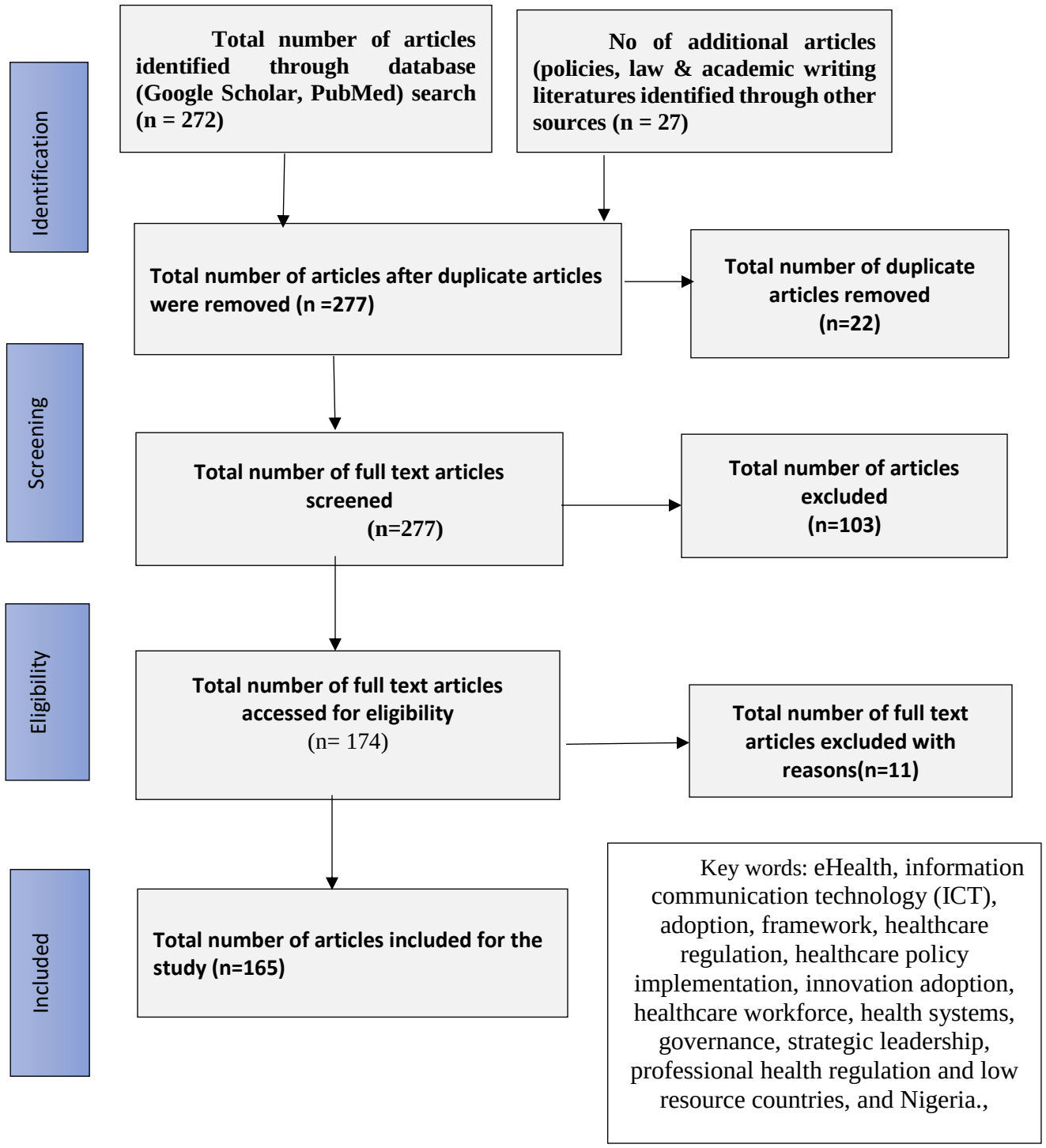

Figure: 3.2. PRISMA chart showing steps taken in the review of the literature on the study of impact and role that strategic government plays in the use and adoption of eHealth in low resource countries.

3.5. Research Design

This involved the use of existing literature, in the field of eHealth, health regulation, relevant policies, and legislation which all would assist in dealing with the research questions.

3.5.1. Review of Existing Literature and Development of Survey Tool (Online Semi-Structured Questionnaire)

The purpose of reviewing existing literature was to ensure a thorough understanding of the topic, to identify potential areas for research, to identify similar work done within the area, to identify knowledge gaps that demand further investigation, to compare previous findings and to critique existing findings and suggest further studies among others.

The survey tool used to gather data from MDCN staff was an online semi-structured questionnaire. The questionnaire comprised six personal information questions, fifteen structured multiple sets of statements which consisted of the constructs used in the study, and three open-ended questions. Participants accessed the questionnaire via an online link after emails were sent to them by the MDCN recruiter, a middle-level staff employee.

The fifteen constructs developed in the questionnaire were based on findings from the literature searched (Table 3.1) and identification of some common challenges that complicate the use and adoption of eHealth in low resource or developing countries. Table 3.1 summarizes and identifies each construct and its related statements, the reasons they were chosen, and references for each of the constructs and statements.

Table 3.1: developed constructs, related statement, and references

Constructs and statements	References
1. Strategic Government Leadership	Leon, N., Schneider. H, and Daviaud, E (2012). *applying a framework for assessing the health system challenges to scaling up mHealth in South Africa.* BMC Med Inform Decision Making. **12**: p. 123. van Dyk, L. (2014). A review of telehealth service implementation frameworks. *Int J Environ Res Public Health, 11*(2), 1279-1298. doi:10.3390/ijerph110201279 Hanson, K., Cleary, S., Schneider, H., Tantivess, S., & Gilson, L. (2010). Scaling up health policies and services in low-and-middle-income settings. *BMC Health Serv Res, 10 Suppl 1*, I1. doi:10.1186/1472-6963-10-S1-I1 Breton, E., & De Leeuw, E. (2011). Theories of the policy process in health promotion research: a review. *Health Promot Int, 26*(1), 82-90. doi:10.1093/heapro/daq051
• The Federal government policy is supportive of eHealth	
• The Medical and Dental Council of Nigeria (MDCN) governing council is well enlightened and supportive of eHealth use and adoption by registered practitioners.	
• MDCN has updated policy guidelines for eHealth regulation	
• eHealth policies are aligned with strategic health goals	
• eHealth policies align with funding sources	
• eHealth policies state common ICT (Information and Communication Technology) standards	
• eHealth policies align with and are supportive of regulatory agency mandates	
• MDCN eHealth policies/guidelines are supportive of practitioner readiness to use and adopt eHealth tools in their practice	
2. Human Resources for Health	Mackey, T. K., & Liang, B. A. (2013) Restructuring brain drain: strengthening

	governance and financing for health worker migration. *Glob Health Action, 6*, 1-7. doi:10.3402/gha.v6i0.19923 Shiferaw, A. M., Zegeye, D. T., Assefa, S., & Yenit, M. K. (2017). Routine health information system utilization and factors associated thereof among health workers at government health institutions in East Gojjam Zone, Northwest Ethiopia. *BMC Med Inform Decis Mak, 17*(1) ,116. doi:10.1186/s12911-017-0509-2
• Medical and dental practitioners are aware of the MDCN guidelines that support eHealth	
• There are adequate registered medical and dental practitioners with eHealth expertise.	
• Registered practitioners comply with eHealth regulations of the MDCN	
3. Federal Ministry of Health (FMOH) and the Medical and Dental Council of Nigeria (MDCN) Capacity for Innovation	Leon, N., Schneider. H, and Daviaud, E (2012). *applying a framework for assessing the health system challenges to scaling up mHealth in South Africa.* BMC Med Inform Decision Making. **12**: p. 123. van Dyk, L. (2014). A review of telehealth service implementation frameworks. *Int J Environ Res Public Health, 11*(2), 1279-1298. doi:10.3390/ijerph110201279 Bizikova, L., Swanson, D., Tyler, S., Roy, D., & Venema, H. D. (2018). Policy adaptability in practice. *Policy Design and Practice, 1*(1), 47-62. doi:10.1080/25741292.2018.1436376 Hanson, K., Cleary, S., Schneider, H., Tantivess, S., & Gilson, L. (2010). Scaling up health policies and services in low-and-middle-income settings. *BMC Health Serv Res, 10 Suppl 1*, I1. doi:10.1186/1472-6963-10-S1-I1 Breton, E., & De Leeuw, E. (2011). Theories of the policy process in health promotion research: a review. *Health Promot Int, 26*(1), 82-90. doi:10.1093/heapro/daq051

• There are adequate resources and capacity to drive eHealth policy development at the MDCN	
• There is adequate capacity for implementing regulatory activities on eHealth among practitioners at the MDCN	
• There is a capability for assessment of readiness for eHealth acceptance and use at the FMOH	
• There is a functional and reliable ICT environment at the MDCN	
• There are effective mechanisms for the implementation, support, monitoring, and evaluation of eHealth projects at the FMOH	
4. Technology Infrastructure	Leon, N., Schneider. H, and Daviaud, E (2012). *applying a framework for assessing the health system challenges to scaling up mHealth in South Africa.* BMC Med Inform Decision Making. **12**: p. 123. van Dyk, L. (2014). A review of telehealth service implementation frameworks. *Int J Environ Res Public Health, 11*(2), 1279-1298. doi:10.3390/ijerph110201279 Shiferaw, A. M., Zegeye, D. T., Assefa, S., & Yenit, M. K. (2017). Routine health information system utilization and factors associated thereof among health workers at government health institutions in East Gojjam Zone, Northwest Ethiopia. *BMC Med Inform Decis Mak, 17*(1), 116. doi:10.1186/s12911-017-0509-2 Eysenbach, G. (2000). Towards ethical guidelines for e-health: JMIR theme issue on eHealth ethics. *J Med Internet Res, 2*(1), E7. doi:10.2196/jmir.2.1.e7
• MDCN has an integrated and sustainable technology infrastructure in place	
• There is widespread availability of ICT infrastructure across the offices of the MDCN	
• The ICT infrastructure is reliable and available 24/7	
• There is the availability of a technologically trained support workforce at MDCN	
5. ICT Usability	Leon, N., Schneider. H, and Daviaud, E (2012). *applying a framework for assessing the health system challenges to scaling up mHealth in*

	South Africa. BMC Med Inform Decision Making. **12**: p. 123. van Dyk, L. (2014). A review of telehealth service implementation frameworks. *Int J Environ Res Public Health, 11*(2), 1279-1298. doi:10.3390/ijerph110201279
• ICT technology that has been adopted by the MDCN is easy to learn	
• ICT technology that has been adopted is easy to use	
• ICT technology that has been adopted is flexible and durable	
6. Interoperability	Leon, N., Schneider. H, and Daviaud, E (2012). *applying a framework for assessing the health system challenges to scaling up mHealth in South Africa.* BMC Med Inform Decision Making. **12**: p. 123. van Dyk, L. (2014). A review of telehealth service implementation frameworks. *Int J Environ Res Public Health, 11*(2), 1279-1298. doi:10.3390/ijerph110201279
• Electronic communications support links among FMOH and professional health regulatory agency ICT platforms	
• Technological solutions can be integrated with existing work practices	
• There are common standards for eHealth technological applications among FMOH and professional health regulatory agencies	
7. Privacy	Zriqat, I.A., and Altamimi, AM (2016). *Security and privacy issues in eHealthcare systems: Towards trusted services.* Int J. Advanced Comp Sci Appl. **7**(9): p. 229-236.
• Regulations have been developed for protecting patient healthcare data managed by registered practitioners	
• Regulations for protecting patient healthcare records are in use and are being enforced	
• The Act of the MDCN is clear about the privacy of patient healthcare information.	
• Privacy of healthcare data is an important concern of patients	
8. Security	Zriqat, I.A., and Altamimi, AM (2016). *Security and privacy issues in eHealthcare systems:*

	Towards trusted services. Int J. Advanced Comp Sci Appl. **7**(9): p. 229-236.
• Security is an important consideration in the MDCN policy guide on eHealth	
• The staff of the MDCN is trained to recognize and avoid malicious attacks on systems and data	
• Data transmission is handled by secure networks	
• Databases are encrypted to prevent data theft	
• Databases are securely backed up regularly to support quick recovery in case of system failure	
9. Data Governance	Were, V., & Moturi, C. (2017). Toward a data governance model for the Kenya health professional regulatory authorities. *The TQM Journal, 29*(4), 579-589. doi:10.1108/tqm-10-2016-0092. Shiferaw, A. M., Zegeye, D. T., Assefa, S., & Yenit, M. K. (2017). Routine health information system utilization and factors associated thereof among health workers at government health institutions in East Gojjam Zone, Northwest Ethiopia. *BMC Med Inform Decis Mak, 17*(1), 116. doi:10.1186/s12911-017-0509-2
• Data from internal and external sources are relevant to policy decisions at the MDCN and at other professional health regulatory agencies	
• Data used for regulatory decisions at the MDCN are accurate.	
• A comprehensive data directory is available at the MDCN	
• Data required for policy decisions at the MDCN are readily accessible	
• The MDCN has a formal data retention policy	
• A data framework has been established	
• There are a general understanding and awareness of data governance issues	
• Authorities favor proper data governance	
10. Funding Sustainability	Leon, N., Schneider. H, and Daviaud, E (2012). *applying a framework for assessing the health system challenges to scaling up mHealth in South Africa.* BMC Med Inform Decision Making. **12**: p. 123.

	van Dyk, L. (2014). A review of telehealth service implementation frameworks. *Int J Environ Res Public Health, 11*(2), 1279-1298. doi:10.3390/ijerph110201279 Swanson, R. C., Atun, R., Best, A., Betigeri, A., de Campos, F., Chunharas, S., . . . Van Damme, W. (2015). Strengthening health systems in low-income countries by enhancing organizational capacities and improving institutions. *Global Health, 11*, 5. doi:10.1186/s12992-015-0090-3
• Adequate funds are budgeted to support MDCN ICT capacity	
• Adequate funds are budgeted for capacity building of staff of the MDCN to support eHealth sustainability and its regulatory activities.	
• The government makes adequate budgetary provision for training of its human resources for health	
11. Effect of eHealth Policy on Registration of Practitioners	Aldridge, S. (2008). The Regulation of Health Professionals: An Overview of the British Columbia Experience. *Journal of Medical Imaging and Radiation Sciences, 39*(1), 4-10 doi:10.1016/j.jmir.2008.01.001
• Registration of practitioners captures the fact that certain practitioners have knowledge/training in eHealth	
• Online registration of practitioners has improved the MDCN regulatory activities.	
• Software used for online registration of practitioners meet expectations of users and staff of MDCN.	
12. Effect of eHealth Policy on Professional Discipline	Aldridge, S. (2008). The Regulation of Health Professionals: An Overview of the British Columbia Experience. *Journal of Medical Imaging and Radiation Sciences, 39*(1), 4-10. doi:10.1016/j.jmir.2008.01.001 Prakash, G. (2015). Steering healthcare service delivery: a regulatory perspective. *Int J Health Care Qual Assur, 28*(2), 173-192. doi:10.1108/IJHCQA-03-2014-0036 National Health Act (2014) hhttp://lawnigeria.com/Laws.php. National Health Policy (NHP) 2016. *Retrieved from www.fmoh.gov.ng*.

• Cases of medical malpractice and negligence can be reduced through the use and adoption of eHealth by practitioners	
• The use and adoption of ICT by MDCN has helped to improve the management of information on malpractice and negligence cases before the MDCN	
• eHealth benefits regulation of medical ethics among practitioners	
13. Effect of eHealth Policy on Medical Education	Aldridge, S. (2008). The Regulation of Health Professionals: An Overview of the British Columbia Experience. *Journal of Medical Imaging and Radiation Sciences, 39*(1), 4-10. doi:10.1016/j.jmir.2008.01.001 Prakash, G. (2015). Steering healthcare service delivery: a regulatory perspective. *Int J Health Care Qual Assur, 28*(2), 173-192. doi:10.1108/IJHCQA-03-2014-0036
• Medical and dental training institutions in Nigeria have adequate resources to train practitioners in eHealth	
• Medical and dental training curricula have been updated to include training and examination of undergraduates in eHealth (ICT)	
• Training of medical and dental practitioners is well captured in the Nigeria ICT for health policy document	
14. Effect of eHealth Policy on Inspectorate activities	Prakash, G. (2015). Steering healthcare service delivery: a regulatory perspective. *Int J Health Care Qual Assur, 28*(2), 173-192. doi:10.1108/IJHCQA-03-2014-0036 Medical and Dental Practitioners Act (Cap M8 LFN 2004). www.mdcn.org.ng
• Cases of malpractice in the medical and dental professions can be checked with the use of ICT by health regulatory agencies, including MDCN	
• The government ICT for health policy supports the MDCN inspectorate activities	
• The MDCN Act provides adequate legislation to support its inspectorate activities making use of eHealth tools (ICT)	
	Swanson, R. C., Atun, R., Best, A., Betigeri, A., de Campos, F., Chunharas, S., . . . Van Damme,

15. Effect of eHealth Policy on Planning, Research and Statistics Activities	W. (2015). Strengthening health systems in low-income countries by enhancing organizational capacities and improving institutions. *Global Health, 11*, 5. doi:10.1186/s12992-015-0090-3 Richard D. Smith, K. H. (2004). Strengthening Health systems_the role and promise of policy and system research. Global Forum for Health Research. ISBN 2-940286-25-6 Yamey, G. (2012). What are the barriers to scaling up health interventions in low- and middle-income countries? A qualitative study of academic leaders in implementation science. *Global Health, 8*, 11. doi:10.1186/1744-8603-8-11 National Strategic Health Development Plan Framework 2010- 2015. *Retrieve from www.health.gov.ng/doc/NSHDP*. National ICT Strategic framework for Nigeria 2015-2020. Retrieved from *https://www.health.gov.ng/doc/HealthICTStrategicFramework.pdf*.
• There are available statistics at the MDCN to support its regulatory activities	
• The use of ICT supports research activities at the MDCN	
• eHealth adoption and use are supported by planning at the MDCN	

3.5.2. Description of the Study Area

The MDCN is one of the 13 professional health regulatory agency of the Federal government of Nigeria in which the Federal Ministry of Health provides an oversight function. It has its head office in the Federal Capital Territory of Nigeria in the Kaura district of Abuja, the Capital of Nigeria. The MDCN also has other offices designated as zonal offices in some of the

state capitals spread across the geopolitical zones in the country. Zonal offices are in Lagos, Kaduna, Enugu, and Ilorin. They include some of the senior staff who took part in the survey.

3.6. The Universe of the Study Area

The universe of the study (target population) is the management and senior staff of MDCN. Their inputs were used to develop the study findings (Cooper & Schinder, 2014). This group of staff were selected based on the positions they occupy in the public service, experience, and responsibilities on the job they do which is mainly in the areas of policy drafting, policy implementation, and health professional regulation. Furthermore, some of the participants were also medical and dental practitioners while others belong to the administrative and executive cadre in the public service.

Before conducting the study, the understanding and approval of the Registrar of the MDCN were obtained, through phone calls and formal letters. A survey recruiter who is a middle cadre, senior staff of the MDCN was appointed by the management of the MDCN to work with the research investigator, provide information and survey URL links to the participants and requests for their participation via email addresses.

3.7. Accessible Population Versus Sampling

The target population refers to the portion of the population to which the researcher has reasonable access; it may be a subset of the target population while sampling refers to the process by which part of the population is selected, and the conclusions drawn about the entire population.

The population refers to the specific and defined body of people or objects under consideration for statistical purposes" (Collis & Hussey, 2009, p. 77).

