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ASSESSMENT OF THE ACCEPTANCE LEVEL IN THE ADOPTION OF ELECTRONIC PRESCRIBING AND INFORMATION SHARING SYSTEM: A CASE STUDY OF NIGERIA

Master's Thesis

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DIGIRETSEPTI JA SÜSTEEMIDEVAHELISE INFOVAHETUSE RAKENDAMISE TULEMUSLIKKUSE HINDAMINE: NIGERIA JUHTUMIUURING

Magistritöö

Juhendaja: Ingrid Pappel
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Author’s declaration of originality

I hereby certify that I am the sole author of this thesis. All the used materials, references to the literature and the work of others have been referred to. This thesis has not been presented for examination anywhere else.

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Abstract

The implementation of Electronic prescribing system serves as an important factor in healthcare delivery system.

The aim of this research is assessing the readiness and challenges that can slow down the adoption of electronic prescribing and information sharing system. However, the study also investigates how the benefits of accepting and implementing the technology in the Nigerian secondary healthcare system. The problem statement discusses the challenges being experienced in the secondary healthcare facilities. Furthermore, the different means of information sharing and patient record keeping, as well as it's challenges and how the implementation of electronic prescribing system can help to tackle all these challenges listed. In to attain our goal, a case study research method was adopted as the suitable research methodology for implementing this research. Survey and informal interview were the primary tools for data gathering. From our results it's indicated that healthcare stakeholders were not pleased with the present situation of information sharing and recording keeping in their respected hospitals where they work, as the paper-based system method of prescribing and recording keeping is still the major form prescribing medication and information sharing in Nigeria. Therefore, there were several issues like; Inadequate information sharing between medical professionals, medication error, poor patient record keeping system. In this regard, the study proposes a framework for the successful adoption of electronic prescribing system in Nigerian healthcare settings.

This thesis is written in English and is 59 pages long, including 6 chapters, 8 figures and 1 table.

Keywords: Electronic Prescribing System, Electronic Health Records, Health Information System, Technology Acceptance Model, Information Sharing, Nigeria

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List of abbreviations and terms

ANT	Actor-Network Theory
CPOE	Computerized Physician Order Entry
EHIMS	Electronic Health Information Management System
EHR	Electronic Health Record
EMR	Electronic Medical Record
EP	Electronic Prescription
EPR	Electronic Patient Record
FMoH	Federal Ministry of Health
HIT	Health Information Technology
ICT	Information and Communication Technology
II	Information Infrastructure
IOM	Institute of Medicine
IS	Information Systems
ISO	International Standards Organization
IT	Information Technology
LGA	Local Government Area
NSHDP	National Strategic Health Development Plan
NHMIS	National Health Management Information Systems
OAUTHC	Obafemi Awolowo University Teaching Hospital
PHC	Primary Health Care
PHI	Private Health Insurance
PPP	Public Private Partnership
SHONET	State Hospital Network
SMoH	State Ministry of Health
TAM	Technology Acceptance Model

WHO	World Health Organization

Table of Content

List of figures

List of tables

1 Introduction

This chapter describe the implementation of health information system in improving the general healthcare delivery settings both in secondary and primary facilities, the chapter went further to explain the primary purpose of the study, as the aim of the research is to assess and investigate the acceptance level towards the implementation of electronic prescribing system and information sharing in the Nigerian health sector. The following section give describe the research problems and the importance of the study. Lastly, the next chapter explains the research questions which will be used for this study.

1.1 Background of study

According to Ojo and Popoola, "The healthcare delivery system of a country hinges, amongst other things, on how well its hospitals are able to deliver qualitative and affordable healthcare to its citizens. Thus, the roles of hospitals in the healthcare delivery system of a nation cannot be overemphasized." (Ojo et al, 2015). According to Adeleke, He stated that "Health records are essential for good healthcare. Their quality depends on accurate and prompt documentation of the care provider and regular analysis of content. Good quality healthcare data plays a vital role in the planning, development and maintenance of optimal healthcare." (Adeleke, 2014). However, the number of information sharing system between healthcare providers has an impact in healthcare delivery. Furthermore, patient medication information has a significant influence in record keeping as to which that can be used to measure the efficiency of record keeping system.

"The history of healthcare informatics systems in Nigeria started in 1980 at that time there was a joint research project which took place between students from Kuopio University in Finland and one of the Nigerian prestigious University the Obafemi Awolowo University." (Idowu et al, 2003). Large number of people in Nigeria are in support in digitalizing the healthcare delivery system, On the hand, the Federal government of Nigerian is developing plans to improve the healthcare setting and implement the use of health information technology across various hospitals in the country. (Adeleke, Erinle et

al. 2015). Adeleke, further explains “that to improve the use of information and communication technology in the country’s healthcare delivery system, the government has created a five years strategic plan on health information system that will take a vital position in the sector”. The primary objective of the government is to create an effective National Health Management Information System(NHMIS).” (Adeleke, Erinle et al. 2015).

According to Holden and Karsh “A Health Information Systems (HIS) can be defined as a set of segments for gathering, storing, handling, processing, and distribution of data, typically includes hardware and programming that manages the sharing and utilization of medical information, data, and information for communication”. (Holden & Karsh 2010, p.161). whereas systems like health information system have some requirement which could be used to obtain, trace and save patient medical record. The implementation of electronic prescription system comes with various challenges in healthcare delivery settings (Schlotzer & Madsen, 2010). Electronic prescription framework has defined as an application that is used to defense and prescribe medications. The technology can possibly reduce medication errors, such as poor doctors hand writing and can also generate alarm for possible prescription issues that may have occurred. According to Ammenwerth, “Health Information Systems (HIS), the term evaluation refers to "the act of measuring or exploring properties of a health information systems in arranging, development, implementation, or operation the result of which informs a choice to be made concerning that framework in a specific context" (Ammenwerth et al. 2004, p.480). “The reason why evaluation of research is important is that it can improve an existing system, which could use as experience and to help grow “the healthcare system as well as to” “make decision easy to implement”. (Friedman and Wyatt 2006).

1.2 Statement of the problem

In Nigeria many secondary healthcare facilities have suffered the lack of electronic record management and proper information sharing system between healthcare providers. However, large number of patients who are seeking quality healthcare service requires a quick, reliable and conducive healthcare system. However, one of the aim of the study, is to investigate the present situation in the health sector and assess acceptance level in the adoption of electronic prescription and information sharing system among the General

Hospitals in Nigeria. Furthermore, in most of the developed countries that has adopt the use of information communication and technology to improve their healthcare delivery system are usually complicated in the process of moving from paper-based to digital method, regularly these countries face challenges like lack of adequate resources, financial constraints, acceptance level of their citizens as well as infrastructural development. In the case of Nigeria, there are various factors that can impede the implementation of the technology due to socioeconomic, technological and political factors. The political factors in Nigeria for example, could be change in government, poor decision making, corruption, and government bureaucracy. From the political point of view, those are the factors that may slow the adoption of electronic prescribing system. Dealing with these factors will enable to successful implementation of the technology in the secondary healthcare facilities. It is therefore important that stakeholders in the health sector participant in politics to ascertain sustainability. According to Ojo and Popoola, they stated that "the high failure rate of EHIMS, successful implementation is of vital importance to realize its benefits. An effective EHIMS is one that serves its expected purpose after implementation". (Ojo and Popoola 2015). The successful achievement of the technology is assessing it through healthcare providers and patient, with the evaluation of the assessment it provides the level of user acceptance and the willingness to adopt. To measure the successful of EHIMS its efficiency can be estimated through feedback from healthcare providers, quality of information sharing, and system quality. The understanding of these factors is answerable for the successful accomplishment of EHIMS. Prescription of medications is among the most utilized treatment in healthcare. However, the process of using paper-based prescription system is time consuming and for healthcare providers and their patients. Moreover, the paper-based system is prone to medication error and could cause misunderstanding between patient and healthcare providers, which in some cases could lead to patient harm. According to Tan, "Electronic prescription has been proposed as an important procedure to reduce medication errors, also it can be used to improve quality of patient care and saves cost in healthcare". (Tan et al., 2009). According to Ash and Bates "Adopting of electronic prescription and electronic health record systems is surrounded with various barriers to its implementation which includes: financial constraints, the significant expenses of purchase, usage and maintenance of the system; the adolescence of the software and vendor". (Ash and Bates, 2005). According to Middleton, he stated that "the use of health information technology may cause great impact, or it can have unintended consequences and even cause harm to

patient". (Middleton,2013). However, health information usage has unintended outcomes, and these outcomes can count for non-use, inappropriate use and destruction. In spite, of the execution of the system, the occurrence of unintended consequences are mostly individual issues, and this happen after the system was implemented.

1.3 Significance of study

The aim of this study is to assess and investigate the acceptance level in the adoption of electronic and information sharing system. Furthermore, another aim for this study is to investigate the issues toward the implementation of electronic prescription and information sharing system in Nigerian General hospitals (Secondary healthcare facilities). The investigation is needed so as to identify the factors that may impede the adoption of the technology. However, it will help us in creating a proposed framework to comprehend the structure, develop and implement an effective electronic prescribing and information sharing system. According to Holden and Karsh, they stated that "understanding the factors that can impede the adoption can help promote the use of technology acceptance and it will enable the use of information technology systems by healthcare stakeholders as well follow the direction to achieve them." (Holden and Karsh,2010). The adoption of electronic prescription system has a strong potential to decrease pharmaceutical errors that may have been encountered from medical transcription, drug abuse and poor doctors handwriting prescription. With this could eradicate some of the setbacks that we encounter as a nation.

According to Ketikidis, "The slow pace in adopting health information technology(HIT) can lead to failure of e-prescribing implementation. However, understanding how medical providers react to healthcare systems is a research priority for the information system field" (Ketikidis,2012). These studies are essential and need for various reasons. First is to observe the overall attitude of healthcare providers and perceive how healthcare provides would react in utilizing the different areas of their information system as an important part that will allow the implementation of the technology (Gardner and Lundsgaarde,1994)

The main objectives of the study are highlighted below:

- Evaluate the readiness of healthcare stakeholders and healthcare centers.

- Assess the acceptance level in the adoption electronic prescribing systems.
- Make recommendations and propose a framework based on my findings.
- Identify the key factors that can slow the adoption of electronic prescription systems.

1.4 Research Questions

Since the Nigerian health care system is poorly developed. The introduction of electronic prescription has many roles to play in improving the Nigerian healthcare system.

In many developed countries, electronic prescription system has been suggested as an important factor to eradicate medication errors, improving patient safety, and reduce cost. The introduction of e-prescription will reduce the use of drug abuse, mismanagement of medications, and create more awareness as to why ICT is important to the effectiveness and increase efficiency in the healthcare sector. Furthermore, these research questions will help us understand if the adoption of electronic prescription is possible in Nigerian healthcare settings or not, and the reason(s) why the implementation of the technology it is not possible? In Nigeria, different challenges have been stated previously by different literature, on factors that can slow down the adoption of electronic prescribing system. For instance, poor funding, lack of good maintenance and implementation of the technology, high cost of purchase, corruption and other human factors.

These questions will enable us to understand what the healthcare professional sees as challenges, factors that can promote the usability and issues that may likely impede the implementation of EPS in the secondary healthcare facilities.

The overall research question tries to understand how the adoption of Electronic Prescribing and information sharing system could improve the healthcare delivery system in Nigeria secondary health facilities?

The following sub-research questions help to understand how much knowledge the healthcare professionals have in electronic health record management and electronic prescribing. Also, it will give an overview of the benefits that is attached the adoption of electronic prescription and information sharing system.

SRQ1. How much understanding of electronic prescribing and information sharing system do the healthcare professionals (Stakeholders) have?

SRQ2. How to find the key criteria that allows for measuring the benefit of adopting electronic prescribing system in the secondary healthcare facilities?

The set of sub-questions will help to understand the roles stakeholder would play to make the adoption a success, from the response of the stakeholders, we can measure the acceptance level. However, the questions would help in understanding if adopting electronic prescribing in the Nigerian healthcare system would benefit stakeholders and their roles to make the adoption a success. The electronic prescribing solution improves the business process. Where stakeholders are aware of the improvement, stakeholders are much likely to adopt it.

- What are the key factors that can hinder the implementation of electronic prescription and information sharing system in the secondary healthcare facilities?
- What are the main criteria that can be used to measure the efficiency of adopting electronic prescription system in Nigeria secondary healthcare facilities?
- What are the roles stakeholders needs to play to make the adoption of EP a success?