The population for this study was the 119 management, senior and junior staff, from which 86 individuals were selected who are management and senior staff and whose job responsibilities cut across the professional departments (Medical Education, Registration, Professional Discipline, Inspectorate, Planning Research and Statistics, and the Information Communication and Technology unit). These individuals work at head office or one of the four Zonal offices (located at Lagos, Kaduna, Enugu, and Ilorin) of the MDCN. They are involved in healthcare policies and regulation in Nigeria and met the selection requirements. The eligibility criteria for participants included: full-time senior-level employee of the MDCN, speaks and writes English, possesses the knowledge and experience of healthcare policies and regulation in Nigeria and possesses knowledge of eHealth (ICT in Health).

3.8. Tools for Data Collection

A descriptive survey method (Gu, Y & Warren, J. 2016) was adopted due to its suitability for answering the research questions through the perceptions of MDCN staff. These perceptions related to the extent health professional regulatory agencies understand their leadership role in encouraging eHealth use and adoption among practitioners, their strategic roles in the regulation of physicians and dentists who use eHealth tools, and effects of existing government policies on eHealth use and adoption.

3.9. Questionnaire

The questionnaire was prepared using Qualtrics software and response data extracted from the same for analysis using SPSS statistical software. “Survey research may use a variety of data collection methods with the most common being questionnaires and interviews. Questionnaires

may be self-administered or administered by a professional, may be administered individually or in a group, and typically include a series of items reflecting the research aims" (Ponto, J. 2015).

The semi-structured questionnaire was developed following the recommendation of Kelley et al., (2003. P. 262 & 263) in designing and planning the research tool. The instrument addressed issues of eHealth use and adoption among professional health regulatory agencies, eHealth policy, and strategic government leadership.

An online semi-structured questionnaire was chosen to ensure high quality and a high level of participation in the survey and to enable better analysis of data and policy matters. The questionnaire consists of six questions which are related to the personal information of the respondents, fifteen questions which are related to the constructs developed and are seven points Likert scale. However, participants had the option of selecting 'Not Applicable' (NA) or 'Don't Know' (DK).

The first phase in the study was a request for MDCN management consent to carry out the survey, at the same time informing them of the survey process and intended benefit in surveying the MDCN and government of Nigeria.

To eliminate any form of bias or undue influence, and to maintain the confidentiality of respondents, leading to a voluntary increase in participation, the following were done: questions relating to the respondent gender were not used, and participation was anonymous. A middle-level administrative employee in MDCN was assigned by MDCN management to disseminate survey information. The URL link to the questionnaire was provided to all 86 potential respondents with a request for their voluntary participation. This email was sent out once, and one reminder was distributed after one week.

The second phase involved the MDCN recruiter contacting all eligible participants via their MDCN email. The recruiter shared information with potential participants regarding the survey such as the introduction of the researcher, purpose, benefit, and risk involved in the study, consent, security and confidentiality of participant information and how to obtain the final findings of the survey. The recruiter requested participants to complete the questionnaire online (see Appendix C) through a URL link (https://Questionnaire URL for Participant Access) to the questionnaire at a secure website at McMaster after reading the consent and survey information.

3.10. Data analysis and interpretation

Participants completed the survey between May 9th and June 12th, 2018 after which access to the URL link was closed. The primary data extracted from the Qualtrics software were loaded into the IBM Statistical Package for the Social Sciences (SPSS) Version 24 and analyzed (a copy of the questionnaire is included in Appendix C).

Prior to conducting the analysis, the data were prepared to ensure accuracy of results obtained. This involved visual inspection, some manual editing, and statistical techniques. The analysis included descriptive statistics and a frequency table for each variable which identified missing values in order to have them replaced to further ensure accuracy of results.

The questionnaire produced a total of 61 variables in the SPSS statistical dataset. In order to reduce the number of variables which were over-determined as a result of the small sample size of 42, two different statistical approaches were employed. The initial approach was factor analysis (Principal Component Factor Analysis with Direct Oblimin) to identify constructs that would fit a specific model, while the second approach used aggregation to combine variables belonging to each of the 15 constructs identified from the questionnaire to form aggregated variables. These

aggregated variables were then subjected to stepwise regression analysis to identify the best fit model that showed a significant relationship between the dependent (outcome) aggregated variable (strategic government leadership - (SGL)) and the fourteen predictor (independent) aggregated variables (see variables listed in Table 3.1).

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Chapter Four - Data Analysis, Presentation, and Interpretation

4.0. Introduction

This chapter contains the analysis of data obtained from an online survey conducted at the Medical and Dental Council of Nigeria (MDCN) between May 9 and June 11, 2018. It also includes the presentation and interpretation of the data. Tables, charts, and graphs have been used to clearly depict and precisely present the collected data.

Out of the expected 86 respondents, 52 respondents successfully returned the questionnaire representing 60.47% of possible respondents. However, 19.23% (10 respondents) were excluded from the analysis (3 were junior staff who erroneously completed the questionnaire, 7 did not complete the survey and 1 respondent provided entries that could not be interpreted). Qualtrics software was used to prepare and disseminate the questionnaire while the IBM (24) Statistical Package for the Social Sciences (SPSS) software was used to provide an analysis of the data.

4.1. Data Preparation

Data preparation involved visual inspection, some manual editing, and statistical techniques. The data were visually inspected and cleaned with the aim of identifying impossible values from the response set. A descriptive statistics and frequency table for each variable were conducted to identify missing values with the aim of replacing a total of 28 missing values that were identified. Questions 1-6 of the survey instrument contained demographic information of the respondents. Questions 7-21 were constructs that included a total of 61 items involving Likert scale responses from 1 to 7 (Strongly Disagree – Strongly Agree) that were loaded into SPSS

software as variables for statistical analysis. Questions 22-24 were open qualitative questions for which themes were identified and analyzed separately.

To deal with missing values in the SPSS data set, a Series Means technique was performed after the data were recorded with missing values of -1, after which a repeat of the descriptive frequency showed no missing values.

4.2. Data Analysis and Interpretation of Results

Although a sample size of more than 200 would have been preferred for typical data analysis, this was not possible from the limited population of potential participants. The 61 variables in the SPSS statistical dataset, therefore, were over-determined due to the final sample size of 42. Two different approaches were identified and tested for pruning the number of variables. The first used factor analysis (Principal Component Factor Analysis with Direct Oblimin) to identify constructs that would fit a specific model, and the second used aggregation to aggregate variables belonging to each of the 15 constructs into single variables.

4.2.1. Factor Analysis (Principal Component Factor Analysis Technique)

Principal Component Factor Analysis (PCFA) is a computationally simplified version of a general class of dimension reduction analyses. Osborne, (2014, p. 1). According to Costello & Osborne (2005, P. 1), the varimax rotation is the preferred method used for data analysis. Of those researchers who report their criteria for deciding the number of factors to be retained for rotation, a majority use the Kaiser criterion (all factors with eigenvalues >1).

These processes extracted a total of 14 components (variables) which showed eigenvalues >1, representing the variables with the highest contributions to the overall variance, and which

could then be used for statistical comparison purposes. “an eigenvalue > 1.0 is a good lower bound for expecting a factor to be meaningful. This is because an eigenvalue represents the sum of the squared factor loadings in a column” Osborne, (2014, p. 18).

Furthermore, Osborne, (2014, p. 6) argues that the goal in deciding what type of rotation to be used is to aid the clarification of the factor structure and make the results of an exploratory factor analysis most interpretable. There are several different rotation methodologies, falling into two general groups: orthogonal rotations and oblique rotations. Orthogonal rotations would keep axes at 90 degrees, forcing the factors to be uncorrelated. Oblique rotations allow angles that are not 90 degrees, thus allowing factors to be correlated if that is optimal for the solution. In this analysis, the oblique rotation was used.

4.2.2. Suitability of Data for Factor Analysis

In considering this technique for statistical analysis the sample size of 42 is very small. A sample size of > 300 would have been more ideal as it would have given a better result by showing more variance of the variables being considered. To determine the strength of inter-correlation among the variables, a value of 0.3 or more would be most appropriate, Bartlett’s test would need to show a p-value of <0.05 while the Kaiser value would have to range between 0 - 1. However, in this analysis, both tests recorded no values.

4.2.3. Descriptive Statistics of Variables (Component Factor Analysis)

Appendix D Table 4.1 shows the means and standard deviations of measures for the 61 variables. The lowest possible value is 1 (Strongly Disagree) and the highest possible value is 7 (Strongly Agree). The variables ‘privacy of healthcare data is an important concern of patients’

and ‘databases are encrypted to prevent data theft’ both account for the variables with the highest mean values (6.2). The variable with the lowest mean value of 1.7 is ‘cases of malpractice in the medical and dental professions can be checked with the use of ICT by health regulatory agencies, including the MDCN’.

4.2.4. Communalities Table

Appendix D. Table 4.2 shows communalities of all the variables. It shows the values of how much of the variance (i.e. the communality value which should be more than 0.5 to be considered for further analysis). The pattern derived from this table indicates that the variables having closer figures are similar and fit into the same construct.

4.2.5. Total Variance Explained

Using the Kaiser criterion which states that an eigenvalue of 1.0 or more is most appropriate to keep the item, it is observed in Appendix D. Table 4.3 that the extraction Sums of Squared Loadings shows the 14 extracted components that meet this criterion. The first component accounts for Total Variance Explained with the highest variance value extracted (33.4%) and this decreases up to 1.6% for the 14^{th} component extracted, with an eigenvalue of 1.004.

4.2.6. Scree Plot

A scree plot was also generated to visually show the variance associated with each component extracted by the Principal Component Analysis technique (Figure 4.1). It can be observed from the vertical intersecting line on the x-axis that components 1 – 14 show better

variances extracted when compared to components 15-61, all of which have small and declining eigenvalues below 1.0.

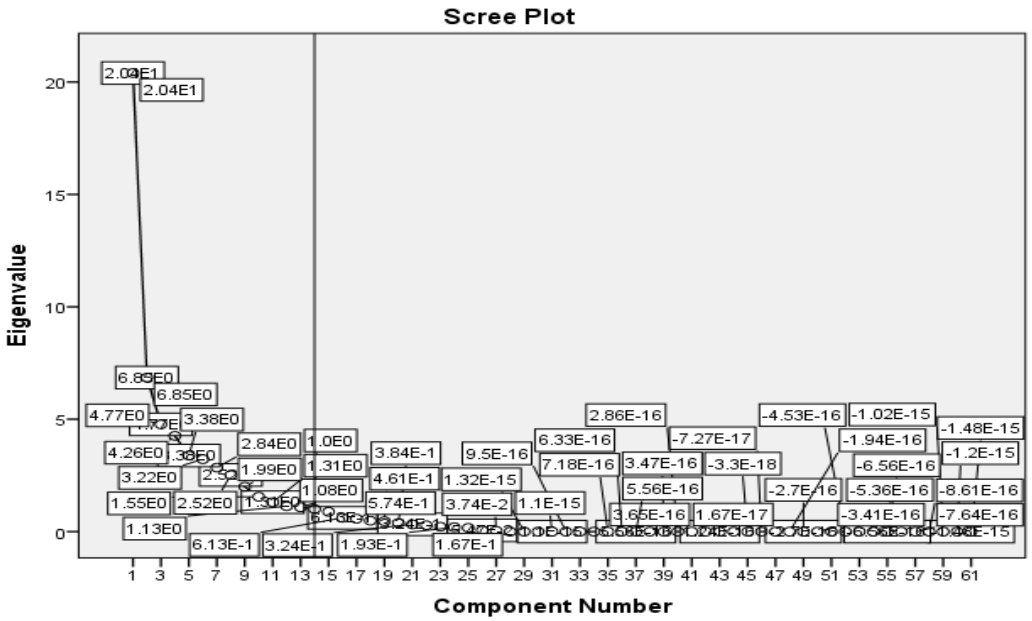

Figure 4.1: Scree plot showing variances of the variables (components). Components to the left of the vertical line represent the 14 extracted components. Source: Extracted from IBM 24 Statistical Package for the Social Sciences (SPSS) 09/09/2018.

4.2.7. Validity of Principal Component Analysis (Parallel Analysis)

To compare the size of eigenvalue obtained from the Principal Component Analysis performed, an attempt was made to conduct a Parallel Analysis using the Monte Carlo Principal Analysis technique. This, however, was not possible as a result of the small sample size of 42 compared to 61, the number of variables. A sample size of 300 or more would have been most ideal.

4.2.8. Dependent and Independent Variables

The 14 extracted variables are shown in Appendix D Table 4.4. They are arranged according to the respective constructs used in this study. The extracted variables each fall under the following constructs; strategic government leadership, privacy, and security, policy and capacity for innovation and infrastructure/technological development. The 14 extracted variables appear close to the final aggregated variables chosen in the multiple regression as seen in Table 4.43.

4.3. Aim and Objective of the Analysis

In exploring the impact and roles strategic government leadership plays in the use and adoption of eHealth in low resource counties, the study investigates and draws inferences from the relationships and associations between the dependent and independent constructs.

The dependent construct is one that is to be predicted and it relates to an expected outcome or target while on the other hand, the constructs used in predicting the value of the dependent constructs is the independent construct (predictor variables). In this study, there are three independent constructs which are; policy, security and privacy and capacity for innovation/infrastructure/technological development each linked to specific variables.

4.4. Research Questions

Analyzing the data is expected to provide answers to the following research questions:

1. Does a relationship exist between strategic government leadership (SGL) and capacity for eHealth innovation and technological/infrastructural development?

2. What are the measures taken and the importance of the security and privacy of practitioner records to Professional Health Regulatory Agencies (PHRAs)?

3. Does strategic leadership, as demonstrated through policy development, affect the adoption and use of eHealth by employees of (PHRAs)?

4.5. Analysis of Demographic Information About Study Participants.

Participants in the survey provided some personal information related to their specific job responsibilities, the department/unit/zonal offices where they work, their years of experience and their cadre of staff in the public service. Analysis of this information is provided in this section.

4.5.1. In What Department or Unit of the Medical and Dental Council of Nigeria (MDCN) Do You Perform Your Duties?

The registration department of the medical and dental council of Nigeria (MDCN) accounted for the highest number of respondents (25%) or 13 while the management information system/ICT unit had no respondents. The planning, research and statistics, and the medical education departments accounted for the same number of respondents (9.62%) or 5 respondents each. This is shown in Figure 4.2. The high level of participation of staff from the registration department may be because of their strategic roles in providing direct services to practitioners and as a result, are involved with the implementation of MDCN policies.

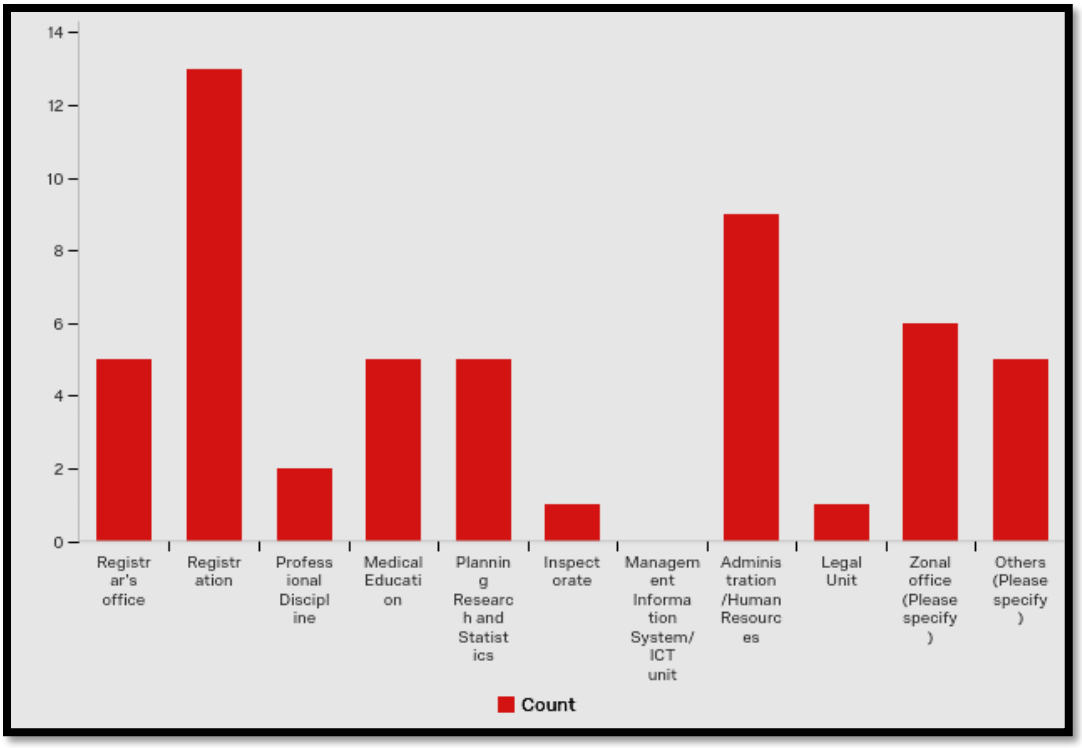

Figure 4.2: Bar chart showing units/departments of respondents who are management and senior levels employees of the MDCN. Source: Extracted from Qualtrics Software 07/21/2018.

4.5.2. To What Category of Staff Within the MDCN Do You Belong?

The categories that staff respondents fall into are shown in Table 4.5. Senior staff of the MDCN is the category that accounted for most respondents (85%) or 44, while management staff accounted for (10%) or 5. Senior staff of MDCN provides by far the major contribution to policy implementation and leadership in the delivery of the mandates of the MDCN.

Table 4.5: Respondent category of staff within the MDCN showing level of participation among the senior and management staff of MDCN.

Source: Extracted from Qualtrics Software 07/21/2018

#	Answer	%	Count
1	Management	10%	5
2	Senior	85%	44

4.5.3. How Long Have You Been Employed in The Public Service (MDCN)?

Figure 4.3 shows 52% (27) respondents have been employed in the public service for >10 years. Those employed for >5 years, but <10 years accounted for 33% (17) while 15% (8) of the respondents have been employed for 5years or < 5 years (Fig. 4.4). This implies that about half of the senior and management staff at the MDCN are experienced in policy and providing leadership.

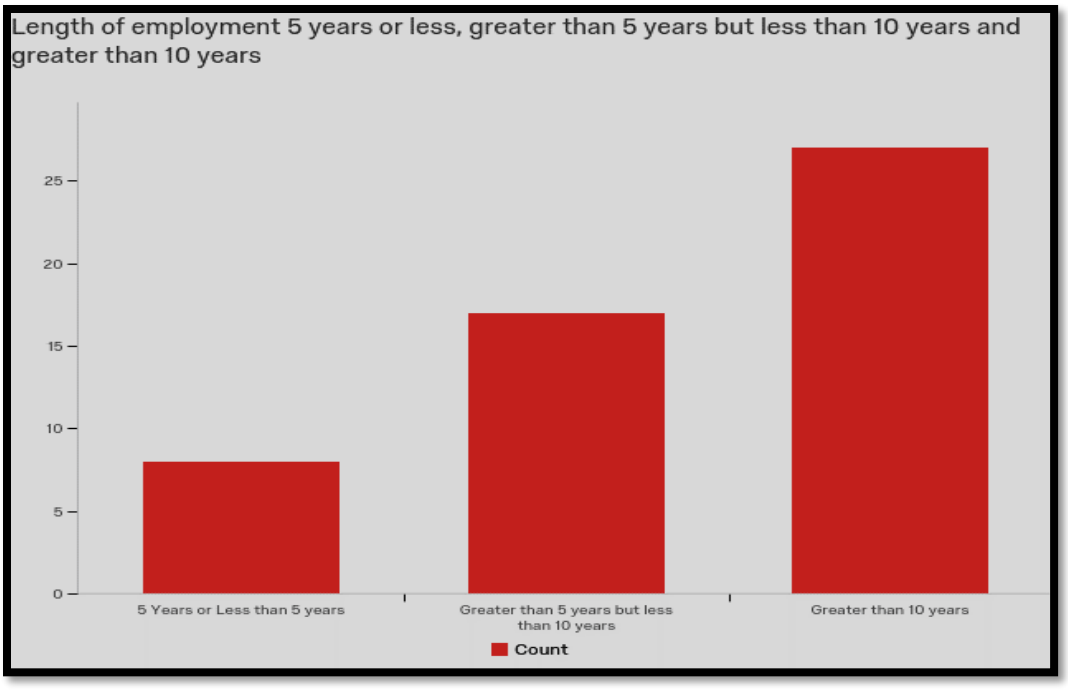

Figure 4.3: Shows the Length of job experience (employment at the MDCN) of respondents in public service. Source: Extracted from Qualtrics software 07/21/2018.