1.5 Justifications

According to Ketikidis, "The instance of low acceptance level of health information technology (HIT) can prompt the unsuccessful usage of electronic prescription system. It implies that comprehending how medicinal providers respond to healthcare systems is an exploration need for the information systems." (Ketikidis et al. 2012). "This study is essential to the development of every health care sector; some of the critical issues to understand is before the adoption can become a success is to investigate perspectives and how end-users respond towards utilizing different parts of their data frameworks is a vital piece of making these frameworks fruitful". (Gardner and Lundsgaarde 1994).

This study from previous researchers has addressed the need for a technology acceptance model in healthcare settings; it will help expand the theoretical validity of the TAM model. Thus, it will as well address the margin in technology acceptance by stakeholders

and end-users. Furthermore, the study will give a broader understanding of issues that is related to healthcare technology acceptance. This study aims to have a better understanding of how the adoption of electronic prescribing systems can be accepted in the context of the Nigerian healthcare system. According to Banderker and Van Belle, "expressed some of the key factors that will help discover how health information innovation arrangements work should to be structured, executed, created, and furthermore point out the variables in the adoption and usage process". (Banderker and Van Belle,2009). This study is essential because it will help identify unwanted problems that the process may encounter in the process of adoption.

2 Background and Literature review

This chapter present the overview of the background of study. It then went on to review the electronic health record as an information infrastructure system which serves as an Actor. Network-Theory. It then went on to assess the two ways of record keeping management in medical facilities; paper-based system and digital record keeping system. Furthermore, this section clarifies the utilization of the TAM and the objective of TAM, which is to explain the determinants of computer acceptance, the chapter gives broader explanation to the implementation of health information technology and the areas of electronic prescription and information sharing system. Finally, the chapter is concluded with a summary and also explains the present situation of the study.

The use of electronic health record system has the potential of increasing the comprehensibility of medical information. Thus, it will increase patient care by less time consuming and make information sharing between medical provider and it will facilitate easy communication between hospitals. According to Baysari, "the implementation of electronic prescription frameworks is challenge for medical centers. Medical professionals' resistance has been one of the huge issues to the successful execution of electronic prescription system". (Baysari et al. .2012). According to Yarbrough and Smith, "the term TAM refers to deliberate utilization of a specific technology". (Yarbrough and Smith,2007). "Ketikidis explains that "innovation acceptance and use is conceptualized as an augmentation of human conduct. Attitude is one of the perspectives that oversee human conduct as it can possibly expand and comprehend issues of innovation acceptance". (Ketikidis,2012).

2.1 Theory of information infrastructure

According to Hanseth, "defined information infrastructure as evolving, open, standardized and diverse installed based too." (Hanseth,2002). On the other hand, another definition of Information infrastructure, according to Pironti, "information infrastructure is defined as all the people, facilities, procedures, tools and technology that supports the creation, use, logistic, storage and destruction of information. An II that is non-local and

suitable, like the EHR, will encompass different stakeholders' characters that may have different needs and interests that may not be adjusted". (Pironti,2006). In 1996 According to Star and Ruhleder, "For an Information infrastructure to work, some working objectives between various local interests and the over- curving or worldwide" The overall interest of the system should be found." (Star and Ruhleder, 1996). "Some of the characteristics of information infrastructure are to develop and grow slowly over time because the existing infrastructure, the installed base, strongly impacts how it can be developed.

The introduction and installation of new technology such as electronic prescription system in Nigeria healthcare facilities, requires that we include the current infrastructure into the healthcare settings in a way that it will help the country develop through broadening and improving the newly installed based system. According to Hanseth & Monteiro, "This will incorporate the patient on the ground that the patient deals with both technical and social aspect that interoperate." (Hanseth and Monteiro,1998)

Often times introducing new technology infrastructure has been very challenging for several reasons which are:

According to Sahay and Monteiro, "Invention of new technology grow through joining the past frameworks that has been isolated, moreover, incorporating isn't based on the technical part of accomplishing interoperability, rather it is a procedure that is encircled by medical professionals, patient, political and institutional interests. For instance, with regards to receiving Electronic prescription system in the Nigerian healthcare settings, various diverse characters, including government, engineers, stakeholders and (Patients), are engaged with veering interests, which requires continuous political arrangement." (Sahay & Monteiro et al. 2009). "It is essential, that infrastructure advancement is described by vulnerability, it is fundamentally an open procedure because of numerous interdependencies that should be managed." (Ambrose Ojodale Attah,2017). In the case of Nigeria, the achievement in the adopting electronic prescription and information sharing system rely on the design which will be implemented to suit the current healthcare settings that the Nigerian health sector operate in and likewise assess the level of acceptance in the implementation process.

Characteristics of Information Infrastructure

According to Hanseth and Monteiro, “Information infrastructure possesses capacities that cause them to contrast from other information frameworks, these capacities are: Socio-technical, heterogeneous, shared, shared, open and installed base." (Hanseth and Monteiro,1998).

Information Infrastructure Socio-Technical Function

According Hanseth and Monteiro, "Data Infrastructures as socio-specialized frameworks underline each the innovative a piece of the system and furthermore the social parts that territory unit presented as a hearty impact for the foundation from the affiliation, its kin and consequently the network at goliath. information foundations won't work while not the help people and consequently the client’s exploitation it appropriately." (Hanseth and Monteiro 1998). Technology and organization can't be isolated but are co-built. As a result. However, the process in implementing the electronic prescription system human and technological factors need to be put in place as a procedure that will enable the technology and the people transform easily through interlink, where it would not be dangerous to point out the primary achievement and failure of the new implemented technology. According to Berg and Toussaint, “Organizational impact can't be assessed by measures, for instance, support/non-support, considering the way that new effects develop, which are not adequately assessed. Thusly, structure and execution can't be pre-arranged and halfway composed, yet ought to be seen as systems of experimentation, political trade and innovativeness.” (Berg & Toussaint 2003).

II Different Function

According to Hanseth and Monteiro, “II are heterogeneous on account of their socio-specialized nature; including mechanical segments, people, associations, and establishments. They will just capacity well with legitimate assistance and utilization by the end clients (Patients). Data Infrastructures along these lines involve an environment of frameworks by interfacing various parts into a reliant system. Data Infrastructures are similarly heterogeneous as in the clearly same limit might be executed in different habits.” (Hanseth and Monteiro 1998). However, In Nigerian healthcare setting implementing a new technology as such, there is a need to assess and consider the end-users.

The Authorized Functions of II

According to Hanseth and Monteiro, “The empowering capacity of Information Infrastructure suggests it is intended to help a wide extent of activities and expected to open-up a field of new exercises, not just improving or robotizing something existing.” (Hanseth and Monteiro 1998).