4.5.4. To What Cadre of Public Servant Do You Belong

From Figure 4.4, administrative cadre staff accounted for most respondents 56% (27). The directorate cadre staff accounted for 10% (5) while staff from the legal cadre accounted for none of the respondents. The high level of administrative cadre staff may be an indication of the need for staff with the qualities and experience in providing leadership through effective development and implementation of policies to ensure effective and efficient delivery of MDCN mandates.

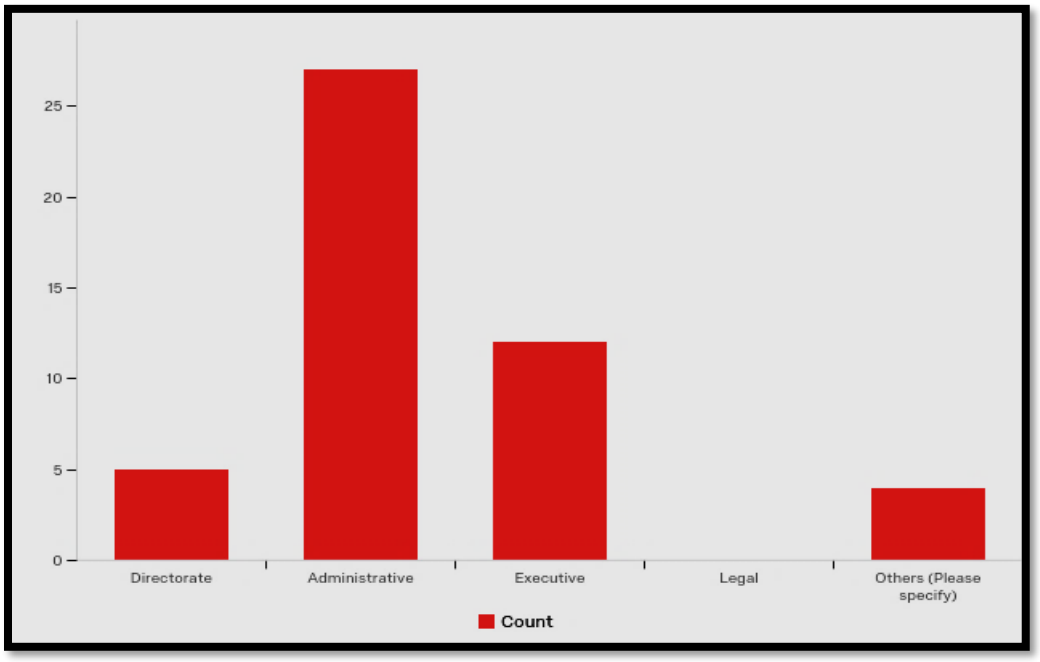

Figure 4.4: Shows the Cadre respondents of the MDCN belong in the public service.
Source: Extracted from Qualtrics software 07/21/2018.

4.5.5. How Many Years' Experience Do Respondents Have in Healthcare Policy and Regulation?

Figure 4.5 show the years of experience respondents (working at the MDCN as public servant) have in healthcare policy and regulation. 71% (34) of the respondents have 5 years or more experience while those with less than 5 years' experience accounted for 21% (10). Those

with no experience were 8 % (4). The high percentage of staff at the MDCN with 5years or more experience in health care policy and regulation indicates the importance the MDCN place on leadership, governance, and policy.

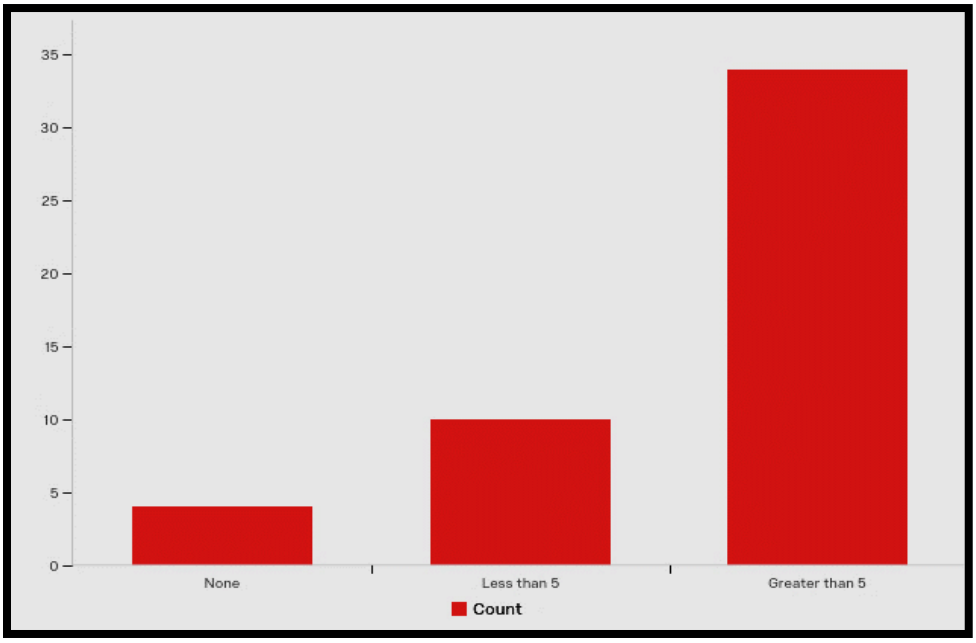

Figure 4.5: Shows the Years of experience (employment at the MDCN) of respondents in healthcare policy and regulation. Source: Extracted from Qualtrics software 07/21/2018.

4.5.6. Rate Your Job Responsibility and Experiences in Healthcare Policy Formulation and Healthcare Regulation

Respondents rated their individual job responsibilities in healthcare policy formulation and healthcare regulation. Figure 4.6 shows the mean and rate (%) of their responsibilities.

Healthcare regulation has the highest rate at 44%, followed by healthcare policy formulation (23%). Other responsibilities accounted for 13%. This tends to reflect the main

responsibility of the MDCN which is in the regulation of health care practitioners followed by policy formulation.

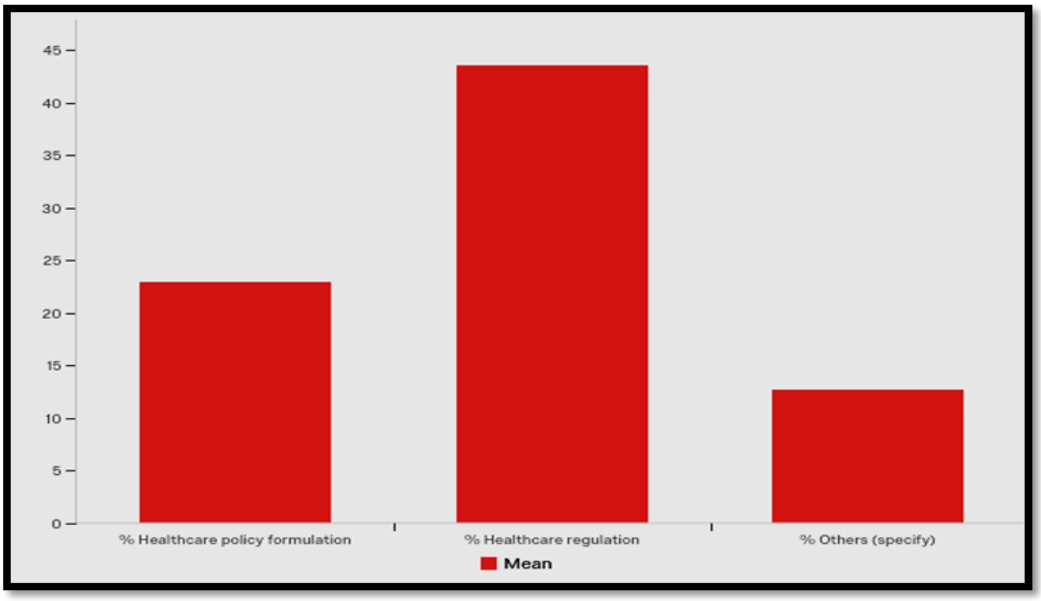

Figure 4.6: Shows the Job responsibility and experience of respondents in healthcare policy and healthcare regulation. Source: Extracted from Qualtrics software 07/21/2018.

4.5.7. List Three or More Reasons for Wanting More and Better eHealth Policies at the MDCN to Boost Its Regulatory Activities

Themes identified from the text of respondents to this question are presented in Table 4.6. This indicates the general view or expected outcomes (of eHealth policies) of employees of the MDCN according to their desires on the adoption and use of eHealth by PHRAs.

Table 4.6: Shows themes derived and frequency of occurrence from comments provided by respondents of the MDCN for wanting more and better eHealth policies at the MDCN to boost its regulatory activities.

Source: Extracted from Qualtrics software 07/21/2018.

#	Reasons	Frequency of occurrence
1	Efficient and effective health services	9
2	Better management of health information	3
3	Better data collection	3
4	Bridge communication gap between practitioners, regulatory agencies and the federal ministry of health	3
5	Check medical tourism	2
6	Reduction in mortality rate	2
7	Cost effective healthcare delivery	2
8	Improve practitioners with knowledge through continuing professional development activities	2
9	Provision of good health	2
10	Check malpractice	2
11	Attract more funding for eHealth activities	1
12	Create more awareness	1
13	Safe healthcare practices	1
14	Disease prevention	1

4.5.8. List Three or More Reasons for Not Wanting More and Better eHealth Policies at the MDCN To Boost Regulatory Activities.

Table 4.7 reflects the general opinion of respondent on reasons why they do not want more eHealth policies at the MDCN. Their views may be an indication that the government should focus on current or existing (better implementation) policies rather than creating more policies that may lead to a waste of resources.

Table 4.7: Shows themes and frequency of occurrences from comments provided by respondents of at the MDCN for not wanting more and better eHealth policies at the MDCN to boost regulatory activities. Source: Extracted from Qualtrics software 07/21/2018.

#	Reasons	Frequency of occurrence
1	Ignorance	2
2	Frequent changes in ICT policies by the government	2
3	May encourage corruption	2
4	Lack of funds	1
5	Redundancy among staff	1
6	Discourage practitioners from requesting services form the MDCN	1

4.5.9. Additional comments of respondent about eHealth policies at the MDCN and in Nigeria: (Policies, regulation, and deficiencies)

Additional comments are summarized in in terms of themes in Table 4.8. These consist of mainly positive themes and expectations of the respondents as to the benefits that the use and adoption of eHealth would bring to the health care system in Nigeria.

Table 4.8: shows additional comments and frequency of occurrence provided by the MDCN respondents regarding eHealth policies at the MDCN and in Nigeria.
Source: Extracted from Qualtrics software 07/21/2018.

#	Comments	Frequency of occurrence
1	eHealth would bring about improved healthcare regulation	4
2	eHealth would help the MDCN to deliver on its mandates	4
3	eHealth would bring about cost-effective health care services	4
4	eHealth would discourage medical tourism	3
5	eHealth would promote effective service delivery to practitioners	2

4.6. Descriptive Statistics of the 14 Extracted Variables

4.6.1 Ehealth Adoption and Use are Supported by Planning at the MDCN

11.9% (5) of the total responders indicated they strongly agree that eHealth adoption and use are supported by planning at the MDCN while 57% (24) of the MDCN staff indicated they agree. The cumulative percent of 12 and 69 respectively, may be an indication of the value placed on planning by Top Management of the MDCN and the stewardship, leadership and innovative qualities of management (Table 4.10). Table 4.9 shows the relevant statistical values for this variable.

Table 4.9. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on' eHealth adoption and use are supported by planning at the MDCN'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	42
	Missing	0
Mean		2.7
Median		2.0
Mode		2
Std. Deviation		1.8
Variance		3.1
Range		7

Table 4.10. Shows the frequency and cumulative percent from the Likert Scale responses obtained from respondents to the question 'eHealth adoption and use are supported by planning at the MDCN'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	5	11.9	11.9	11.9
	Agree	24	57.1	57.1	69.0
	Somewhat agree	5	11.9	11.9	81.0
	Neither agree nor disagree	4	9.5	9.5	90.5
	Somewhat disagree	1	2.4	2.4	92.9
	Disagree	1	2.4	2.4	95.2
	Do not know	2	4.8	4.8	100.0
	Total	42	100.0	100.0	

4.6.2. There are Effective Mechanisms for Implementation, Support, Monitoring and Evaluation of eHealth Projects.

Result obtained are shown in Tables 4.11 and 4.12. 40.5% (17) of respondents agree that there are effective mechanisms for implementation, support, monitoring and evaluation of eHealth projects. This also indicates the leadership and stewardship qualities of the MDCN staff.

Table 4.11. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'There are effective mechanisms for implementation, support, monitoring and evaluation of eHealth projects.'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	41
	Missing	1
Mean		5.3
Std. Error of Mean		.22
Median		6.0
Mode		6
Std. Deviation		1.4
Variance		1.9
Range		6

Table 4.12. Shows the frequency and cumulative percent from Likert Scale responses obtained from respondents to the question 'There are effective mechanisms for implementation, support, monitoring and evaluation of eHealth projects.'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	2.4	2.4	2.4
	Disagree	2	4.8	4.9	7.3
	Somewhat disagree	1	2.4	2.4	9.8
	neither agree or disagree	4	9.5	9.8	19.5
	Somewhat agree	11	26.2	26.8	46.3
	Agree	17	40.5	41.5	87.8
	Strongly agree	5	11.9	12.2	100.0
	Total	41	97.6	100.0	
Missing	-1	1	2.4		
Total		42	100.0		

4.6.3. Ehealth Policies Align with and are Supportive of Regulatory Agency Mandates.

Data obtained from responses to this question are summarized in Tables 4.13 and 4.14. Table 4.14 indicates 50% (21) of respondents agree that eHealth policies align with and are supportive of regulatory agency mandates.

Table 4.13. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'eHealth policies align with and are supportive of regulatory agency mandates.'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	38
	Missing	4
Mean		5.7
Std. Error of Mean		.21
Median		6.0
Mode		6
Std. Deviation		1.3
Variance		1.6
Range		6

Table 4.14. Shows the frequency, valid percent, and cumulative percent from Likert Scale responses obtained from respondents to the question 'eHealth policies align with and are supportive of regulatory agency mandates.'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	2.4	2.6	2.6
	Somewhat disagree	2	4.8	5.3	7.9
	Neither agree nor disagree	3	7.1	7.9	15.8
	Somewhat agree	4	9.5	10.5	26.3
	Agree	21	50.0	55.3	81.6
	Strongly agree	5	11.9	13.2	94.7

	Not applicable	2	4.8	5.3	100.0
	Total	38	90.5	100.0	
Missing	-1	4	9.5		
Total		42	100.0		

4.6.4. Security is an Important Consideration in the MDCN Policy Guide on Ehealth

33.3% (14) of respondent strongly agree, and 40.5% (17) agree that security is an important consideration in the MDCN policy guide on eHealth (Tables 4.15 and 4.16)

Table 4.15. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'Security is an important consideration in the MDCN policy guide on eHealth.'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	42
	Missing	0
Mean		6.00
Std. Error of Mean		.152
Median		6.00
Mode		6
Std. Deviation		.988
Variance		.976
Range		5

Table 4.16. Shows the frequency, valid percent, and cumulative percent from Likert Scale responses obtained from respondents to the question 'Security is an important consideration in the MDCN policy guide on eHealth.'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	2.4	2.4	2.4
	Somewhat agree	10	23.8	23.8	26.2
	Agree	17	40.5	40.5	66.7
	Strongly agree	14	33.3	33.3	100.0
	Total	42	100.0	100.0	

4.6.5. Federal Government Policy is Supportive of Ehealth.

Tables 4.17 and 4.18 shows that a majority of the respondent either agree, strongly agree or somewhat agree that the federal government policy is supportive of eHealth.

Table.4.17. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'Federal government policy is supportive of eHealth.'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	42
	Missing	0
Mean		5.36
Std. Error of Mean		.207
Median		6.00

Mode	6
Std. Deviation	1.340
Variance	1.796
Range	6

Table 4.18. Shows the frequency, valid percent, and cumulative percent from Likert Scale responses obtained from respondents to the question 'Federal government policy is supportive of eHealth.'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	2.4	2.4	2.4
	Disagree	1	2.4	2.4	4.8
	Somewhat disagree	2	4.8	4.8	9.5
	Neither agree nor disagree	4	9.5	9.5	19.0
	Somewhat agree	10	23.8	23.8	42.9
	Agree	18	42.9	42.9	85.7
	Strongly agree	6	14.3	14.3	100.0
	Total	42	100.0	100.0	

4.6.6. Databases are Securely Backed Up Regularly to Support Quick Recovery in Case of System Failure.

57.1% (24) of respondent agree and 26.2% (11) of respondent strongly agree that database is securely backed up regularly to support quick recovery in case of system failure as shown in Table 4.19. Table 4.20 reflects the same level of agreement.

Table 4.19. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'Databases are securely backed up regularly to support quick recovery in case of system failure.'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	42
	Missing	0
Mean		5.98
Std. Error of Mean		.191
Median		6.00
Mode		6
Std. Deviation		1.239
Variance		1.536
Range		7

Table 4.20. Shows the frequency, valid percent, and cumulative percent from Likert Scale responses obtained from respondents to the question 'Databases are securely backed up regularly to support quick recovery in case of system failure.'

Source: Extracted from Qualtrics software 09/091/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	2.4	2.4	2.4
	Somewhat disagree	2	4.8	4.8	7.1
	Neither agree nor disagree	2	4.8	4.8	11.9
	Somewhat agree	1	2.4	2.4	14.3
	Agree	24	57.1	57.1	71.4
	Strongly agree	11	26.2	26.2	97.6
	Do not know	1	2.4	2.4	100.0

	Total	42	100.0	100.0	

4.6.7. Data Transmission Is Handled by Secure Networks

The results in Tables 4.21 and 4.22 show strong agreement that data transmission is handled by secure networks.

Table 4.21. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'Data transmission is handled by secure networks.'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	42
	Missing	0
Mean		5.7
Std. Error of Mean		.2
Median		6.0
Mode		6
Std. Deviation		1.2
Variance		1.4
Range		6

Table 4.22. Shows the frequency, valid percent, and cumulative percent from Likert Scale responses obtained from respondents to the question 'Data transmission is handled by secure networks.'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	2.4	2.4	2.4
	Somewhat disagree	2	4.8	4.8	7.1
	Neither agree nor disagree	1	2.4	2.4	9.5
	Somewhat agree	5	11.9	11.9	21.4
	Agree	26	61.9	61.9	83.3
	Strongly agree	7	16.7	16.7	100.0
	Total	42	100.0	100.0	

4.6.8. There Is Adequate Capacity for Implementing Regulatory Activities On Ehealth Among Practitioners.

Results in Table 4.23 and 4.24 show agreement that there is adequate capacity for implementation regulatory activities on eHealth among practitioners.