The Divided Function of II

As indicated by Hanseth and Monteiro, "Data Infrastructure take into account sharing of data and information by the individuals from a network as in it is one and same single thing electronic prescription system used by every one of them to achieve a comparable objective. Disregarding the way that it may appear in a surprising manner, the fragments are related. As a result of this common limit, Information Infrastructure are unchangeable. This infers all the different clients utilize the framework as the framework can't be part into isolated parts utilized by various gatherings freely." (Hanseth and Monteiro 1998).

II Open Function

As indicated by Hanseth and Monteiro, "Where frameworks are characterized as open, it suggests that information sources and yield can experience their fringes and interfaces. Data Infrastructures are open as in there are no limitations for the quantity of end clients, partners, merchants notwithstanding, center points in the system and other mechanical segments, application districts or framework administrators. “It doesn't infer that everything is remembered for each Information Infrastructure nonetheless, infers that one can't draw an extreme breaking point between what is on one side of the Information Infrastructure and what is on the contrary side. The straightforwardness of Information Infrastructures likewise infers that they are dynamic and persistently moving, consequently there is necessity for every Information Infrastructures to be versatile to some degree in order to acknowledge soundness over some unclear time period". (Hanseth and Monteiro 1998).

II Installed base

As indicated by Hanseth and Monteiro, "Data Infrastructures are never arranged without any planning, yet they are made through the improvement of an introduced base (Hanseth and Monteiro 1998). Also, Hanseth and Lyytinen, “defined an installed base as the

current “set of ICT capacities and their users, tasks, and plan networks”.(Hanseth and Lyytinen,2010). In Nigeria Healthcare settings for example, an introduced base may incorporate existing patients record structures, various gatherings of specialists as customers (medical professionals, clinicians).

2.1.1 Actor Network Theory

According to Cresswell and Worth, "The growing scale of computerization of advanced healthcare delivery features the necessity for a continuously modern-day view on associations among individuals and goals as technologies become never-endingly intricate". (Cresswell, Worth et al. 2010). In 1997 As stated by Walsham, “The ANT was clarified primarily by Michel Callon, Bruno Latour, and John Law. It is concerned with the creation and backing of coextensive frameworks of human and nonhuman segments which, on account data innovation, fuse people, affiliations, programming, PC and correspondence equipment, and foundation rules”. (Walsham 1997). The theory is another method to deal with people and also perceive how they interact with insentient objects, the theory is as been seen as a technology that was developed out of social interest and can potentially build strong social interactions among others (Prout, 1996). However, the use if actor network theory has been suggested as a means of improving healthcare delivery system and it has a unique role in assessing the acceptance of a new technology (Cresswell, Worth et al, 2010). According to Cresswell and Worth, explains that “The knowledge can add to an increasingly all-encompassing gratefulness for the multifaceted nature of new innovation introduction in medicinal services settings. “It can in like manner exhibit in every practical sense supportive in giving a speculatively instructed approach to manage analyzing (by drawing on sources that are related to the innovation being referred to) and assessment (by giving a calculated gadget and jargon that can shape the reason for understandings)”. (Cresswell, Worth et al. 2010).

There are two attributes of the Actor Network Theory which are: translation and inscription.

Translation System

According to Callon, “Translation includes partner "heterogeneous substances” “to shape an actor world through allocating, to each, "a character, interests, an errand to do, a

direction of action measures pass through , and undertakings to do" It incorporates pleasing the different implications the on-screen characters hold of a given wonder, during understanding, entertainer associate with each other to work out a circumstance of how the framework will work and will be used, in receiving and executing electronic prescription, it is essential to discover the interests of the significant number of on-screen characters, and conceivably move the interests of others, in other to upset any deterrents". (Callon, 1996). As stated by Callon, "the method of interpretation occurs in four stages: problematization, between evaluation, enrolment and activation. During the fundamental stage called problematization, a focal on-screen character perceives various entertainers that have targets and interests predictable with its own and develops itself as an obligatory section point which is a part that must be passed by all the on-screen characters in order to satisfy the interests that have been attributed to them by the focal factor". (Callon,1986).

Inscription system

Monteiro, clarifies that "the possibility of engraving insinuates the way wherein specialized relics encapsulate examples of utilization". (Monteiro,2000). "Engraving is the system whereby interpretation of one's tendencies are typified into specialized antiques. That is, "a translation assumes a substance to which it is recorded: content, programming, aptitude, etc. "engraving unites a program of activity for the customers, and it portrays roles to be played by customers and the structure " (Monteiro, 2000).

"At the point when a program of movement is recorded into a touch of innovation, the innovation transforms into an entertainer driving its engraved program of action on its clients. There are four interesting pieces of the thought of engravings: (1) "What is recorded": which desires for use are imagined; (2) "what is the materials for engravings"; (3) "who writes them; and (4) "the nature of the engravings": "how much effort does it take to repudiate an engraving". "The nature of engravings, whether or not they ought to be followed or whether they can be kept up some key good ways from, depends upon the irreversibility of the on-screen character arrange into which they are recorded". (Monteiro, 2000).

2.1.2 Architecture

According to Vassilakopoulou and Grisot, "The idea of engineering passes on the likelihood that a great deal of parts are groups into structures that are more or less pens and relate among themselves following a predefined method of reasoning". "Investigating the use of thought of design". (Vassilakopoulou and Grisot,2013) perceive three talks related to the thought plan and follow how different conceptualizations distinguish to change:

“Alessandra explains that “Most of the literatures addresses programming design as a prescriptive thought that portrays how antiques ought to be figured it out. The term engineering is used to connote a canny course of action of norms and decides that guide structure. The key point of convergence of standards and rules here is about the associations among parts that include an unmistakable obliged specialized framework with a characterized work”. (Aleksandra,2016). This is a responsive attitude towards change, concentrating on the structured capacities of the technological article.

Architecture as a means of controlling evolution- Regulation.

In the enterprise design literature 'the architect’ is liable for controlling the consistence of novel endeavors to technical models, business targets and operational archetypes. Design has a 'top-down' regulatory role. Architectures are comprehensive, completely comprehensive blueprints that spread all parts of deliberate work frameworks. Notwithstanding being demonstrated unrealistic practically for huge scope frameworks with huge social components, this "control perfect" is as yet not deserted.