Table 4.23. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'There is adequate capacity for implementing regulatory activities on eHealth among practitioners.'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	41
	Missing	1
Mean		5.4

Std. Error of Mean	.22
Median	6.0
Mode	6
Std. Deviation	1.4
Variance	1.9
Range	5

Table 4.24. Shows the frequency, valid percent, and cumulative percent from Likert Scale responses obtained from respondents to the question 'There is adequate capacity for implementing regulatory activities on eHealth among practitioners.'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	7.1	7.3	7.3
	Somewhat disagree	3	7.1	7.3	14.6
	neither agree or disagree	1	2.4	2.4	17.1
	Somewhat agree	8	19.0	19.5	36.6
	Agree	21	50.0	51.2	87.8
	Strongly agree	5	11.9	12.2	100.0
	Total	41	97.6	100.0	
Missing	-1	1	2.4		
Total		42	100.0		

4.6.9. There Is A Capacity for Assessment of Readiness for Ehealth Acceptance and Use.

71.4% (30) of respondents agree while 9.5% (4) disagree that there is a capacity for assessment of readiness for eHealth acceptance and use. See Tables 4.25 and 4.26.

Table 4.25. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'There is a capacity for assessment of readiness for eHealth acceptance and use.'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	42
	Missing	0
Mean		5.4
Std. Error of Mean		.22
Median		6.0
Mode		6
Std. Deviation		1.4
Variance		2.0
Range		7

Table 4.26. Shows the frequency, valid percent, and cumulative percent from Likert Scale responses obtained from respondents to the question 'There is a capacity for assessment of readiness for eHealth acceptance and use.'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	9.5	9.5	9.5
	Somewhat disagree	1	2.4	2.4	11.9

	neither agree or disagree	3	7.1	7.1	19.0
	Somewhat agree	3	7.1	7.1	26.2
	Agree	30	71.4	71.4	97.6
	Do not know	1	2.4	2.4	100.0
	Total	42	100.0	100.0	

4.6.10. The Staff of The MDCN are Trained to Recognize and Avoid Malicious Attacks On The Systems And Data.

Results obtained are presented in Tables 4.27 and 4.28. 47.6% (20) of respondents agree, 21.4% (9) strongly agree, indicating overall positive agreement.

Table 4.27. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'The staff of the MDCN are trained to recognize and avoid malicious attacks on the systems and data.'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	42
	Missing	0
Mean		5.6
Std. Error of Mean		.25
Median		6.0
Mode		6
Std. Deviation		1.6
Variance		2.6
Range		8

Table 4.28. Shows the frequency, valid percent, and cumulative percent from Likert Scale responses obtained from respondents to the question 'The staff of the MDCN are trained to recognize and avoid malicious attacks on the systems and data.'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	2.4	2.4	2.4
	Disagree	3	7.1	7.1	9.5
	Somewhat disagree	1	2.4	2.4	11.9
	Neither agree nor disagree	2	4.8	4.8	16.7
	Somewhat agree	5	11.9	11.9	28.6
	Agree	20	47.6	47.6	76.2
	Strongly agree	9	21.4	21.4	97.6
	Do not know	1	2.4	2.4	100.0
	Total	42	100.0	100.0	

4.6.11. Medical and Dental Training Curricula Have Been Updated to Include Training and Examination of Undergraduates in Ehealth (ICT).

Tables 4.29 and 4.30 show that 33.3% (14) agree, 9.5% (4) do not know that medical and dental training curricula have been updated to include training and examination of undergraduates in eHealth. This may indicate the lack of awareness and dissemination of information to the staff of the MDCN by management. It accounted for a low mean value of 3.6 and a standard deviation of 2.14.

4.29 Shows the mean, median, mode, variance and standard deviation results obtained from the response provided on 'Medical and dental training curricula have been updated to include training and examination of undergraduates in eHealth (ICT).'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	42
	Missing	0
Mean		3.62
Std. Error of Mean		.330
Median		3.00
Mode		2
Std. Deviation		2.141
Variance		4.583
Range		8

Table. 4.30. Shows the frequency, valid percent, and cumulative percent from Likert Scale responses obtained from respondents to the question 'Medical and dental training curricula have been updated to include training and examination of undergraduates in eHealth (ICT).'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	1	2.4	2.4	2.4
	Agree	14	33.3	33.3	35.7
	Somewhat agree	11	26.2	26.2	61.9
	Neither agree nor disagree	9	21.4	21.4	83.3
	Somewhat disagree	2	4.8	4.8	88.1
	Not applicable	1	2.4	2.4	90.5

	Do not know	4	9.5	9.5	100.0
	Total	42	100.0	100.0	

4.6.12. Regulations for Protecting Patient Healthcare Records Are In Use And Are Being Enforced.

Over 60% (64.3%) 27 of respondents agree that the regulation for protecting patient health care records are in use and are being enforced (Tables 4.31 and 4.32).

Table 4.31. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'Regulations for protecting patient healthcare records are in use and are being enforced'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	42
	Missing	0
Mean		5.9
Std. Error of Mean		.2
Median		6.0
Mode		6
Std. Deviation		1.2
Variance		1.3
Range		6

Table 4.32. Shows the frequency, valid percent, and cumulative percent from Likert Scale responses obtained from respondents to the question 'Regulations for protecting patient healthcare records are in use and are being enforced.'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	2.4	2.4	2.4
	Somewhat disagree	2	4.8	4.8	7.1
	Neither agree nor disagree	2	4.8	4.8	11.9
	Somewhat agree	1	2.4	2.4	14.3
	Agree	27	64.3	64.3	78.6
	Strongly agree	8	19.0	19.0	97.6
	Not applicable	1	2.4	2.4	100.0
	Total	42	100.0	100.0	

4.6.13. Regulations Have Been Developed for Protecting Patient Healthcare Data Managed by Registered Practitioners.

59% (25) of respondents agreed that regulations have been developed for protecting patient healthcare data managed by registered practitioners (Table 4.34). This was responsible for a mean value and standard deviation of 5.88 and 1.249 respectively (*Table 4.33).*

Table.4.33. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'Regulations have been developed for protecting patient healthcare data managed by registered practitioners.'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	41
	Missing	1
Mean		5.9
Std. Error of Mean		.2
Median		6.0
Mode		6
Std. Deviation		1.2
Variance		1.6
Range		6

Table 4.34. Shows the frequency, valid percent, and cumulative percent from the Likert Scale responses obtained from respondents to the question 'Regulations have been developed for protecting patient healthcare data managed by registered practitioners.'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	4.8	4.9	4.9
	Somewhat disagree	1	2.4	2.4	7.3
	Neither agree nor disagree	2	4.8	4.9	12.2
	Somewhat agree	1	2.4	2.4	14.6
	Agree	25	59.5	61.0	75.6
	Strongly agree	9	21.4	22.0	97.6
	Not applicable	1	2.4	2.4	100.0

	Total	41	97.6	100.0	
Missing	-1	1	2.4		
Total		42	100.0		

4.6.14. eHealth benefits regulation of medical ethics among practitioners

28 Respondents (66.7%) agree that eHealth benefits the regulation of medical ethics among practitioners, while 2.4% (1) respondent disagree and 4.8% (2) do not know (Table 4.36). This is an indication of the knowledge respondents have about eHealth. While Table 4.35 shows mean and standard deviation values for the variable.

Table 4.35. Shows the mean, median, mode, variance and standard deviation results obtained from the Likert Scale response provided on 'eHealth benefits regulation of medical ethics among practitioners.'

Source: Extracted from Qualtrics software 09/09/2018.

N	Valid	41
	Missing	1
Mean		2.7
Std. Error of Mean		.3
Median		2.0
Mode		2
Std. Deviation		1.8
Variance		3.1
Range		8

Table 4.36. Shows the frequency, valid percent, and cumulative percent from Likert Scale responses obtained from respondents to the question 'eHealth benefits regulation of medical ethics among practitioners'

Source: Extracted from Qualtrics software 09/09/2018.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	3	7.1	7.3	7.3
	Agree	28	66.7	68.3	75.6
	Somewhat agree	3	7.1	7.3	82.9
	Neither agree nor disagree	3	7.1	7.3	90.2
	Somewhat disagree	1	2.4	2.4	92.7
	Disagree	1	2.4	2.4	95.1
	Do not know	2	4.8	4.9	100.0
	Total	41	97.6	100.0	
Missing	-1	1	2.4		
Total		42	100.0		

4.7. Multivariate Regression Analysis

According to Alexopoulos, (2010. p. 1). "the goal in any data analysis is to extract from raw information the accurate estimation. One of the most important and common question concerning if there is a statistical relationship between a response variable (Y) and explanatory variables (X) and an option to answer this question is to employ regression analysis to model its relationship". Linear regression is the procedure that estimates the coefficients of the linear equation, involving one or more independent variables that best predict the value of the dependent

variable which should be quantitatively used when we want to predict the value of a variable based on the value of two or more other variables.

The variable to be predicted is called the dependent variable (outcome, target or criterion variable) while the variables to be used in predicting the value of the dependent variable are called the independent variables (predictor variables). Regression analysis is also employed to determine the overall fit (variance explained) of the model and the relative contribution of each of the predictors to the total variance explained.

4.7. 1. Regression Model (Best Fit): Relationship between Mean of Dependent Variable and R-Square

In considering models that would best fit a regression model the R-squared (R^2) is always considered and is ranges between 0 and 100% (Frost 2018). This implies 0% represents a model that does not explain any of the variation in the response variable around its mean The mean of the dependent variable predicts the dependent variable as well as the regression model. 100% represents a model that explains all the variation in the response variable around its mean. Usually, the larger the R^2, the better the regression model fits your observations.

4.7.2. Linear regression: stepwise regression of aggregated variables

Forward stepwise regression essentially does multiple regression several times, each time adding the strongest remaining unused independent variable. In the end, independent variables remaining that cannot be added to the regression with a significance greater than a pre-specified limit are left out.

In performing the stepwise multiple regression analysis, the variables which constitute each construct in the survey were aggregated due to the fact that the small sample did not lend itself to statistical analysis.

The results from the 15 sets of variables corresponding to the 15 constructs in the questionnaire were summed to create aggregated variables which would represent each construct, each with its own aggregated values for the 42 participants. The variables in each set will most likely correlate with one another since they all represent a particular construct, more than they do with statements in other sets or constructs. This was followed by the regression of aggregated variable 1 (dependent variable) against aggregated variables 2 through 15 (independent variables) to get an overall view of how the 14 independent aggregated variables affect aggregated variable 1 (dependent variable) which in this research represents strategic government leadership (SGL). This resulted in finding which aggregated variables have the most and least effect on aggregated variable 1(SGL). To prevent the generation of negative coefficients recoding (to reverse the result obtained) of the variables for funding and planning, research and statistics (PRS) was done as results from responses received from respondents resulted in responses on the disagreed part of the scale.

4.7.3. Stepwise Regression of Aggregated Variables: Descriptive Statistics of Aggregated Variables (15 Combined Variables)

Table 4.37 shows the 15 aggregated variables and their individual means and standard deviations. The dependent variable (SGL) has the highest mean (41.07) and standard deviation (9.48) values.

Table 4.37: Stepwise regression (descriptive table) of the 15 aggregated variables showing individual means and standard deviations of each combined variable

Source: IBM 24 Statistical Package for the Social Sciences 09/20/2018.

S/N	Aggregated Variables	Mean	Std. Deviation
1	SGL	41.0732	9.48523
2	HRH	16.7073	2.52234
3	CAPINNO	26.3659	6.17558
4	TECHINFRA	22.6585	3.17498
5	ICTUSABILITY	17.8537	1.90474
6	INTEROP	16.3659	3.97967
7	PRIVACY	24.0732	3.43795
8	SECURITY	29.5122	4.47840
9	GOVERNANCE	21.5366	9.32228
10	FUNDING	7.6829	4.26872
11	REGISTRATION	7.3902	3.12152
12	PROFDIS	7.8780	3.91277
13	MEDEDU	10.3415	5.42499
14	INSPT	8.0732	3.88838
15	PRS	7.0000	2.78388

4.7.4. Stepwise Regression of Aggregated Variables: Model 4 (Best Fit Model)

Table 4.38 shows the variables used to build the models; ICTUSABILITY, PRS, MEDEDU, and CAPINNO. These represent the strongest predictors with a significant p-value <0.05 (model 4).

Table 4.38: Stepwise regression of aggregated variables: showing variables that constitute the best fit model (model 4)
Source: IBM 24 Statistical Package for the Social Sciences 09/20/2018.

Variables Entered/Removed			
Model	Variables Entered	Variables Removed	Method
1	ICTUSABILITY	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	PRS	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	MEDEDU	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
4	CAPINNO	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
a. Dependent Variable: SGL			

SGL: strategic Government Leadership

4.7.5. Stepwise Regression of Aggregated Variables: Model Summary

Table 4.39 gives details of the overall correlation between the variables left in the models and the dependent variable. The final adjusted R-square is 0.461, which means that the 4 predictors in model 4 account for 46% of the variance. Also, the table shows an R square value for model 4

to be highest (.515) indicating a goodness-of-fit measure for the linear regression, meaning the predictors in model 4 are the most significant of the models. The Table further shows that the difference in each of the four models between their respective R square and adjusted R square values with model 4 having a difference of 0.054 (.515 - .461= .054) which of a small value indicating very little redundancy and variability. The standard error estimate (SEE) is also of significance. Model 4 has the least value of SEE (6.96) making model 4 the most significant model (the distance between the data points and fitted values are smallest). Model 4 has a significant Durbin-Watson value of 1.995 (0 to <2 is positive autocorrelation) which indicates correlation exists between SGL and the four predictor variables (ICTUSABILITY, PRS, MEDEDU, and CAPINNO).

Table 4.39: Stepwise regression of aggregated variables: Model Summary showing the values of the R Square and adjusted R Square.

Source: IBM 24 Statistical Package for the Social Sciences 09/20/2018.

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
4	.718	.515	.461	6.96078	1.995
Predictors: (Constant), ICTUSABILITY, PRS, MEDEDU, CAPINNO					
Dependent Variable: SGL					

4.7.6. Stepwise Regression of Aggregated Variables: ANOVA

Table 4.40 shows the ANOVA table of all 4 models. Model 4 model accounted for a statistically significant amount of variance in the outcome when compared to models 1-3. Model

4 has p-value of <.05 (.000), the least mean square value (48.45) and F-value (9.56). This indicates that model 4 shows more of the data points closer to the regression line (least variability around the mean). Model 4 also has the smallest F value making it the model with the overall significance (linear regression model with the best fit to the data).

Table 4.40: Stepwise regression of aggregated variables: ANOVA Table showing the F value and the significance value

Source: IBM 24 Statistical Package for the Social Sciences. 09/20/2018

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
4	Regression	1854.490	4	463.623	9.569	.000[e]
	Residual	1744.290	36	48.453		
	Total	3598.780	40			
Predictors: (Constant), ICTUSABILITY, PRS, MEDEDU, CAPINNO						

4.7.7. Stepwise Regression of Aggregated Variables: Coefficients Table

Table 4.41 shows the linear regression equation coefficients for the various model variables. The significance (Sig.) figures should be 0.05 or below to be significant at 95 percent.

In the coefficients table, the 4th and final model is of importance. The final model (model 4) states that SGL = 7.308 + 1.243 + -1.206 + 0.593 + 0.527. The strongest predictor is the capacity for Innovation (CAPINNO) with a beta coefficient of 0.527 and a significant p-value of 0.010 (<0.050). The table shows that the variables (ICTUSABILITY, CAPINNO, MEDEDU, PRS) in model 4 all have a significant association with the outcome variable (SGL).

The Variance Inflation Factor (VIF) is a measure of how multi-collinearity affects results. From the table the VIF values for the four variables remaining in the equation are all below 2, indicating that multicollinearity between the variables is not significant.

Table 4.41: Stepwise regression of aggregated variables: Coefficients Table showing correlations of the variable that constitutes Model 4.
Source: IBM 24 Statistical Package for the Social Sciences.09/20/2018

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**95.0% Confidence Interval for B**		**Correlations**			**Collinearity Statistics**	
4	(Constant)	**7.308**	13.011		.562	.578	-19.080	33.695					
	ICTUS ABILITY	**1.243**	.679	.250	1.832	**.075**	-.133	2.619	.511	.292	.213	.725	**1.379**
	PRS	**-1.206**	.457	-.354	-2.642	**.012**	-2.132	-.280	-.502	-.403	-.307	.750	**1.334**
	MEDEDU	**.593**	.217	.339	2.731	**.010**	.153	1.034	.106	.414	.317	.872	**1.146**
	CAPINNO	**.527**	.219	.343	2.410	**.021**	.084	.970	.508	.373	.280	.665	**1.503**

4.7.8 Stepwise Regression of Aggregated Variables: Excluded Variables

Table 4.42 shows the variables not included in the final model (model 4). The coefficients of the variables were mostly negative, indicating very little or no association with the outcome variable. Also, the p-values for most of the variables removed in each model were >.05 indicating they are not statistically significant and do not contribute much in associating with the outcome variable (SGL). Likewise, the t – values of the variables

removed in each of the models were of negative values indicating they correlate very minimally with the outcome variable (SGL)

Table 4.42: Stepwise regression of aggregated variables: showing significance (sig)values and VIF (Variance Inflation Factor) values of the excluded variables

Source: IBM 24 Statistical Package for the Social Sciences. 09/20/2018

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
4	HRH	.040e	.288	.775	.049	.715	1.398	.652
	TECHINFRA	.044e	.336	.739	.057	.812	1.231	.621
	INTEROP	-.192e	-1.439	.159	-.236	.731	1.368	.564
	PRIVACY	.032e	.228	.821	.039	.694	1.441	.601
	SECURITY	-.044e	-.245	.808	-.041	.434	2.303	.434
	GOVERNANCE	-.218e	-.943	.352	-.157	.252	3.972	.252
	FUNDING	-.267e	-1.993	.054	-.319	.693	1.444	.663

	REGISTRATION	.062e	.447	.658	.075	.707	1.414	.654
	PROFDIS	-.151e	-.968	.340	-.161	.551	1.817	.506
	INSPT	.005e	.025	.980	.004	.295	3.386	.295

4.7.9. Stepwise Regression of Aggregated Variables: Collinearity Diagnostics

Table 4.43 gives details of how the variables vary with each other. The variances for the four predictor variable all appear to be close to the values of the variance proportion (constant).

Table 4.43: Stepwise regression of aggregated variables: Collinearity Diagnostics. Shows variables for model 4 (best fit), comparison of individual eigenvalues of the variables in model 4.
Source: IBM 24 Statistical Package for the Social Sciences. 09/20/2018

	Dimension	Eigenvalue	Condition Index	Variance Proportions				
				(Constant)	ICTUSABILITY	PRS	MEDEDU	CAPINNO
4	1	4.657	1.000	.00	.00	.00	.01	.00
	2	.204	4.777	.00	.00	.04	.51	.04
	3	.117	6.303	.00	.00	.59	.38	.01
	4	.018	16.027	.08	.11	.18	.10	.94
	5	.004	33.776	.92	.89	.19	.00	.01

4.7.10. Stepwise Regression of Aggregated Variables: Residual Statistics

Table 4.44 shows the mean and standard deviation of the predictor variable. A low mean value (.003) and standard deviation (.988) of the standard predicted is highly significant and shows an association between the outcome variable and predictor variables for model 4. Also, the standard residual mean and standard deviation .014 and .942 indicate linearity, normality, and homogeneity of variance assumptions of multiple regression.

Table 4.44: Stepwise regression of aggregated variables: Residuals Statistics showing the means and standard deviations of the predicted variable (SGL)

Source: IBM 24 Statistical Package for the Social Sciences. 09/20/2018

	Minimum	Maximum	Mean	Std. Deviation
Predicted Value	24.2429	54.9370	41.0905	6.72637
Residual	-15.94488	10.20004	.10000	6.55467
Std. Predicted Value	-2.472	2.036	.003	.988
Std. Residual	-2.291	1.465	.014	.942

4.7.11. Stepwise Regression of Aggregated Variables: Histogram

Figure 4.7 represents an almost symmetrically (normal) distributed curve of the histogram indicating the variance in the mean between the predicted (dependent) variable (SGL) and the predictor(independent) variables. The standard deviation is <1 (.94) while the mean value is very

small (.01). This indicates a very small variability of the predictor variable from the dependent variable (SGL) and a strong relationship.

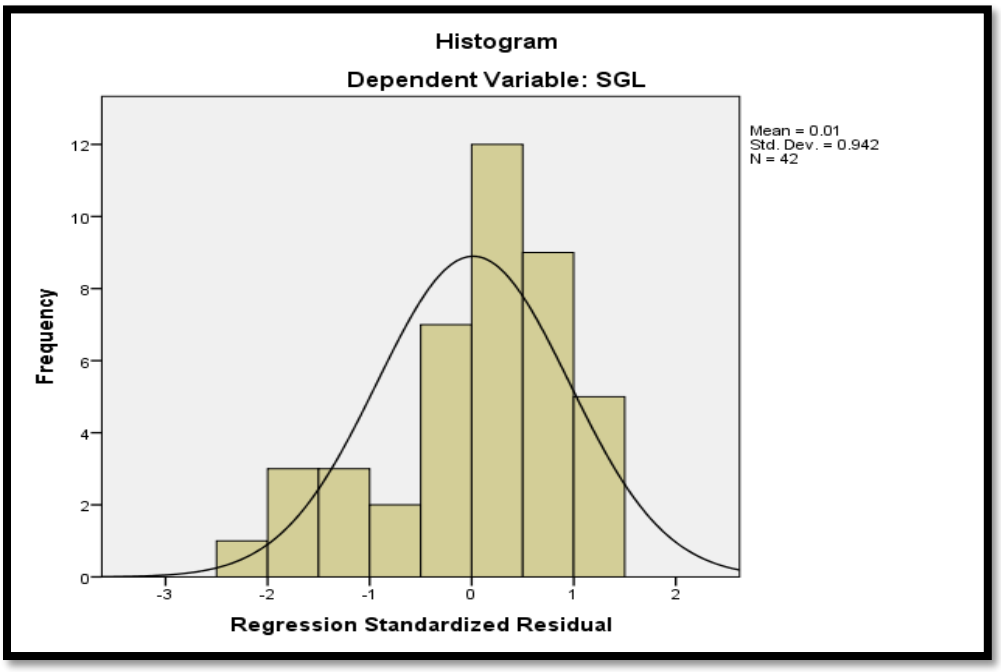

Figure 4.7: Stepwise regression of aggregated variables: Histogram. Showing the distribution of the variables from the mean. Source: IBM 24 Statistical Package for the Social Sciences. 09/20/2018 (SGL: strategic Government Leadership, N: sample size)

4.7.12. Stepwise Regression of Aggregated Variables: Scatter Plot

The regression scatter plot is shown in Figures 4.8 and 4.9. Most of the data points appear to be distributed towards the mid and upper part of the regression line indicating a low variance and significance. There are however some outliers scattered above and below the regression line. This is indicative of some linearity in the relationship.

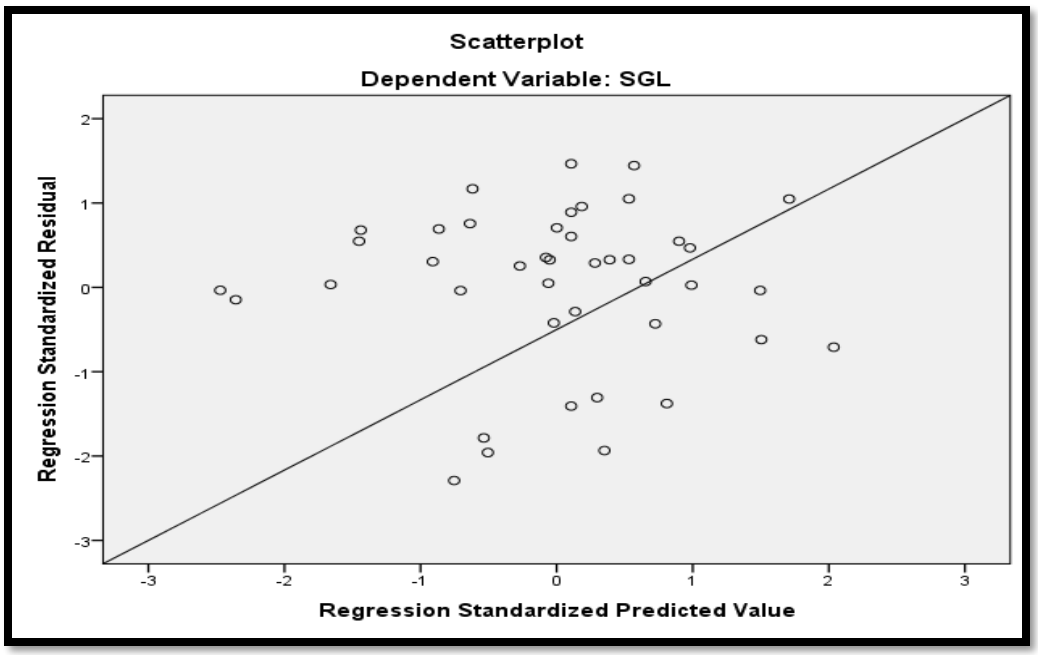

Figure 4.8: Stepwise regression of aggregated variables: scatter plot showing the variance of the variables I relation to the regression line
Source: IBM 24 Statistical Package for the Social Sciences. 09/20/2018
(SGL: Strategic Government Leadership)

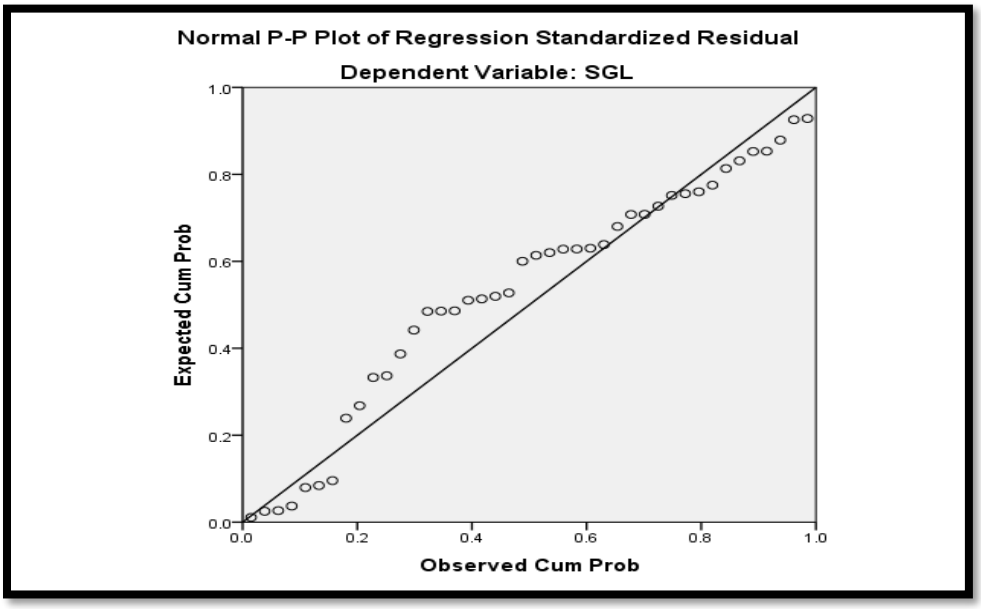

figure 4.9: Stepwise regression of aggregated variables: P-P plot showing the 15 combined variables representing each of the constructs and their distribution around the regression line.
Source: IBM 24 Statistical Package for the Social Sciences. 09/20/2018

4.7.13. Summary of Findings

The data obtained from the primary sources have been presented by charts, tables, graphs of different types and other possible ways. Furthermore, analysis of the data involved visual inspection, coding, categorization, tabulation, and interpretation of the data. The responses were then translated into absolute figures and appropriate percentages, tables and supporting descriptive statements.

Multiple regression (stepwise) analysis predicted models which showed relationships between a dependent (predicted or outcome) variable and some independent (predictors) variables. The final model (model 4) includes the predictor variables (CAPINNO, MEDEDU, PRS, and ICTUSABILITY) that best predict the value of the dependent (predicted) variable. This model also indicates the overall fit (variance) and the relative contribution of the predictors to the total variance. This indicates a positive and existing relationship between strategic government leadership and the independent variables (innovation, medical education, planning research and statistics, and ICT usability).

To derive further evidence for the opinions expressed by the participants, the statistical characteristics of the 15 constructs were developed by aggregating the means and variances of their constituent variables. The results appear in Appendix D table 4.45 the mean of each construct was calculated in a straightforward manner from its constituent variables. The items in each construct are all correlated, calculation of the standard deviation for the resulting aggregation variable while taking into account all the true inter-variable correlations would be rather complex.

For this reason, two theoretical results were calculated, based on two rather extreme assumptions. The first calculation assumed that all the constituent variables for each construct variable were independent (that is, $\rho = 0$ in all cases). In this case, the correlation coefficients ρ

(rho) among all the constituent variables were all zero. The other theoretical extreme assumption that the correlation coefficients among all the constituent variables were one ($\rho = 1$).

The actual correlation coefficients, of course, must lie between these two extremes, but since they are not zero they will increase the variance and standard deviations above the value calculated with correlation coefficients of zero. The corresponding standard deviations for the aggregated construct variables are given in two columns in Appendix D table 4.45. Neither of these results is correct, but the true result will lie between them. Because the constituent items or variables were all chosen deliberately to reflect similar facts, the actual correlation coefficients will lie closer to one than to zero. Thus, the true standard deviation will lie closer to the result shown in the column.

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Chapter Five - Discussion, Summary of Findings

5.0. Introduction

This chapter summarizes and describes the main findings relating to the research questions and general findings observed in the thesis. Also, the strengths and limitations of this thesis are considered and suggestions for future research into eHealth adoption and use are presented. The conclusion of the chapter proffers some recommendations for three categories of stakeholders in health care: policy makers (government), professional health regulatory agencies (PHRAs) and medical and dental practitioners.

5.1. Discussion and Summary of Findings

According to Mars & Scott (2010), the policy needed to guide e-health development is limited and just now emerging in developed countries. They also indicate that fostering eHealth growth in the developing world requires thoughtful policies to facilitate patient mobility and data exchange, across both international borders and regional boundaries within countries. Low resource countries (LRCs) their study identified have taken steps in encouraging the adoption and use of eHealth to improve health care services, such as the development of tools to encourage data exchange, and accessibility through the development and implementation of policies, frameworks, and legislation.

In 2016, the Nigerian government approved its National Information Communication Technology (ICT) for Health framework and empowered its agency, the National Information Technology Development Agency (NITDA) through legislation, to provide the required leadership, governance, and stewardship for improving the use of ICT in the provision of

healthcare services. My study has also identified similar LRCs, like Bangladesh, Kenya, Uganda, Namibia, Ethiopia, Ghana, Swaziland, India and Jamaica amongst others that have all recently developed eHealth frameworks to improve health care and service delivery.

This study has found that, among key stakeholders in the health sector, PHRAs play an important role in encouraging the adoption and use of eHealth in hospitals/clinics and among professional's health regulatory bodies (agencies). These regulatory agencies have mandates to ensure registration of qualified professionals, determine and maintain the right standard of education, training and continuing education of healthcare professionals and discipline of professionals among other responsibilities. Their overall objective is protecting and safeguarding the lives of the public.

The staff of these regulatory agencies have also been shown to contribute immensely to the adoption and use of eHealth. This occurs because they are involved with policy development, implementation and provision of services to stakeholders like practitioners, private and public organizations, and international agencies and development partners.

In encouraging eHealth adoption and use in LRCs, my study also describes the concept of strategic government leadership (SGL), health regulation and eHealth policy as factors that affect effective eHealth implementation, adoption, and use in LRCs. It also explains the relationships between strategic leadership, governance, policy implementation, and innovation. Key terms such as strategic leadership, stewardship, governance, policy, and framework, healthcare regulation, health systems LRCs and Nigeria were clearly defined, to aid better understanding and discussion of the topic and the study's findings. "Although many actors have an influence on stewardship, there is a central role for the government in ensuring equity, efficiency and sustainability of the health system" (Olmen, 2010).

The study by Olmen found that stewardship and governance involve policy guidance to the whole health system, coordination between actors and regulation of different functions, levels, and actors in the system, and optimal allocation of resources and accountability for all stakeholders.

Hanson et al (2010) found that there is a scaling up challenge needed for related policy development and implementation processes to be managed strategically for supporting services. The importance that the contribution of policies and legislation play in the overall picture of use and adoption of eHealth is seen as a key driver, with effective implementation of related policies and legislation being a recurring limitation.

LRCs have been identified as countries that are the most challenged with the implementation of policies that can drive the development of critical sectors, including healthcare. Despite the development of policies and frameworks in these LRCs, many still struggle to deliver on their health goals. eHealth adoption and use in these countries has been viewed as having the potential to improve the quality of healthcare, as in developed countries. This can result in saving medical costs and improving the efficiency and knowledge of healthcare practitioners (Black et al., 2011).

The failure of most low resource African countries to integrate ICTs into development programs could have been as a result of the failure by these governments to recognize the importance and effectiveness of ICTs in boosting development and in reducing poverty. This could only happen if LRCs recognize the potential of ICTs and put in place broader and more comprehensive national development strategies (Chavula & Chekol (2010).

The evolution of the Nigerian health system was examined in this study, ranging from the pre-colonial era, emphasizing the development of health policies which could influence future eHealth use and adoption. The creation of health agencies and policies to provide more effective

regulation and oversight activities for a healthier nation were also examined. Responsibilities of the leadership structure of the Nigerian health system were described to identify how and what each of the leaders can do to encourage the use and adoption of eHealth. These would be in the area of developing common ICT platforms, in sharing health information to improve accessibility and data management, investment of health resources in the training of health workers, and the commitment and political will to invest in ICT research. This would bring about the much-required technological innovation in health care services.

Findings from literature reviewed in this study, observed that healthcare system in all countries does not operate in the same way it does in Nigeria or in LRCs. For example, in South Africa all the PHRAs belong to one large umbrella body known as the health professional council of South Africa while in Nigeria each of the PHRAs are independent of the other in terms of management, and administrative structure. In Canada the healthcare disciplines are self- regulated and operate under provincial or territorial legislative Acts (except federal for military and indigenous people). The provincial and federal governments provide about 75% of the funding, but don't provide strategic leadership to the disciplines. In Nigeria the health professions are likewise self-regulated, with the federal government providing the strategic leadership and full funding of both capital and recurrent (overhead) budgetary activities including renumeration of employees of the PHRAs. In Nigeria the direct influence of the government is only limited in cases involving professional discipline of the practitioners. In Nigeria the professional health associations are closely involved in regulation and collaborate with the PHRAs in areas of continuing professional development and welfare of practitioners, in some instances they provide administrative support as some of the professionals are appointed to serve as members of the

professional councils or board. In China and Russia, the situation is also different as the practitioners all typically work for the state and not private facilities or individuals.

To strengthen and support arguments in the existing literature regarding factors that affect eHealth adoption and use in LRCs, SGL as an area of focus was examined closely. It was discovered that existing literature about eHealth adoption challenges in LRCs limited, particularly as it relates to eHealth policies and SGL. The study by Black et al. (2011) identified the potential from eHealth adoption, and the effects of its use on health outcomes, quality, and the efficiency of services delivered to patients.

However, despite the positive benefits eHealth offers, studies indicate that the rate of e-Health adoption in some developing countries has either been low or underutilized. This has been argued to be due, in part, to barriers such as resistance from healthcare professionals, poor infrastructure, and low technical expertise among other issues. Also, Yamey, (2012) believes that most low- and middle-income countries (LMICs) are currently not on the path to reach the health-related Millennium Development Goals (MDGs), now overtaken by the Sustainable Health Goals of the United Nations.

One way to accelerate progress would be through the large-scale implementation of evidence-based health tools and interventions (Yamey, G. 2012). A notable number of studies have been carried out and many are still in progress with the aim of assessing the impact of eHealth solutions on the quality and safety of health care, and to inform policy decisions on eHealth deployments (Black et al., 2011, p. 11).

My study found that PHRAs play a critical role in encouraging the adoption and use of eHealth. The medical and dental council of Nigeria (MDCN), through its mandates and responsibilities, can utilize eHealth to bring about effective regulation of practitioners. This it has

done, and it could do still more. The MDCN is now able to archive records using customized software for registration and archiving of practitioner records. To further implement much-needed efficiency and innovations the MDCN would have to put in place policies and legislation that are up to date with current realities and practices in the medical and dental professions. This includes updating curricula (with the inclusion of eHealth) for the training of medical and dental practitioners at both the undergraduate and postgraduate levels, as well as standardizing its licensure, medical education, inspectorate, and professional discipline processes through a better understanding of eHealth.

In exploring the impact and roles SGL pays in the adoption and use of eHealth, a total of 277 articles and other publications were screened. However, only 165 were included for full assessment and inclusion. The articles reviewed were those related to health policies and legislation, health systems in developing and/or LRCs, Health Management Information Systems or ICT, professional healthcare regulation, leadership, health care governance, and stewardship.

Findings from the literature revealed a clear understanding of eHealth and innovation, its benefits, and challenges in LRCs. Healthcare governance, leadership, and stewardship in the Nigerian healthcare system were largely well reported. This is evident by the existence of a tangible number of policies, legislation and healthcare reforms in the Nigerian health sector dating back to pre-independence. These could be leveraged by the relevant stakeholders in health to encourage eHealth adoption. However, understanding how best to streamline and implement these policies and legislation remains an uphill task for the relevant government agencies. Many of the policies relating to eHealth or Health Information Systems appear not to be specific to the mandates of PHRAs, as they appear rather general or implied. Most of the legislation and/or

subsidiary laws of the PHRAs appear to be deficient or obsolete as to the regulation of practitioners and health facility users of eHealth tools in the present dispensation.

Barriers to progress on this front include: lack of political will; healthcare domiciled in the concurrent list of the Nigerian 1999 Constitution; conflicting legislation and mandates especially among the PHRAs who have similar mandates; interprofessional rivalry, poor budgetary allocations to health, lack of healthcare system interoperability, and infrastructural challenges. These have been debated as factors that could impede eHealth adoption and use in LRCs. This study discovered the apparent existence of a drought in the available literature on PHRAs in Nigeria, including their activities and how they inter-relate with each other and with the government at the center, especially in sharing health information and data.