Architecture as a means of handling complexity

The "control ideal” is surrendered and focus is coordinated towards architectural decisions and the impact they have. The accentuation isn't on getting ready total outlines with segments and interconnections, yet on applying architectural standards and building up an awareness to the decisions that are as of now set up: "An express comprehension of the fundamental architecture is an essential for the design, development and support of present day information systems that must supplement the present complex business forms spread across inner divisions and external partners” (Smolander et al., 2008).

As indicated by Hanseth clarifies that "exploring the role of architecture in Information Infrastructures and proposed the possibility of generative design to layout a continuously

complete appreciation of the job of design". (Hanseth et al, 2012). They identify two primary architectural approaches:

1. “Institutional Interface Architecture”
2. “Service Provider Architecture”

After the conducted study by Hanseth et al, they are of the opinion that service provider architecture is evolving and increasing over the years. while Application institutional interface architecture has a strong connection when combine with EDI mode, the number went up in the mid 70s, at that time it requires for a framework for electronic means of communication among organizations, these was then the starting point for information exchange between organizations. from there the new technology has then substituted from the paper-based method of communication to electronic framework. The case of Nigeria, if follow such paradigm it will enable smooth transition from paper-based of prescribing medication to electronic prescription system and there can be easily communication between healthcare providers.

Considering the paper-based system as the traditional means of communication between organization and medical providers, the focus areas of EDI models has created attribute that fits electronic norms. The functionalities of information infrastructure are to enable easy exchange of information among organization, at the stage, it will be suggested to expand the application content which is the real information that will make organization send and receive messages without any delay. Below Figure 1. Explain present the framework.

Consequently. Hanseth, explains “design of the general Information Infrastructures as Application Centric. Thusly of building Information Infrastructures likewise suggests that the EDI paradigm depends on a technological architecture that mirrors precisely the organizational structure made by the information stream between the organizations in question, for example the interfaces between the primary modules of the Information Infrastructures are equivalent to the interfaces between the foundations associated with the information exchange as represented”. (Hanseth et al, 2012). by Figure 1 below.

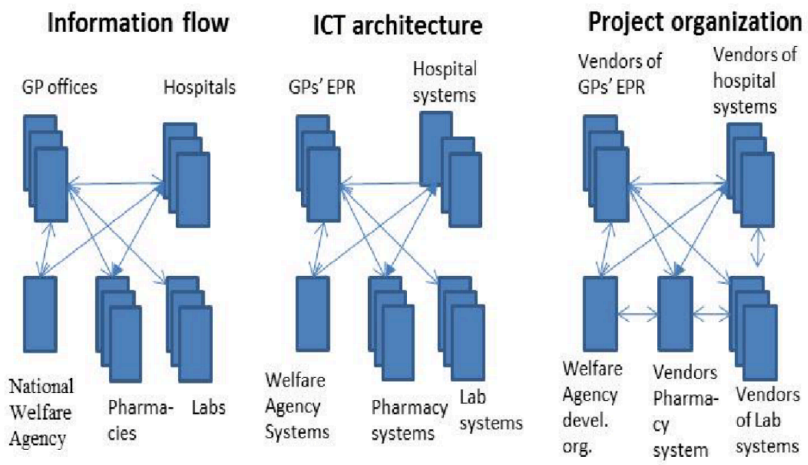

Figure 1. "The INA architectural approach" (Hanseth et al., 2012)

According to Hanseth et al, "the fundamental distinction between AC/INA and the second, CSC/SPA architecture identified, is that in the last case all information exchanged is dealt with by one separate system and not as an expansion of the application as outlined in Figure 2. this implies that in the AC/INA architecture there is a tight coupling between every application and the module dealing with the information exchange for this specific application and a free coupling between the different modules taking care of the information for the different applications, while in the CSC/SPA this is inverse: a loose coupling between the applications and the communication framework and a tight coupling between the different communication modules. Consequently, they allude to this architecture as Communication System Centric". "Be that as it may, there is likewise another distinction between these two models". "In the AC/INA communication is thought to be symmetric (applications are sending and accepting messages between one another) while applications incorporated by the CSC/SPA are integrated by according to an asymmetric design where the Information Infrastructure is set up to empower a few organizations to convey their services to others in a progressively proficient manner". Furthermore, "the communication framework is more tightly coordinated to the frameworks of the service provider that those of the service users. Regularly, CSC/SPA based Information Infrastructures are offering the Services Providers administrations to the users in the service user organization straightforwardly and not through their current applications". (Hanseth et al, 2012). Consequently Hanseth, "state that this architecture is additionally a Service Provider situated Architecture". (Hanseth et al, 2012)

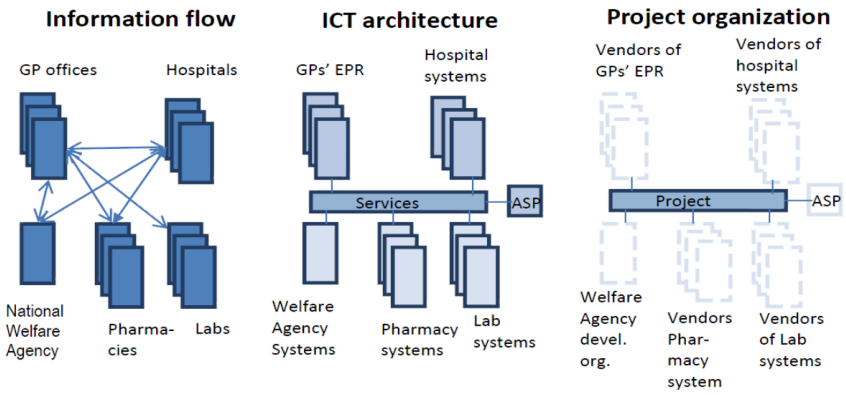

Figure 2. The SPA architectural approach (Hanseth et al., 2012).

2.2 Technology Acceptance Model (TAM)

According to Hsiao, "defined technology acceptance model as one of the Information Systems (IS) fields' own theory used for evaluating data framework acknowledgment particularly how clients come to recognize and use technology". (Hsiao et al. 2011). "The primary objective of TAM is to clarify determinants of computer acceptance that is general and fit for clarifying user conduct" (Davis et al,1989). "There are numerous noticeable (technology) acceptance models created in Information Systems". (Ammenwerth et al. 2003). Hu, explains that "Technology Acceptance Model is one of the most remarkable, promising and original models (Hu et al. 1999). "Technology acceptance model is an aim-based model initially created by Davis et al. ,1989) to more readily understand end-user's ability to accept of information technology system for both necessary and willful IT utilization. "Technology acceptance model should be well examined and as well pass through some test, then it will have evaluated from the feedback of end-user". (Banderker and Van Belle 2009, p.41).According to Venkatesh and Davis "Technology acceptance model built to expand TAM and the new version TAM2

TAM has experienced numerous progressions and updates, for example Venkatesh and Davis (2000) built up the extended TAM otherwise called TAM2.

"it was technology acceptance model should be used to determine social and intellectual since it has great impact in accepting new technology. The New very of TAM is called

the Unified Theory of acceptance, there no hug difference compare to the older version". (Holden &Karsh,2010)

2.2.1 Importance of TAM?

"Many studies have suggested the use of technology acceptance model as the theory structure to measure the acceptance attitude of end-users and assessing the attitudes of adopting the electronic prescription system in Nigeria healthcare delivery system. Technology acceptance model was selected to inspire healthcare provide so as not to ignore the significant challenges and it present a lot of construct to be assessed". (Anderson & Aydin, 2005). "Technology acceptance model is rapidly growing in information technology settings to carry out adequate clarifications about end-user's technology acceptance. several research have been conducted to look into and from the results it gathered enough positivity when accepted. (Hu et al, 1999). In addition, according to Holden & Karsh, the stated that "technology acceptance model 30 to 40 percent in new user acceptance of technology because it is easy to learn and straightforward". (Holden & Karsh,2010). The user acceptance of new technology system aim is to impact by its perceived usefulness and the ease of use in the system. However, proposing that two stated determinants have effect on end user attitude toward the implementation of the new system which can as well be measured by individual behavioral go to utilize the new framework. Furthermore, Perceived user and perceived ease of use are the most important factors to assess in adopting a new system. Perceived user presents how much end-users accept that using a new technology would enable them to expand their job and easily implement it, while perceive ease of use represent "how much end-users accepts that using an identified system to be liberated from exertion". (Davis et al,1989, p.985). The diagram below illustrates the TAM model

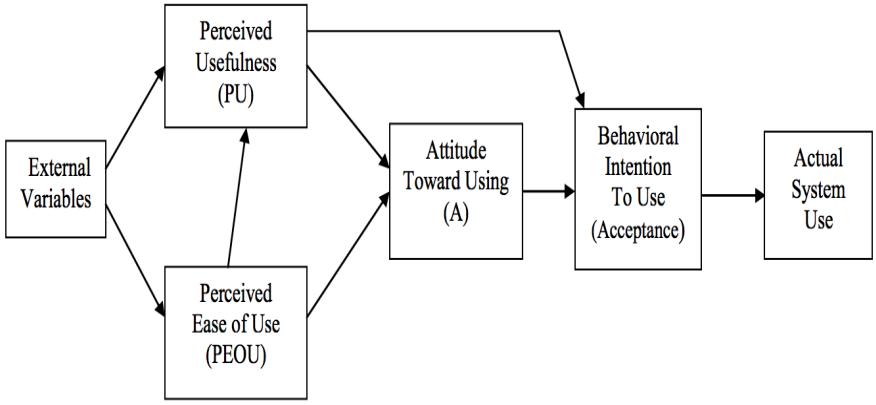

Figure 3. Technology Acceptance Model (TAM)

Source: (Davis et al. 1989, p.985).

"Above is the diagram that illustrates TAM model. The box explains the technology acceptance model construct, while the arrows from the left corner describe the determinant. The input variable show that it can arbitrate, doing so implication that affects perceived usefulness and perceive ease of use are the advancement process, recording/documentation, earlier use and the system quality. For instance, perceived ease of use is directed by the external elements. While, "perceive usefulness is impacted by perceived ease of use and various external factors. Measuring the attitude towards using a new technology is mutually identified by the presence of perceived use and perceived ease of us". Behavioral intention is mutually dictated by the user demeanor and perceived usefulness. Publication demonstrates that various empirical research utilizing TAM are not reliable and unobtrusive concerning factors that influence demeanor and acceptance of healthcare systems. Hu et al. (1999) examine physician's choice to acknowledge telemedicine technology.

"Technology acceptance model qualitative research was conducted by Karsh et al, the study reveals that error of utilizing error communication system were impacted by the acceptance of perceived usefulness and perceived ease of use". (Harsh et al, 2006). The term demeanor alludes to "individual's positive or contrary emotions about performing the objective behavior, for example utilizing a system" (Davis et al. 1989).

As stated by Succi and Walter, assess healthcare providers deposition towards health information system is significant for two reason which are; Several studies indicate that

not all healthcare provider such as doctors, physician etc. show resistance in accepting new healthcare technology framework. Secondly, assessing the general attitude of healthcare providers toward accepting health information technology plays and important role in the process of implementing the new framework since many healthcare settings trust this and it will help reduce cost. According to Davis, what derives people to use information technology application is that, there are disposition towards those applications in a long run". (Davis et al, 1989). However, Davis argue that healthcare providers attitude and objectives towards learning how to use new technology is because the nature of the new technology can be complex and can be an element of vulnerability. Finally, in talking about the TAM hypothetical model (Chow et al. 2012) noticed that TAM centers around attitudes towards information technology use by assessing the client recognition.

2.3 Healthcare Information System

Healthcare information system is defined as information technology system which is built to for healthcare information management which include how information is being processed, stored and transferred between healthcare providers. Health information systems can also be classified as system that deals with data related activities. The significant purpose of healthcare information technology is to impact growth, improvement and sustainability in healthcare delivery system. Furthermore, the roles of these systems are to reduce cost by alleviating undesired redundancies, another role of health information technology is to reduce medication errors that most of the medical facilities encounter on a daily basis. According to Shortliffe and Cimino, "the primary purpose of HIS is to minimize medical errors and organization information, it is also a means to communicate smoothly between medical staff and enables the needs of healthcare providers to do carry out their job effectively" Shortliffe and Cimino, further explains that healthcare information system enables integration of data, easy data exchange among various healthcare providers". (Shortliffe & Cimino,2006).