My study is critical in identifying the impact and roles SGL could play in eHealth adoption and use by PHRAs, specifically the Medical and Dental Council of Nigeria (MDCN). The study helps to better understand what impact and roles SGL plays in the adoption and use of eHealth in LRCs from the point of view of policies. MDCN was used as a case study to demonstrate this understanding, being a government institution established by legislation with a clear mandate and reliance on legislation and policies in the performance of its statutory roles. The study found that the MDCN had enough policies to encourage its employees to adopt and use eHealth tools to provide regulation, but it lacks adequate eHealth regulation in its legislation to encourage it to effectively regulate the practitioners in the areas of licensure, professional discipline, education and continuing professional development of. The Medical and Dental Practitioner Act 2004 of the MDCN requires revision to incorporate eHealth in its activities in order to provide effective regulation of practitioners. This would improve its strategic leadership role and responsibilities.

The study also provides answers to the three research questions which were postulated. Findings from the study also revealed the strategic leadership role of the MDCN as a regulator in delivery of its mandates in reducing cases involving practitioner's negligence and malpractice, improving licensure activities, and training of practitioners. In addition, I have shown that employees of the MDCN were very knowledgeable and perceptive of the existing eHealth policy in Nigeria, and relevant legislation at the MDCN.

A detailed analysis and interpretation were performed with data collected from MDCN staff about eHealth policy, the experience of regulators in the agency, issues of security, privacy, interoperability, innovation, planning, financing (funds), and SGL roles of healthcare regulators and agencies. This was in addition to studying the existence of other challenges and concerns which may affect eHealth adoption and use by the staff of regulatory agencies and registered practitioners.

86 respondents were expected to have completed the questionnaire, but only 52 (60.5%) of potential respondents successfully completed the questionnaire. The analysis was based on these completed questionnaires after the data were cleaned and recoded. Discussion of results generated for each of the fifteen combined variables (constructs) represents overall participant opinions of each of the aggregated variables.

Constructs nine through fifteen reflect a certain level of disagreement as seen in Appendix D Table 4.45. The individual mean values for these constructs all range between 2.3 and 2.6 (the negative range) when compared to constructs one through eight whose mean values range between 5.3 and 6.0 in the more positive range.

Participants largely disagreed with statements arising from constructs concerning (data governance, funds sustainability, effects of eHealth policies on regulation of practitioners,

professional discipline, medical education, inspectorate activities and planning research and statistics)

5.3. Research Questions.

From the statistical findings of this study answers are provided for the three postulated research questions in the following sections:

5.3.1. Does a Relationship Exist Between Strategic Government Leadership (SGL) and Capacity for Ehealth Innovation and Technological/Infrastructural Development?

Statistics generated from the data strongly agree that SGL is closely associated with the perception of the capacity for innovation and technological/infrastructural development. This can be seen in Appendix D table 4.45. The table shows the aggregate of the construct SGL in relation to the constructs for capacity for innovation and technological infrastructure. A correlation appears to exist between these constructs, evident by the results from the regression analysis.

In further support of this answer, the responses (there is adequate capacity for implementing regulatory activities on eHealth among practitioners, there is a capacity for assessment of readiness for eHealth acceptance and use, and there are effective mechanisms for implementation, support, monitoring and evaluation of eHealth projects) based on the mean value of the participant responses are also seen to be positive (agree) in Appendix D table 4.45. The proposed theory from the literature review of this study (chapter 2 p44, table 2.7) ‘family of diffusion of innovation models as proposed by Rogers 2003; Oldenburg and Glanz 2008’ relates to and supports this argument.

5.3.2. What are the Measures Taken and the Importance of the Security and Privacy of Practitioner Records to Professional Health Regulatory Agencies?

Table 4.4 shows the 14 extracted variables from the principal component analysis technique of which 6 relate to security and privacy. Likewise, from responses of respondents (Tables 4.15, 4.16, 4.19 and 4.21) and the variables belonging to the constructs, security, and privacy (appendix D table 4.5), the respondents perceive that:

- databases are securely backed up regularly to support quick recovery in case of system failure
- data transmission is handled by secure networks, and staff of the MDCN is trained to recognize and avoid malicious attacks on the systems and data
- security is an important consideration in the MDCN policy guide on eHealth
- regulations for protecting patient's healthcare records are in use and are being enforced.

Regulations have been developed for protecting practitioner's data managed by MDCN, and it can also be deduced that issues of security and privacy of all practitioner's records/information are of high importance to this PHRAs from the perceptions of the staff of the MDCN. However, further investigation would be required to ascertain to what extent and what measure the PHRAs like the MDCN have taken to provide security and privacy. The external users of the MDCN ICT systems (software) who are mainly the medical and dental practitioners would need to be invested to confirm this as responses from staff of MDCN where only perception and this can not serve as a hard fact for this study.

5.3.3. Does Strategic Leadership, as Demonstrated Through Policy Development, Affect the Adoption and Use of Ehealth by Employees of Professional Health Regulatory Agencies (PHRAs)?

Table 4.4 shows extracted variables and their respective constructs from the principal component analysis performed which resulted in 14 variables that contribute the most to the variance and are closely associated with the dependent variable SGL. Three variables were extracted belonging to the policy construct and these have to do with the mandates of PHRAs (medical education and professional discipline), as follows: eHealth adoption and use are supported by planning at the MDCN, medical and dental training curricula have been updated to include training and examination of undergraduates in eHealth, and eHealth benefits regulation of medical ethics among practitioners.

Also, the summary Table of the stepwise regression analysis (Table 4.38) shows that the medical education and ICT usability predictor variables were among the four variables which constituted the final model resulting from the multiple regression. This indicates that the variables FMoH and MDCN Capacity for Innovation (CAPINNO), Effect of eHealth Policy on Medical Education (MEDEDU), Information and Communication Technology usability (ICT USABILITY), and Effect of eHealth Policy on Planning, Research and Statistics Activities (PRS) construct variables have a significant association with the dependent variable SGL.

The proposed theory in this study "family of diffusion of innovation models" as proposed by Rogers 2003; Oldenburg and Glanz 2008 in the review of literature (Table 2.6) also supports this result, making it a good fit for adoption by low resource countries. Basically, this shows that with effective planning and research in innovation and its adoption, the seven key drivers proposed by Rogers, and Oldengurh and Glanz in their innovation theories (models of diffusion of

innovation) tend to apply here. These drivers are development, diffusion, adoption, implementation, maintenance, sustainability and institutionalization.

The provision of strategic leadership in the direction of developing policies would ensure that each of these drivers is effectively captured and implemented, as well as ensuring the compliance of health workers.

5.4. Regression Analysis Model

The model generated from the stepwise analysis (table 4.39) indicates a significant relationship between the dependent (outcome) combined variable, which is strategic government leadership (SGL) and the predictor (independent) combined variables; FMOH and MDCN Capacity for Innovation (CAPINNO), Medical Education (MEDEDU), ICT USABILITY and Planning, Research and Statistics (PRS). This would imply that when strategic leadership is provided through the development and implementation of the right policies by the PHRAs, it most likely will lead to improved perceptions regarding: a) better capacity for innovation, b) better policies and educational curricula to improve or encourage eHealth use and adoption, c) better use and adoption of information communication technology (ICT) in healthcare, and d) improved planning, research and statistics in PHRAs for the overall benefit of encouraging eHealth use and adoption.

5. 5. Strengths and Limitations

Study limitations are the peculiarities of the study design or methodology which influences the interpretation of the findings obtained from research. These include challenges involving generalizability, applications to practice, and/or utility of findings which are outcomes of the ways

the study design or method was chosen, to establish internal and external validity (Prince, & Murnan, 2004).

In this study, the size of the sample population (119) was comprised of management, senior and junior staff of a single agency. This was a significant limitation as only one of the thirteen PHRAs in Nigeria was considered, due to time and geographical location constraints. For more generalizable results, the study would have to be conducted in larger and more diverse populations in similar regulatory agencies. This would help in comparing information from various agencies to establish any general form of relationship among variables.

The impression derived from the study was that most respondents were experienced public servants with job experience and responsibility in healthcare regulation and policy development. They were mainly senior employees in the administrative cadre who provide direct professional services to practitioners from the registration department of the MDCN. Few of the respondents belong to the top management of MDCN who are mainly responsible for policy development within the MDCN and at the Federal Ministry of Health. More participation from such high-level employees of the MDCN would have improved the outcome values of the study.

This study proposes a theoretical framework from the review of literature (Table 2.6) which is classified into the three categories of innovation, leadership, policy and health regulation. The theoretical framework that would best suit and support this study is one that encompasses these key ideas. This framework should be tested to ensure that the requirements suggested herein constitute a practical and workable solution. This was not done because of limited time. It is, therefore, possible that the findings of this study may have a certain degree of error. However, I attempted to eliminate errors wherever possible.

One key limitation of the study was the small number of participants (52), with only 42 completed surveys remaining after the data were cleaned. This made it difficult to validate the results obtained from the factor analysis since there were a total of 61 items or variables in the questionnaire, making it over-determined and impossible to carry out a full analysis. Furthermore, the reduced number of participants made the task of applying theoretical problems to the research findings challenging.

A limited result was possible through the first step of the principal components analysis which extracted 14 variables with eigenvalues greater than one. Also, the creation of 15 combined variables from the items that made up each construct, allowed a limited multiple regression study with a result that supported the principal component study.

The questionnaire was designed using easy to understand English for clarity and easy understanding by non-IT respondents of the items (variables) included.

Although this thesis captures some important issues confronting eHealth implementation in PHRAs and LRCs, it does not report on cultural dimensions of the people in those organization. Since this has the potential to impact the implementation of the eHealth, future studies should consider the impact of culture on eHealth adoption. Another consideration is to investigate the opinions of other stakeholders such as healthcare practitioners and patients.

5.6. Recommendation for Further Studies

This study may form a useful contribution towards understanding the impact and roles of strategic leadership in the adoption and use of eHealth in LRCs, especially in PHRAs. The study hints of a possible way forward for the sustainable development of eHealth policies in LRCs. It has identified the importance of putting in place policies that can assist government institutions in

LRCs to provide strategic leadership, thus helping in the uptake and use of eHealth by the relevant stakeholders in healthcare. However, due to the above-highlighted limitations, it is recommended that another study should first be carried out to determine the suitability of the framework for encouraging strategic leadership, through policies, designs, and innovation. This framework should identify key eHealth stakeholders, and the tasks they should perform in a logically iterative manner for sustainable eHealth utilization in low resource countries.

A qualitative approach in the form of interview either through telephone call, emails or physical contact was considered, however, it was not possible due to the time and resource constraint in considering such an approach. In future interview involving patients, practitioners and other relevant stakeholders is suggested to improve on this study as it would help to provide fresh ideas on SGL and help to confirm some of the perceptions of staff of the MDCN as to their responses in this study.

5. 7. Contributions of This Research

The contribution of this thesis is primarily towards the understanding of policies that can regulate eHealth in a way that will provide a maximum positive impact on healthcare: The study identifies and improves the understanding of the strategic roles health regulators can play to improve the adoption, use, and sustainability of eHealth tools, especially in economically challenged environments. Here, budgetary allocations to the healthcare sector and particularly the ICT infrastructure pose serious challenges, since eHealth capacity available to healthcare practitioners is often abysmally poor. Furthermore, knowledge gathered from the study can assist in future policy development, planning, revision, and implementation including eHealth functionalities, health data gathering, sharing, and accessibility. These undertakings may be more

successfully planned and executed if there are better and more robust policies and better understanding among healthcare stakeholders and regulators. The study also showed that the MDCN can effectively provide better regulation if it is able to revise its enabling law (MDP Act) to incorporate eHealth activities and regulation. As the Act stands it does not sufficiently cover eHealth and would make regulation of licensure, professional discipline, education and training of practitioners who use eHealth tools ineffective.

5.8. Recommendations to Stakeholders

The following recommendations are drawn from the study for consideration by the key categories of stakeholders in the Nigerian health care system: policy makers (Federal Ministry of Health), PHRAs and medical and dental practitioners.

5.8.1. Policymakers (Federal Ministry of Health)

The government should be well informed about the benefits and latest innovations in eHealth to encourage appropriate allocation of funds. There is also a need for government to invest more in capacity building and to drive the awareness of medical and dental practitioners, ICT experts and health regulators towards the encouragement and scale-up of eHealth. Notable of such training was the 2016 eHealth capacity building workshop facilitated by NITDA in collaboration with McMaster University, Canada and AAjimatic Inc. who both provided the expertise, knowledge and experience from North America that the Nigerian government could build upon. (http://nitda.gov.ng/nitda-conducts-e-health-training/ accessed 03/02/2018)

This study suggests that a distinctive strategy should be put in place by governments and policymakers to guarantee proper planning for a national eHealth environment. In addition,

funding support and permanent sustainability should be national priorities. Governments need to prioritize investments in basic eHealth infrastructure and the improvement of human resource capacity in this area. It is also important for governments to play a dynamic role in eHealth implementation through the execution of suitable national policies and guidelines (Adebesina et al., 2014).

In line with this, the study will help to guide the Federal Ministry of Health and the Federal Ministry of Communication in development and future revision of policies, by making them more easily adaptable, and more integrated through a multi-stakeholder approach. Such policies should also have an automatic adjustment mechanism, enabling self-organization and social networking, decentralization of decision making, and allowing suitable variations, through the encouragement of continuous learning and policy review (Swanson & Bhadwal 2009; Swanson et al. 2010).

Movement on these issues might enhance the scaling up or implementation of eHealth in Nigeria and encourage the adoption and use of eHealth tools among registered healthcare practitioners such as nurses, physicians, laboratory scientists, pharmacists. The current National Health ICT Strategic Framework (2015-2020) document was developed through the visionary leadership of both the Ministries of Health and Communication with support from agencies of government they supervise, including MDCN, the National Information Technology Development Agency (NITDA), non-governmental organizations (National Health ICT Strategic Framework 2016), and other development partners from the private sector like AAJimatics, a Canadian company with a Nigerian branch.

NITDA, the ICT policy implementing agency of the Federal Ministry of Communications has the mandate to plan, develop and promote the use of information technology in Nigeria. The legislation establishing NITDA (NITDA Act 2007) Part II gave it the responsibility to develop

guidelines for electronic governance and monitoring of the use of online data interchange and other forms of electronic communication transactions as an alternative to paper-based methods in government, health, commerce, education, the private and public sectors, labor, and other fields. Electronic communication of data and information is clearly the future of healthcare in Nigeria.

5.8.2. Health Professional Regulatory Agencies

My study recorded the highest number of participants 13 (25%) from the Registration Department of the MDCN and found that staff of this department are involved with direct customer service responsibilities as well as providing policy guidance and development to the government on the registration of qualified practitioners. However, given the bureaucratic structure of governance in most public institutions, it would be advantageous to equip these skilled middle-level senior staff with more responsibilities beyond customer service. Such responsibilities could involve enforcement and the implementation of policies to improve eHealth adoption and use.

Many of the policies relating to eHealth or Health Information Systems appear not to be specific to the mandates of PHRAs but as rather general or implied. This is because most of the legislation and subsidiary laws of the PHRAs are deficient and out-of-date in the regulation of practitioners and health care providers who use eHealth tools.

The study discovered an apparent drought in the existence of suitable literature on PHRAs in Nigeria, including their activities and how they inter-relate with each other. This study has identified the impact and the roles that SGL could play in eHealth adoption and use by PHRAs, specifically the MDCN. It is therefore recommended that MDCN take the lead in this direction by investing more in research and publications of their activities and by ensuring that eHealth policy

is included in the study curricula of the training of both undergraduate and postgraduate medical and dental practitioners.

The research findings and results that are reported in this study may also provide to the management of the MDCN and the other twelve PHRAs the required knowledge to provide an improved service to practitioners who use the eHealth tools. In turn, this would benefit their understanding and use of eHealth policies. The regulators would also be able to generate, access, disseminate and store valuable data and information which could be used for health and economic planning by governments to improve the life of citizens.

The study may also benefit the training of human resources for health, which is vital to the growth and sustenance of eHealth adoption and use . MDCN regulates and determines the minimum standards acceptable for the practice of the medical and dental professions in Nigeria, especially at the undergraduate level. This study would help to motivate the revision of the MDCN guidelines of registration and the minimum standards for medical and dental education in the Nigerian curriculum. These were last reviewed in 2004 and 2008 respectively and are long overdue for revision. This would also apply to the other twelve sister PHRAs.

This study could be helpful to the MDCN in fashioning improved strategies in the conduct of updating its courses and assessment examinations for foreign-trained medical and dental practitioners. They, by statute are subjected to licensure and professional competency examinations before being able to obtain registration and licenses to practice from the MDCN. Currently the update courses and examinations are conducted manually and are contracted out to teaching hospitals across the country in a rotation fashion twice annually (MDPA 2004, MSMDEN 2004). The examination is usually in the form of multiple-choice questions, clinical practical (steeple chase or life case basis), and oral interviews. Over the years the processes and outcomes

of update preparatory courses and actual examination have been criticized for failing to produce and register foreign trained practitioners with high quality standards when compared to practitioners trained locally. Adopting and using eHealth tools in the preparation, registration and conduct of the update courses and examination by the MDCN would ensure a seamless process. They would also ensure that results achieved by the candidates are very transparent, real time, and have an impact on the standard and quality of practitioners to be registered and licensed to practice the profession. Having an online or computer-based examination process would eliminate the challenges of long-distance travel and high logistics costs by both MDCN staff and candidates, and enable the MDCN to work from a rich reserve of questions.

The adoption of eHealth in the examination process could help the MDCN to transition from traditional methodologies of assessing physicians to more modern ways such as those being employed by PHRAs in resource rich counties such as Canada, Australia and the United Kingdom. These countries have adopted a three-stage examination process which is largely ICT driven, as compared to a one step examination process adopted by the MDCN. This may help to improve on the quality and standard of practitioners registered to practice.

Another goal of the study is to benefit future researchers as a guide that might bridge certain gaps in eHealth policy development and implementation, discourage brain drain and medical tourism in developing countries and improve continuous professional development, training and retraining of healthcare practitioners. The study should also benefit health sector planning as well as data gathering and sharing among stakeholders in the health sector.

Overall the study is intended to reinforce health regulation at the professional agency level, in line with the mandates of the thirteen federal health regulatory agencies including: registration, education, continuing professional development of registered practitioners, inspectorate activities,

professional discipline of erring members, and helping to build a robust and reliable database which often resides in the Planning Research and Statistics departments of these agencies.

5.8.3. Medical and Dental Practitioners.

The use and acceptance of ICT services that support healthcare activities are highly recommended. These services should be scaled up and an awareness of their benefits communicated to practitioners to encourage the adoption of technologies as they become available.

This study could help promote medical training, continuing professional development through telemedicine, preparation for computer-based assessments and increase awareness of practitioners about the enabling ICT legislation related to health and their practices and how the PHRA enforces such laws and policies.

5.9. Conclusion

This study explored the impact and role that SGL plays in stakeholder perceptions regarding the adoption and use of eHealth in Nigeria, using the MDCN as a case study of PHRAs in LRCs. The study found that MDCN can provide strategic leadership through an effective and up to date policy if its enabling legislation (MDP Act) is updated to adequately incorporate innovations such as eHealth. The study also found that staff of the MDCN were very knowledgeable about existing eHealth legislation in Nigeria that affects the MDCN. The study also provided answers to research questions, by demonstrating the relationship between SGL and the capacity for the MDCN to provide innovation and technological infrastructural development. This can encourage eHealth adoption and use in the agency, and employees of the MDCN has a strong perception on the measure and importance the MDCN places on security and privacy of

practitioner records however, a further study involving other stakeholders like the physicians would be helpful to confirm such perception among the MDCN staff. The study is one step towards understanding these challenges in LRCs. It also provides a better understanding of what PHRAs face in policy development and implementation and how they can scale-up eHealth innovation, adoption and use, through strategic leadership.

The challenge of strategic leadership through policy development and implementation has been identified as a perceived barrier that must be addressed before eHealth is successfully implemented and scaled up in LRCs. For example, this barrier will require a transformation of the standards development process at an international level. Governments of LRCs need to adopt as a high priority an investment in the development of human resource capacity and to play a more active role in standards adoption through appropriate national policies and guidelines.

The proposed theoretical framework based on a 'family of diffusion of innovation models may show the way forward in encouraging the development of policies that are sustainable and implementable by government agencies. The proof will lie in extensive innovations in eHealth and its regulation in LRCs. This would also ensure that future reviews of governmental eHealth policy are all-encompassing and inclusive of all stakeholders.

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APPENDIX A

SUMMARY OF THE MANDATES OF 13 PROFESSIONAL HEALTH REGULATORY AGENCIES SUPERVISED BY THE NIGERIAN FEDERAL MINISTRY OF HEALTH.

Sources: 2004 laws of the federation of Nigeria http://lawsofnigeria.placng.org/. Accessed 05/25/2018.

1	Medical and Dental Council of Nigeria (MDCN)	- Regulation of training and practice in Medicine, Dentistry and Alternative Medicine in Nigeria - Determination of the knowledge and skills of these professionals. - Regulation and control of Laboratory Medicine in Nigeria. - Determine code of practice of practitioners and discipline of erring practitioners - Registration of practitioners
2	Pharmacy Council of Nigeria (PCN)	- Determining the standards of knowledge and skill, to be attained by persons seeking to become registered members of the Pharmacy profession - the establishment and maintenance of registers of persons entitled to practice as members of the profession and the publication, from time to time, of lists of those persons;

		- Reviewing and preparing from time to time, a statement as to the code of Conduct which the council considers desirable for the practice of the Pharmacy profession, - Regulating and controlling the practice of the profession in all its aspects and ramifications. - Overcoming, such other functions as may be required of the council under This Decree, and (2)
3	Medical Laboratory Science Council of Nigeria (MLSCN)	- To regulate the practice of Medical Laboratory Science in Nigeria - To determine from time to time the standard of knowledge and skill to be attained by persons seeking to become Medical Laboratory Scientists, Medical Laboratory Technicians and Medical Laboratory Assistants (referred to as "Scientists', 'Technicians' and 'Assistants'). - To regulate the training of Scientists, Technicians and Assistants in any institutions in Nigeria and give periodic accreditation to institutions. - To provide and maintain separate register for Scientists, Technicians and Assistants. - To regulate the production, importation, sales and stocking of diagnostic laboratory reagents and chemicals.

		- To assess, evaluate and register foreign graduates of Medical Laboratory Science - To conduct examinations for Technicians and Assistants - To inspect regulate and accredit Medical Laboratories (Public and Private) and
4	Nursing and Midwifery Council of Nigeria (NMCN)	- Determining what standards of knowledge and skill are to be attained by persons seeking to become members of the profession of nursing and midwifery (in this Act referred to as "the profession") and reviewing those standards from time to time as circumstances may require; - the establishment and maintenance of a register of persons entitled to practice the profession and the publication from time to time of the lists of those persons; - regulating and controlling the practice of the profession in all its ramifications;
5	Health Record Officers Registration Board of Nigeria (HRRBN)	- Determining what standards of knowledge and skill shall be attained by a person seeking to become a member of the profession of health records management and improving those standards from time to time of list of those persons;

		- the establishment and maintenance of a register of persons registered under this Act as member of the profession and the publication from time to time of lists of those persons - Conducting examinations in health records management and awarding certificates or diplomas to successful candidates as appropriate, and for such purpose the Board shall prescribe fees to be paid in respect thereof.
6	Optometrist and Dispensing Optician Registration Board of Nigeria (ODORBN)	- Determining what standards of knowledge and skill are to be attained by persons seeking to become members of the profession of optometry and dispensing optics and improving those standards from time to time as circumstances may permit; - the establishment and maintenance of a register of persons registered under this Act as members of the profession of optometry and dispensing optics and the publication from time to time of lists of those persons; - Conducting examinations in the relevant profession, and awarding certificates or diplomas to successful candidates as appropriate; and for such purpose the Board shall prescribe fees to be paid in respect thereof; and

7	Institute of Public Analyst of Nigeria (IPAN)	- Determining what standards of knowledge and skill are to be attained by the persons seeking to practice as Public Analysts and managing those standards from time to time as circumstances Training and registration of Public Analysts. - Regulation of the practice of Public Analysts by issuing guidelines on ethics and professional practice, review of such guidelines from time to time. - Registration and regulation of analytical laboratories and carryout other functions to ensure compliance with approved standards of practice. - Apply sanctions for professional misconduct by members of the Institute. - Provide library for research and the advancement of knowledge of members and the public. - Creation of fora where Public Analysts meet to discuss matters affecting the profession. - Co-ordination of information relevant to the profession and dissemination amongst Public Analysts. - Standardization of analytical methods and development of new ones. - Co-operation with relevant organizations whose objectives border on: Standardization of consumer products, Control of regulated products such as Food,

		Drugs, Cosmetics, Medical Devices, Water and Chemicals, Protection of the environment from hazardous substances. - Participation in National Planning and Development.
8	Dental Technology Registration Board of Nigeria (DTRBN)	- Determining what standards of knowledge and skill are to be attained by persons seeking to become members of the profession of dental therapy and improving those standards, from time to time, as circumstances may permit; - the establishment and maintenance of a register of persons registered under this Act as members of the profession of dental therapy and the - publication, from time to time, of lists of those persons; - conducting examinations in the profession, and - awarding certificates or diplomas to successful candidates as appropriate; and for that purpose,

		- the Board shall prescribe fees to be paid in respect thereof; and
9	Dental Therapist Registration Board of Nigeria (DTRBN)Medical Rehabilitation	- Determining what standards of knowledge and skill are to be attained by persons seeking to become members of the profession of dental therapy and improving those standards, from time to time, as circumstances may permit; - the establishment and maintenance of a register of persons registered under this Act as members of the profession of dental therapy and the - publication, from time to time, of lists of those persons; - conducting examinations in the profession, and - awarding certificates or diplomas to successful candidates as appropriate; and for that purpose, the Board shall prescribe fees to be paid in

		respect thereof; and
10	Medical rehabilitation therapist Board of Nigeria (MRTBN)	- Determining what standards of knowledge and skill are to be attained by persons seeking to become registrants of the relevant professions. - Raising the standards from time to time as circumstances may permit. - Conducting examinations in the relevant profession and awarding Degree or Diploma certificates to successful candidates as appropriate and prescription of fees to be paid in respect thereof. - Regulation and control of professional practice of Physiotherapy, Occupational Therapy, Speech Therapy and Audiology in Nigeria either hospital based or otherwise. - Accreditation of academic and clinical programs, for medical Rehabilitation training and practice in the country. - Infiltrating discipline and decorum into the profession by enacting Medico-legal attributes of the Board, MRTB, for the protection of Registrants. - Elimination of quackery through proper registration of Medical Rehabilitation Therapy training and clinical premises and through surveillance and monitoring activities.

		- Production and maintenance of up-to-date register for the Registrants under the Board (MRTB). - Conducting Induction Programs to admit fresh graduands into Medical Rehabilitation Professions. - Organizing refresher courses in form of Continuing Professional Development (CPD) Programs for the Manpower Development Strategies for Medical Rehabilitation professionals nationwide. -
11	Radiographer Registration Board of Nigeria (RRBN)	- Determining the standard of knowledge and skill to be possessed by persons seeking to become members of the profession and to improve those standards from time to time as circumstances may permit. - Maintain a register of members of the profession and the publication from time to time of the list of such persons. - Conducting examinations in the profession and issue certificates or diplomas to successful candidates as appropriate. - Ensuring quality service delivery by every Radiography centre in Nigeria. Ensuring discipline and good professional, ethical and moral standards of all Radiographers

12	Institute of Chemist of Nigeria (ICN)	- determining what standards of knowledge and skill are to be attained by persons seeking to become registered as chemists and raising those standards from time to time as circumstances may permit; - the establishment and maintenance of a register of fellows, associate members, professional members, ordinary members and honorary fellows and members of the Institute and the - publication from time to time of the lists of those persons; and
13	Community and Environmental Health Registration Board of Nigeria (CEHRB)	- Determining what standards of knowledge and skills to be attained by persons seeking to become members of the profession of Community Health and improving the standard from time to time. - The establishment and maintenance of a register of persons registered as members of the profession - Conducting Examination in the profession and awarding Certificates of

		Diploma to successful candidates and prescribe fees to be paid in respect thereof. - Indexing of trainees for various Community Health Practice Courses. - Inspection of schools and institutions where Community Health Practitioners are trained for the purpose of accreditation of Community Health programs. - Accreditation of schools and courses. - Development of training curriculum for Community Health Practitioners. - Preparation of printing, and sales of Standing Orders, curriculum, and other relevant publications. - Organize and conduct studies seminars and workshop to upgrade knowledge and skills of Community Health practitioners. - Regulation of the profession and maintenance of discipline among members of the profession. - To collect monies (revenue and subventions) including examination fees, indexing fees, registration and licensing of members and incur expenditure for the purpose of execution of functions enumerated under the Decree establishing the Board.

APPENDIX B

SUMMARY OF SELECTED POLICY DOCUMENTS IN RELATED TO THE NIGERIAN HEALTH SYSTEM AND EHEALTH

Sources:

www.health.gov.ng/doc/NSHDP. Accessed 07/02/2018.

https://www.nitda.gov.ng. Accessed 06/08/2018.

http://www.who.int/workforcealliance/countries/Nigeria_HRHStrategicPlan_2008_2012.pdf.Accessed 07/02/2018.

http://lawnigeria.com/LawsoftheFederation/National-Health-Act,-2014.html. Accessed 07/02/2018.

www.fmoh.gov.ng. Accessed 07/02/2018.

https://www.health.gov.ng/doc/HealthICTStrategicFramework.pdf. Accessed 05/22/2018.

https://www.mdcn.gov.ng. Accessed 07/02/2018.

S/N	Title	Year of production and implementation	Major players affected	Major issues raised	Current state
1	National Health ICT Strategic Framework (eHealth)	2015-2020	Health care providers and their facilities at both the public and private sectors. Health care professionals (physicians, nurses, laboratory scientist, pharmacist etc) ICT professionals Patients Policy makers Pharmaceutical companies and	Nigeria's advancement in the use of ICT for health. Largely uncoordinated Health ICT ecosystem Provision of strategic leadership in the use of ICT in healthcare. Achievement of universal health coverage and other health goals and priorities (the 2030 target of Sustainable Development Goals). Serves as an umbrella to planning and coordinating different	Still at the implementing phase. Some level of awareness is being created by government and its agencies and also the private sector ICT infrastructure, system interoperability, power supply, internet, and training of health professionals

			manufactural of medical devices	national health ICT efforts while considering other elements such as regulation, governance, standards, policy, financing, and human capacity. Training of health care professional at the undergraduate and postgraduate levels	are still challenging.
2	National Health Policy (NHP)	2016	All public and Pricate health institutions All Health professionals The public	Provision of Universal Health Coverage to its citizens, attainment of the health-related Millennium Development Goals (MDG's) and now the Sustainable Development Goals of the United Nations. The need to enhance the collaboration between the federal, state and local government authorities in the implementation of health objectives for the country To be implemented through the development and implementation of a series of National Strategic Health Development Plans	High level of implementation at the mostly at federal level

3	National Health Act	2014	All health professionals All public and Private health Institutions The public	Provides a framework for the regulation, development, and management of a national health system and sets standards for rendering health services in the Federation Universal Health Coverage, Improved quality of health services	Yet to be fully implemented Very little awareness created
4	National Strategic Health Development Policy (NSHDP)	2009-2015	All health professionals All public and private health intuitions Policy maters at the federal, state and local government levels	Providing an overarching framework for sustained health development in the country	Implementation is on0going
5	Human Resource for Health Strategic Plan (HRHSP)	2008-2012	All health professionals All public and private health intuitions Policy maters at the federal, state and local government levels	Areas with the lowest concentration of health professionals have the worst health indices in the country. Need for a close collaboration between the public and private sectors is identified as a way to mobilize resources to develop and retain capable and motivated health	Needs to be reviews. However its being implemented

				workers in the right numbers and the right distribution. The policy was not explicit on the use of technology as an option, such as telemedicine, in overcoming this challenge.	
6	National Information Technology Development Agency (NITDA)	Act 2007	All health professionals All public and private health intuitions Policy makers at the federal, state and local government levels	Universal access to Information Technology and systems provide frameworks to facilitate the establishment and maintenance of appropriate information technology and systems application and development develop policies for electronic governance and monitor the use of electronic data interchange and other forms of electronic communication transactions d) develop framework documents to enable networking among the public and private sector.	Increase level of implementation. However, more awareness and education is required especially among health professionals

7	Medical and Dental Practitioners	Act (Cap M8 LFN) 2004	All qualified and registered medical and dental practitioners The public	Safe guarding the life of the public through effective regulation and control of medical and dental practitioners	Implementation is on-going but long overdue for a revision. Training of medical and dental practitioners and regulation of eHelath tools need to be captured

APPENDIX C

QUESTIONNAIRE: THE IMPACT AND ROLES THAT STRATEGIC GOVERNMENT LEADERSHIP COULD PLAY IN THE ADOPTION AND USE OF ELECTRONIC HEALTH (eHealth) IN NIGERIA

URL link: https://Questionnaire URL for Participant Access. Accessed May 9 – June 12, 2018

Personal Information (Tick as applicable)

1. The Department/Unit of the MDCN where I perform my duties (check only one):

___ Registration

___ Professional Discipline

___ Planning Research and Statistics

___ Inspectorate

___ Medical Education

___ Management Information Unit/ICT Unit

2. My category of staff within MDCN is:

___Senior Management Staff

___Other senior staff

___Junior staff

3. Number of years in Public Service and/or in MDCN:

___5 years of Less than 5 Years

___Greater than 5 Years but less than 10 years

___Greater than 10 years

4. My Cadre of staff is:

___Directorate

___Administrative

___Executive

___ Legal

___ others (specify)

5. My years of experience with healthcare policies and regulation in Nigeria is approximately (check one):

___ 1

___ 2

___ 3

___ 4

___ more than 4

6. The percentages of my job responsibilities and experience in the MDCN have been in the following environments (number percentages must total 100%).

___ % Healthcare policy formulation

___ % Healthcare regulation

___ % others (specify)

For each following statement please click on a number from 1 to 7 indicating your level of agreement with the statement. Click 1 if you Strongly Disagree, 2 if you Disagree, 3 if you Disagree

Slightly, 4 if you neither Agree nor Disagree, 5 if you Agree Slightly, 6 if you Agree, 7 if you Strongly Agree; Otherwise, click N/A if the statement is not applicable or DK if you don't know.

7. Strategic Government Leadership

7.1. The Federal government policy is supportive of eHealth	1	2	3	4	5	6	7	N/A	DK
7.2. The Medical and Dental Council of Nigeria (MDCN) governing council is well enlightened and supportive of eHealth use and adoption by registered practitioners.	1	2	3	4	5	6	7	N/A	DK
7.3. MDCN has updated Policy guidelines for eHealth Regulation.	1	2	3	4	5	6	7	N/A	DK
7.4. eHealth policies are aligned with strategic health goals	1	2	3	4	5	6	7	N/A	DK
7.5. eHealth policies align with funding sources	1	2	3	4	5	6	7	N/A	DK
7.6. eHealth policies state common ICT (Information and Communication Technology) standards	1	2	3	4	5	6	7	N/A	DK
7.7. eHealth policies align with and are supportive of regulatory agency mandates.	1	2	3	4	5	6	7	N/A	DK
7.8. MDCN eHealth policies/guidelines are	1	2	3	4	5	6	7	N/A	DK

supportive of practitioner readiness to use and adopt eHealth tools in their practice.

8. Human Resources for Health

8.1. Medical and dental practitioners are aware of the MDCN guidelines that support eHealth.	1 2 3 4 5 6 7 N/A DK
8.2. There are adequate registered medical and dental practitioners with eHealth expertise.	1 2 3 4 5 6 7 N/A DK
8.3. Registered practitioners comply with eHealth regulations of the MDCN	1 2 3 4 5 6 7 N/A DK

9. Federal Ministry of Health (FMoH) and the Medical and Dental council of Nigeria (MDCN) Capacity for Innovation

9.1. There are adequate resources and capacity to drive eHealth policy development at the MDCN.	1 2 3 4 5 6 7 N/A DK
9.2. There is adequate capacity for implementing regulatory activities on eHealth among practitioners at the MDCN.	1 2 3 4 5 6 7 N/A DK
9.3. There is a capability for assessment of readiness for eHealth acceptance and use at the FMoH.	1 2 3 4 5 6 7 N/A DK

9.4. There is a functional and reliable ICT environment at the MDCN.	1	2	3	4	5	6	7	N/A	DK
9.5. There are effective mechanisms for implementation, support, monitoring, and evaluation of eHealth projects at the FMoH.	1	2	3	4	5	6	7	N/A	DK

10. Technology Infrastructure

10.1. MDCN has an integrated and sustainable technology infrastructure in place.	1	2	3	4	5	6	7	N/A	DK
10.2. There is widespread availability of ICT infrastructure across the offices of the MDCN.	1	2	3	4	5	6	7	N/A	DK
10.3. The ICT infrastructure is reliable and available 24/7.	1	2	3	4	5	6	7	N/A	DK
10.4. There is availability of a technologically trained support workforce at MDCN.	1	2	3	4	5	6	7	N/A	DK

11. ICT Usability

11.1. ICT technology that has been adopted by the	1	2	3	4	5	6	7	N/A	DK

MDCN is easy to learn.

11.2. ICT technology that has been adopted is easy to Use.	1	2	3	4	5	6	7	N/A	DK
11.3. ICT technology that has been adopted is flexible and durable	1	2	3	4	5	6	7	N/A	DK

12. Interoperability

12.1. Electronic communications support links among FMoH and professional health regulatory agency ICT platforms.	1	2	3	4	5	6	7	N/A	DK
12.2. Technological solutions can be integrated with existing work practices.	1	2	3	4	5	6	7	N/A	DK
12.3. There are common standards for eHealth technological applications among FMoH and professional health regulatory agencies.	1	2	3	4	5	6	7	N/A	DK

13. Privacy

13.1. Regulations have been developed for protecting patient healthcare data managed by registered practitioners.	1	2	3	4	5	6	7	N/A	DK
13.2. Regulations for protecting patient healthcare	1	2	3	4	5	6	7	N/A	DK

records are in use and are being enforced.

13.3. The Act of the MDCN is clear about privacy of patient healthcare information.	1 2 3 4 5 6 7 N/A DK
13.4. Privacy of healthcare data is an important concern of patients.	1 2 3 4 5 6 7 N/A DK

14. Security

14.1. Security is an important consideration in the MDCN policy guide on eHealth.	1 2 3 4 5 6 7 N/A DK
14.2. Staff of the MDCN are trained to recognize and avoid malicious attacks on systems and data.	1 2 3 4 5 6 7 N/A DK
14.3. Data transmission is handled by secure networks	1 2 3 4 5 6 7 N/A DK
14.4. Databases are encrypted to prevent data theft	1 2 3 4 5 6 7 N/A DK
14.5. Databases are securely backed up regularly to support quick recovery in case of system failure	1 2 3 4 5 6 7 N/A DK

15. Data Governance

15.1. Data from internal and external sources are	1 2 3 4 5 6 7 N/A DK

relevant to policy decisions at the MDCN and at other professional health regulatory agencies.