Furthermore, the viable utilization of communication and technology by healthcare experts and patients can realize a period of patient and public centered health information and services, this can happen by deliberately joining health information tools and enable

effective communication forms, beneath are potential that may happen when the combing of this frameworks occur:

- Improve public health information infrastructure
- Improve patient health care safety and quality
- Build health skills and knowledge
- Increase the efficiency of health care
- Facilitate clinic and consumer decision making

Disparities in getting great medical services information technology can result to low user acceptance and utilization rate of preventive services, likewise less knowledge in electronic prescription. Throughout the years public and private healthcare establishments have been utilizing the internet and different advances technologies to streamline the conveyance of healthcare information systems, the thought for this awareness is for healthcare experts to develop extra aptitude in understanding and increase the user acceptance of health information frameworks. According to Schlotzer and Madsen "Health information systems (HIS) in the early period was created to serve administrative need, for example, completing administrative assignment and creating billing calendar. Modern healthcare setting comprises of two kinds of health information systems which are: Hospital information systems and organization information systems". (Schlotzer and Madsen, 2010). One example, "is electronic prescription system compare to paper-based system, which healthcare organizations need to actualize because electronic prescription system reduces drug error, and other medication blunders, which on the other hand increase patient and healthcare providers safety". (Schlotzer & Madsen, 2010). A healthcare system can be characterized as all exercises whose basic role is to advance, reestablish, and maintain health (The World Health Organization,2000).

There are numerous components outside the health system that influence individuals' health, for example, poverty, education, infrastructure and more extensive social and political environment. Since they are available to impact from outside, healthcare systems are known as open frameworks. A health system's numerous parts at many levels. Smaller system might naturally have contained and have restricted scale and extension, for example, the individuals who are associated with running health center or dealing with a

health information system. Bigger systems may include the meeting up of different smaller systems (e.g., clinics, hospital, health advancement programs) to give intelligence at network or national level (Healthy Development, 2007). However, "the aim behind the healthcare system is to reduce the regular illness, loads disease and to increase the healthcare delivery and capacity of individuals". (Berwick, 2002). The institute of medicine IOM, "Explains the primary objectives of implementing healthcare information technology". (IOM,2001) which should provide:

- **Effective:** According to (IOM) "effective healthcare delivery should provide various services based on scientific knowledge to individuals who could pick up and refrain offering types of assistance to this unlike to benefit That is, maintaining a strategic distance from both underuse of effective care and abuse of incapable care". (IOM,2001).

- **Safe:** "The safety of patient in should come first in healthcare delivery facility, the facility should be as safe as their homes". (IOM,2001)

- **Timely:** "Health information technology decrease patient waiting and reduces delay for both patient and healthcare providers". (Berwick, 2002)

- **Efficient:** "As a result of efficiency, it reduces cost of care, minimize expenses of medical supplies and equipment". (Berwick, 2002)

- **Equitable:** "Health information technology provide quality healthcare delivery as a result of patient characteristics". (IOM, 2001)

- **Patient-centered:** Health information technology should enable responsive and respected healthcare delivery irrespective of the patient and their preferences and to ensure that patient find value in visiting the clinic.

"The benefits of implementing health information technology system is to provide quality healthcare service to patient. However, some advantages of utilizing HITS are: It reduces cost, it increases efficiency, and improve patient quality care". (Shortliffe & Cimino, 2006). Health information technology are influenced by the six components listed above, the essential use of these components is to enable health information technology collect information, keep information, and to retrieve patient medical history.

2.4 Description of study country

Officially the Federal Republic of Nigeria, is situated in the south east of West Africa. Nigeria is populated with over 190 million people and it is covered with over 200 ethnic groups, which occupy an area of 923,768 km square, it is almost four times the size of the United Kingdom.

Figure 4. The Nigerian Map

Source: https://msquarenewsonline.wordpress.com

2.4.1 The Nigerian Healthcare system

The Nigerian healthcare system over the years has been poorly developed. In spite of the country's position in Africa, Nigeria healthcare system is far behind progress and some of the reasons for the country's major setback on health issues is basically lack of healthcare facilities such as: Inadequate medical equipment to treat patients, poor awareness of information technology systems in healthcare sector, electronic methods acceptance level, lack of coordination of services, lack of clarity of roles and responsibilities among various levels of government to have helped compound the issues. Lastly, healthcare centers which are not functioning properly mostly in the rural areas.

Healthcare system is presently characterized by inadequate infrastructures and lack of basic amenities.

Nigeria operates a pluralistic healthcare delivery system which is the traditional healthcare delivery system. However, despite of all the contributions of the federal government of Nigeria to promote the healthcare delivery system, Majority of the hospitals still utilize the traditional method of information sharing and prescribing of medication, which is the paper-based system. According to Ambrose, "The Nigerian health sector consist of three tiers. "The healthcare policies recommend the Primary Health Care as the entry point to healthcare system in the country". (Ambrose, 2017).