15.2. Data used for regulatory decisions at the MDCN are accurate. 1 2 3 4 5 6 7 N/A DK

15.3. A comprehensive data directory is available at the MDCN 1 2 3 4 5 6 7 N/A DK

15.4. Data required for policy decisions at the MDCN are readily accessible. 1 2 3 4 5 6 7 N/A DK

15.5. The MDCN has a formal data retention policy 1 2 3 4 5 6 7 N/A DK

15.6. A data framework has been established 1 2 3 4 5 6 7 N/A DK

15.7. There is a general understanding and awareness of data governance issues. 1 2 3 4 5 6 7 N/A DK

15.8. Authorities favor proper data governance 1 2 3 4 5 6 7 N/A DK

16. Funding Sustainability

16.1. Adequate funds are budgeted to support MDCN ICT capacity 1 2 3 4 5 6 7 N/A DK

16.2. Adequate funds are budgeted for capacity 1 2 3 4 5 6 7 N/A DK

building of staff of the MDCN to support eHealth sustainability and its regulatory activities.

16.3. Government makes adequate budgetary provision for training of its human resources for health — 1 2 3 4 5 6 7 N/A DK

17. Effect of eHealth Policy on Registration of Practitioners

17.1. Registration of practitioners captures the fact that certain practitioners have knowledge/training in eHealth. — 1 2 3 4 5 6 7 N/A DK

17.2. Online registration of practitioners has improved the MDCN regulatory activities. — 1 2 3 4 5 6 7 N/A DK

17.3. Software used for online registration of practitioners meet expectations of users and staff of MDCN. — 1 2 3 4 5 6 7 N/A DK

18. Effect of eHealth Policy on Professional Discipline

18.1. Cases of medical malpractice and negligence can be reduced through use and adoption of eHealth by practitioners — 1 2 3 4 5 6 7 N/A DK

18.2. The use and adoption of ICT by MDCN has helped to improve management of information on malpractice and negligence cases before the MDCN. — 1 2 3 4 5 6 7 N/A DK

18.3. eHealth benefits regulation of medical ethics among practitioners	1 2 3 4 5 6 7 N/A DK

19. Effect of eHealth Policy on Medical Education

19.1. Medical and dental training institutions in Nigeria have adequate resources to train practitioners in eHealth.	1 2 3 4 5 6 7 N/A DK
19.2. Medical and dental training curricula have Been updated to include training and examination of undergraduates in eHealth (ICT)	1 2 3 4 5 6 7 N/A DK
19.3. Training of medical and dental practitioners is well captured in the Nigeria ICT for health policy document.	1 2 3 4 5 6 7 N/A DK

20. Effect of eHealth Policy on Inspectorate activities

20.1. Cases of quackery in the medical and dental professions can be checked with the use of ICT by health regulatory agencies, including MDCN	1 2 3 4 5 6 7 N/A DK
20.2. The government ICT for health policy supports the MDCN inspectorate activities	1 2 3 4 5 6 7 N/A DK
20.3. The MDCN Act provides adequate legislation to support its inspectorate activities making use of eHealth tools (ICT)	1 2 3 4 5 6 7 N/A DK

21. Effect of eHealth Policy on Planning, Research and Statistics Activities

21.1. There are available statistics at the MDCN to support its regulatory activities	1	2	3	4	5	6	7	N/A	DK
21.2. The use of ICT supports research activities at the MDCN.	1	2	3	4	5	6	7	N/A	DK
21.3. eHealth adoption and use is supported by planning at the MDCN	1	2	3	4	5	6	7	N/A	DK

Please enter any comments that you have about eHealth policies, health agency roles and regulation of practitioners use and adoption of eHealth in Nigeria in the following spaces that you believe have not been covered adequately by any previous items. In particular:

22. List three or more reasons for wanting more and better eHealth policies at the MDCN to boost its regulatory mandates.

23. List three or more reasons for not wanting more and better eHealth policies at the MDCN to boost regulatory mandate.

24. Please feel free to enter any additional comments you have about eHealth policies in your organization and in Nigeria: Policies, regulation and deficiencies.

Thank you for participating in the survey. Your input about eHealth policies and regulatory activities of health agencies in Nigeria will help develop a better understanding of ways in which strategic leadership in professional health regulatory agencies can assist in developing eHealth policies that support more effective healthcare for the Nigeria.

APPENDIX D

STATISTICAL TABLES SHOWING VARIABLES AND CONSTRUCTS OBTAINED FROM ANALYSIS USING THE FACTOR ANALYSIS TECHNIQUE AND STEPWISE REGRESSION METHOD TO OBTAIN STATITICAL MODEL

Source: IBM 24 Statistical Package for the Social Sciences 09/20/2018.

Table 4.1. Factor Analysis (Descriptive statistics of variables)

Variables/Constructs	Mean	Standard deviation
8. Strategic Government Leadership (Dependent variable)		
The Federal government policy is supportive of eHealth	5.39	1.474
The Medical and Dental Council of Nigeria (MDCN) governing council is well enlightened and supportive of eHealth use and adoption by registered practitioners.	5.79	1.258
MDCN has updated Policy guidelines for eHealth regulation	5.07	1.631
eHealth policies are aligned with strategic health goals	5.39	1.641
eHealth policies align with funding sources	4.82	1.827
eHealth policies state common ICT (Information and Communication Technology) standards	5.18	1.722
eHealth policies align with and are supportive of regulatory agency mandates	5.54	1.374
MDCN eHealth policies/guidelines are supportive of practitioner readiness to use and adopt eHealth tools in their practice	5.46	1.374
9. Human Resources for Health		
Medical and dental practitioners are aware of the MDCN guidelines that support eHealth	5.11	1.449
There are adequate registered medical and dental practitioners with eHealth expertise.	5.93	1.086
Registered practitioners comply with eHealth regulations of the MDCN	5.14	1.177

10. Federal Ministry of Health (FMoH) and the Medical and Dental council of Nigeria (MDCN) Capacity for Innovation		
There are adequate resources and capacity to drive eHealth policy development at the MDCN	5.50	1.478
There is adequate capacity for implementing regulatory activities on eHealth among practitioners at the MDCN	5.64	1.129
There is a capability for assessment of readiness for eHealth acceptance and use at the FMoH	5.71	1.049
There is a functional and reliable ICT environment at the MDCN	5.39	1.286
There are effective mechanisms for implementation, support, monitoring, and evaluation of eHealth projects at the FMoH	5.50	1.232
11. Technology Infrastructure		
MDCN has an integrated and sustainable technology infrastructure in place	5.93	1.152
There is widespread availability of ICT infrastructure across the offices of the MDCN	6.14	.891
The ICT infrastructure is reliable and available 24/7	4.82	1.679
There is availability of a technologically trained support workforce at MDCN	5.75	1.351
12. ICT Usability		
ICT technology that has been adopted by the MDCN is easy to learn	6.18	.772
ICT technology that has been adopted is easy to use	6.00	.720
ICT technology that has been adopted is flexible and durable	5.86	.651
13. Interoperability		
Electronic communications support links among FMoH and professional health regulatory agency ICT platform	5.11	1.771
Technological solutions can be integrated with existing work practices	5.93	.940
There are common standards for eHealth technological applications among FMoH and professional health regulatory agencies	5.32	1.657
14. Privacy		

Regulations have been developed for protecting patient healthcare data managed by registered practitioners	5.82	1.188
Regulations for protecting patient healthcare records are in use and are being enforced	5.82	1.090
The Act of the MDCN is clear about privacy of patient healthcare information.	6.04	1.170
Privacy of healthcare data is an important concern of patients	6.21	.917
15. Security		
Security is an important consideration in the MDCN policy guide on eHealth	5.89	1.066
Staff of the MDCN are trained to recognize and avoid malicious attacks on systems and data	5.50	1.667
Data transmission is handled by secure networks	5.57	1.372
Databases are encrypted to prevent data theft	6.21	1.197
Databases are securely backed up regularly to support quick recovery in case of system failure	6.04	1.453
16. Data Governance		
Data from internal and external sources are relevant to policy decisions at the MDCN and at other professional health regulatory agencies	2.32	1.964
Data used for regulatory decisions at the MDCN are accurate.	2.54	1.232
A comprehensive data directory is available at the MDCN	2.71	1.384
Data required for policy decisions at the MDCN are readily accessible	2.61	1.343
The MDCN has a formal data retention policy	3.18	2.001
A data framework has been established	2.46	1.170
There is a general understanding and awareness of data governance issues	2.75	1.798
Authorities favor proper data governance	2.75	1.624
17. Funding Sustainability		
Adequate funds are budgeted to support MDCN ICT capacity	2.46	1.478

Adequate funds are budgeted for capacity building of staff of the MDCN to support eHealth sustainability and its regulatory activities.	2.36	1.393
Government makes adequate budgetary provision for training of its human resources for health	2.79	1.931
18. Effect of eHealth Policy on Registration of Practitioners		
Registration of practitioners captures the fact that certain practitioners have knowledge/training in eHealth	3.11	2.079
Online registration of practitioners has improved the MDCN regulatory activities.	1.89	1.315
Software used for online registration of practitioners meet expectations of users and staff of MDCN.	2.57	1.345
19. Effect of eHealth Policy on Professional Discipline		
Cases of medical malpractice and negligence can be reduced through use and adoption of eHealth by practitioners	2.11	.956
The use and adoption of ICT by MDCN has helped to improve management of information on malpractice and negligence cases before the MDCN	3.00	1.905
eHealth benefits regulation of medical ethics among practitioners	2.46	1.527
20. Effect of eHealth Policy on Medical Education		
Medical and dental training institutions in Nigeria have adequate resources to train practitioners in eHealth	3.18	1.744
Medical and dental training curricula have been updated to include training and examination of undergraduates in eHealth (ICT)	3.50	2.082
Training of medical and dental practitioners is well captured in the Nigeria ICT for health policy document	3.43	2.168
21. Effect of eHealth Policy on Inspectorate activities		
Cases of quackery (malpractice) in the medical and dental professions can be checked with the use of ICT by health regulatory agencies, including MDCN	1.75	.752
The government ICT for health policy supports the MDCN inspectorate activities	2.86	1.779
The MDCN Act provides adequate legislation to support its inspectorate activities making use of eHealth tools (ICT)	3.14	1.880
22. Effect of eHealth Policy on Planning, Research and Statistics Activities		

There are available statistics at the MDCN to support its regulatory activities	2.11	.994
The use of ICT supports research activities at the MDCN	2.14	.891
eHealth adoption and use are supported by planning at the MDCN	2.75	2.030

Table 4.2. Factor analysis communalities table of variables

Communalities		
Variables/Constructs	**Initial**	**Extraction**
Technology Infrastructure		
MDCN has an integrated and sustainable technology infrastructure in place	1.000	.888
There is widespread availability of ICT infrastructure across the offices of the MDCN	1.000	.910
ICT infrastructure is reliable and available 24/7	1.000	.827
There is availability of a technologically trained support workforce at the MDCN	1.000	.948
Federal Ministry of Health (FMoH) and the Medical and Dental council of Nigeria (MDCN) Capacity for Innovation		
There are adequate resources and capacity to drive eHealth policy development	1.000	.934
There is adequate capacity for implementing regulatory activities on eHealth among practitioners	1.000	.930

There is a capacity for assessment of readiness for eHealth acceptance and use	1.000	.829
There is a functional and reliable ICT environment	1.000	.902
There are effective mechanisms for implementation, support, monitoring and evaluation of eHealth projects	1.000	.902
Strategic Government Leadership (Dependent variable)		
Federal government policy is supportive of eHealth	1.000	.970
MDCN Governing Council is well enlightened and supportive of eHealth use and adoption by registered practitioners	1.000	.963
MDCN has an updated policy guideline for eHealth regulation	1.000	.903
eHealth policies are aligned with strategic health goals	1.000	.928
eHealth policies align with funding sources	1.000	.970
eHealth policies state common ICT (Information and Communication Technology) standards	1.000	.963
eHealth policies align with and are supportive of regulatory agency mandates	1.000	.944
MDCN eHealth policies/guidelines is supportive of practitioner's readiness to use and adopt eHealth tools in their practice.	1.000	.945
Human Resources for Health		
Medical and dental practitioners are aware of the MDCN guidelines that support eHealth	1.000	.951
There are adequate registered medical and dental practitioners with adequate expertise.	1.000	.944

Registered practitioners comply with eHealth regulations of the MDCN	1.000	.937
ICT Usability		
ICT technology that has been adopted by the MDCN is easy to learn	1.000	.898
ICT technology that has been adopted at the MDCN is easy to use	1.000	.892
ICT technology that has been adopted at the MDCN is flexible and durable	1.000	.876
Interoperability		
Electronic communications support links among FMOH and professional health regulatory agency ICT platforms	1.000	.961
Technological solutions can be integrated with existing work practices	1.000	.964
There are common standards for eHealth technological applications among FMOH and professional health regulatory agencies	1.000	.951
Privacy		
Regulations have been developed for protecting patient healthcare data managed by registered practitioners	1.000	.928
Regulations for protecting patient healthcare records are in use and are being enforced	1.000	.943
The Act of the MDCN is clear about privacy of patient healthcare information	1.000	.942
Privacy of healthcare data is an important concern of patients	1.000	.862

Security		
Security is an important consideration in the MDCN policy guide on eHealth	1.000	.898
Staff of the MDCN are trained to recognize and avoid malicious attacks on the systems and data	1.000	.826
Data transmission is handled by secure networks	1.000	.902
Databases are encrypted to prevent data theft	1.000	.941
Databases are securely backed up regularly to support quick recovery in case of system failure	1.000	.972
Data Governance		
Data from internal and external sources are relevant to policy decisions at the MDCN and at other professional health regulatory agencies	1.000	.938
Data used for regulatory decisions at the MDCN are accurate	1.000	.873
A comprehensive data directory is available at the MDCN	1.000	.939
Data required for policy decisions at the MDCN are readily accessible	1.000	.930
The MDCN has a formal data retention policy	1.000	.914
A data framework has been established	1.000	.949
There is a general understanding and awareness of data governance issues	1.000	.956
Authorities favor proper data governance	1.000	.919
Funding Sustainability		

Adequate funds are budgeted to support MDCN ICT capacity	1.000	.935
Adequate funds are budgeted for capacity building of staff of the MDCN to support eHealth sustainability and its regulatory activities	1.000	.889
Government makes adequate budgetary provision for training of its human resources for health.	1.000	.936
Effect of eHealth Policy on Registration of Practitioners		
Registration of practitioners captures the fact that certain practitioners have knowledge/training in eHealth	1.000	.850
Online registration of practitioners has improved the MDCN regulatory activities	1.000	.969
Software used for online registration of practitioners meets expectations of users and staff of MDCN	1.000	.864
Effect of eHealth Policy on Professional Discipline		
Cases of medical malpractice and negligence can be reduced through use and adoption of eHealth by practitioners	1.000	.983
The use and adoption of ICT by MDCN has helped to improve management of information on malpractice and negligence cases before the MDCN	1.000	.875
eHealth benefits regulation of medical ethics among practitioners	1.000	.954
Effect of eHealth Policy on Medical Education		
Medical and dental training institutions in Nigeria have adequate resources to train practitioners in eHealth	1.000	.848

Medical and dental training curricula have been updated to include training and examination of undergraduates in eHealth (ICT)	1.000	.914
Training of medical and dental practitioners is well captured in the Nigeria ICT for health policy document	1.000	.941
Effect of eHealth Policy on Inspectorate activities		
Cases of quackery (malpractice) in the medical and dental professions can be checked with the use of ICT by health regulatory agencies, including the MDCN	1.000	.948
The government ICT for health policy supports the MDCN inspectorate activities	1.000	.980
The Act establishing the MDCN provides adequate power to support its inspectorate activities making use of eHealth (ICT) tools	1.000	.986
Effect of eHealth Policy on Planning, Research and Statistics Activities		
There are available statistics at the MDCN to support its regulatory activities	1.000	.925
The use of ICT supports research activities at the MDCN	1.000	.924
eHealth adoption and use is supported by planning at the MDCN	1.000	.942

Table 4.3. Factor analysis total variance of variables showing the 14 extracted components

Component	**Total Variance Explained**
	Initial Eigenvalues

	Total	% of Variance	Cumulative %
1	20.400	33.443	33.443
2	6.853	11.235	44.678
3	4.772	7.822	52.500
4	4.261	6.985	59.485
5	3.384	5.548	65.033
6	3.223	5.284	70.317
7	2.844	4.663	74.980
8	2.521	4.134	79.114
9	1.995	3.270	82.383
10	1.550	2.542	84.925
11	1.307	2.143	87.069
12	1.130	1.852	88.920
13	1.083	1.775	90.696
14	1.004	1.645	92.341

Table 4.4: Categories of variables extracted and constructs they represent

S/N	Constructs	Variables
	Dependent variables	
1	**Leadership (Stewardship/Governance) Strategies**	

		• eHealth policy aligns with and are supportive of regulatory agency mandate.
		• Federal government policy is supportive of eHealth
Independent variables		
2	**Policy (on medical education and professional discipline of practitioners)**	
		• eHealth adoption and use are supported by planning at the MDCN
		• Medical and dental training curricula have been updated to include training and examination of undergraduates in eHealth (ICT)
		• eHealth benefits regulation of medical ethics among practitioner's
3	**Security and privacy**	
		• Databases are securely backed up regularly to support quick recovery in case of system failure.
		• Data transmission is handled by secure networks.

		• Staff of the MDCN are trained to recognize and avoid malicious attacks on the systems and data.
		• Security is an important consideration in the MDCN policy guide on eHealth.
		• Regulations for protecting patient healthcare records are in use and are being enforced.
		• Regulations have been developed for protecting patient healthcare data managed by registered practitioners.
4	**Capacity for Innovation and Infrastructural/Technological development**	
		• There is adequate capacity for implementing regulatory activities on eHealth among practitioners.
		• There is a capacity for assessment of readiness for eHealth acceptance and use
		• There are effective mechanisms for implementation, support, monitoring and evaluation of eHealth projects

Table 4.45: Aggregation of Construct Results, Calculated from Survey Data

Construct	Construct Name	Items	Mean	SD (Rho = 0)	SD (Rho = 1)	Response Based on Mean of Construct (aggregated var)
1	Strategic Government Leadership	8	5.330	0.548	1.538	Agree Slightly/Agree
2	Human Resources for Health	3	5.393	0.720	1.196	Agree Slightly/Agree
3	FMoH and MDCN Capacity for Innovation	5	5.548	0.556	1.235	Agree Slightly/Agree
4	Technology Infrastructure	4	5.660	0.650	1.268	Agree
5	ICT Usability	3	6.013	0.413	0.832	Agree
6	Interoperability	3	5.453	0.867	1.404	Agree Slightly/Agree
7	Privacy	4	5.973	0.548	1.091	Agree
8	Security	5	5.842	0.611	1.351	Agree
9	Data Governance	8	2.665	0.564	1.565	Disagree/Disagree Slightly
10	Funding Sustainability	3	2.537	0.934	1.512	Disagree/Disagree Slightly
11	Effect of eHealth Policy on Registration of Practitioners	3	2.523	0.935	1.558	Disagree/Disagree Slightly
12	Effect of eHealth Policy on Professional Discipline	3	2.523	0.874	1.499	Disagree/Disagree Slightly
13	Effect of eHealth Policy on Medical Education	3	3.370	1.158	1.877	Disagree Slightly/Neutral

14	Effect of eHealth Policy on Inspectorate Activities	3	2.583	0.898	1.456	Disagree/Disagree Slightly
15	Effect of eHealth Policy on Planning, Research and Statistics Activities	3	2.333	0.810	1.546	Disagree/Disagree Slightly