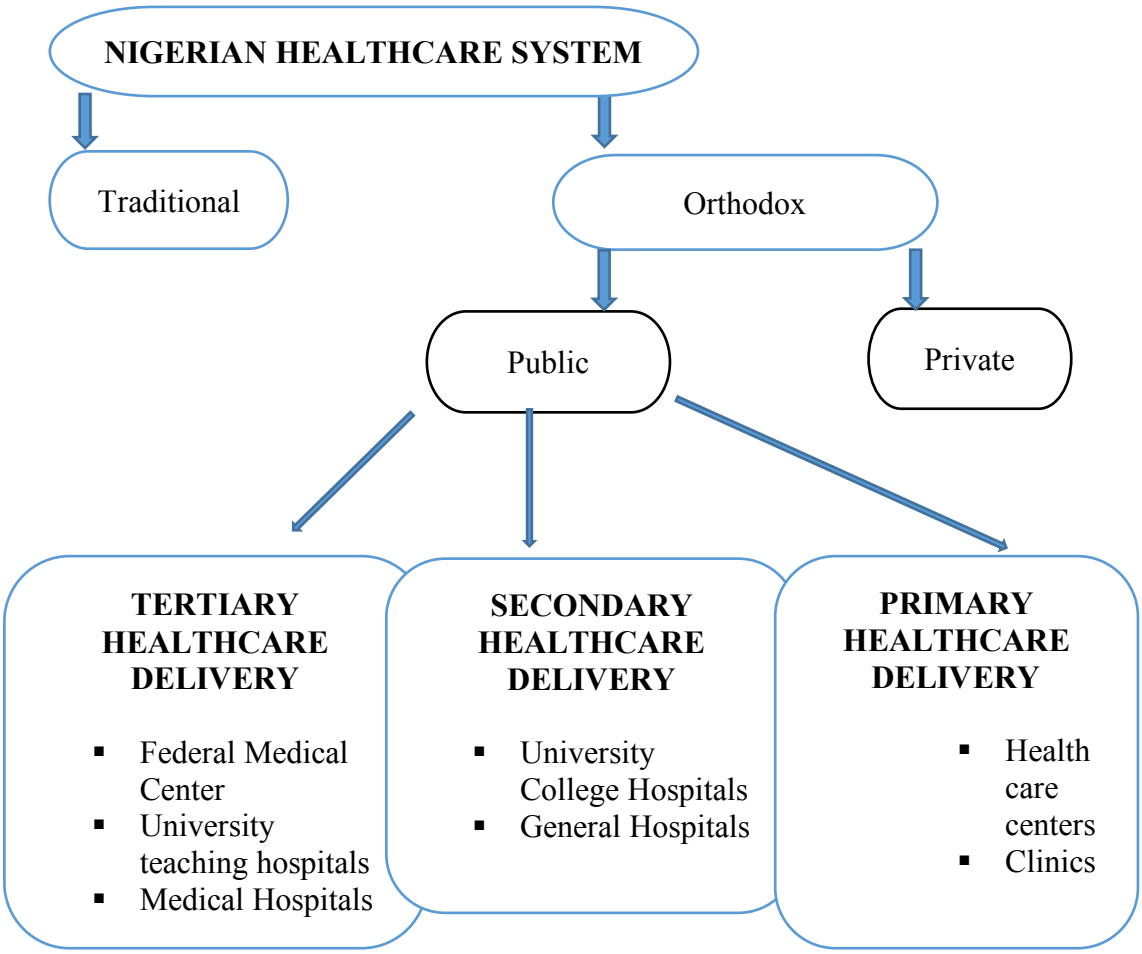

Figure 5. This diagram illustrates the three tiers of healthcare service in Nigeria

Source: Author

The Nigerian primary healthcare facility is managed by the local government areas, with the assistance of State Ministry of Health. The healthcare administration is divided in wards, the provisions of the PHC consist of clinics and comprehensive healthcare centers.

General hospitals is managed at the federal level, which is the Federal Ministry of Health it supplies tertiary and surgical clinic healthcare services through various University Teaching Hospitals. While the organization of the healthcare sector appears to be coordinated, the reasonable operations of the system isn't as consistent as delineated. Different level of government has their roles and responsibilities to play in the listed healthcare delivery system in Nigeria. According to World Health Organization. "The private hospitals are fast developing and ready to spend lot of money in preparing competent healthcare providers for quality delivery of healthcare services. According to WHO, it is estimated that 55.70% of healthcare delivery in Nigeria are being provided by private healthcare sectors". (WHO,2004). "There is often duplication and disarray of roles and responsibilities among the various levels of government". (Adeyemo 2005). The private healthcare sector is developing, and the private sector is occupied in the preparation of new medical students for health services, pharmaceuticals companies, and through conveyance of services. Furthermore, "It is estimated that the private sector gives 65.70% of healthcare conveyance in Nigeria". (WHO 2004).

The budget of the Nigerian health sector is relatively low, compare to other African countries. According to Soyinbo, he highlighted that "Nigeria total health budget is as low gross domestic product from 1998 to year 2000 which was under 5 percent, comparing the total health expenditure and gross domestic product proportion of other countries in African, for instance Zambia with 6.2%, Tanzania with 6.8% Kenya with 5.3%, Malawi with 7.2% and South Africa with 7.5%". (Soyinbo,2005). While the total budget on health sector in Nigeria as at 2014 is 3.7% (UNdata, 2017). "There is numerous challenging confronting the Nigerian health sector which includes; poor financing, counterfeit and adulterated drug, poor healthcare financing and sustainability; increased cash-based expenditure; deficient basic infrastructure and hardware; insufficient medical supply and low percentage of drug provisions; poor compensation of healthcare professionals and corruption that results in the theft of healthcare budget and shortage of medical staff". (Oyibocha et al. 2014).

2.4.1.1 General Hospital

According to Badru, "The Nigerian secondary facilities have the arrangement for "emergency unit and diagnosis unit" (including X-ray, "filter machines" and other neurotic services) among different administrations". (Badru, 2003). According to the "Medical and Dental Council of Nigeria, Hospitals should at least have three healthcare

providers who are to look after patient, pediatric and obstetric care in their facilities. On the other hand, “Secondary healthcare facilities integrate the facilities of the primary healthcare settings into their own to play its roles as a second-tier health organization”. (Ademiluyi and Aluko Arowolo,2009).

2.4.1.2 E-health service strategy in Nigeria

“The introduction to adopt e-healthcare system in Nigeria started in 1994, the effort that employ towards to adoption was uncoordinated. Early 2014, “there was an assessment on the implementation of e-health, as at then 84 information health system were recognized. While on 28 percent of those idea were drivers and 24 percent were in the progress of scaling up from implementation”. (FMoH, 2016). “The Federal Government of Nigeria came up with a strategic plan for 5 years to improve the healthcare delivery system in the country and also to have an effective National Health Management Information System”. (FMoH,2016)

As indicated by Adebola, “Many challenges have been affecting the implementation of e-health in Nigeria these challenges include; poor power supply, poor healthcare policy, poor funding, poor internet connectivity and lack of proper e-health strategy”. (Adebola, 2013). According to Hovenga, defined e-health as the modern technology for easy communication between healthcare providers and to enable easy transfer of patient information across various hospitals” (Hovenga, 2010). Which means that introducing and implementing information technology into the healthcare system will increase efficiency and reduce medication blunders. This will assist healthcare stakeholders to provide sound healthcare and accessible care which in a long run will produce a better outcome.

2.5 Electronic Prescription Systems

According to Guchelaar and Kalmeijer, “Modern healthcare delivery, which prescription of medication is seen as one of the mostly used methods of medication” (Guchelaar and Kalmeijer, 2003). The first electronic system was created in 1970s to lessen cost of formularies. Electronic prescription (e-prescription) frameworks are automated medical frameworks that can give the creation, transmission, apportioning, and observing of pharmacological treatments Mill et al. (2005).

Another definition of electronic prescription systems expresses that it is "Electronic prescription systems is encouraged and seen as an effective technology that improves means of communication between the prescriber, patient and the physician, electronic prescribing system help in decision making and supply medical information". (Caldwell and Power, 2012, p.124). Electronic prescribing has to do with computerized forms of antiquated paper solutions. A doctor produces an electronic or computerized rendition of the prescription during a patient experience. The electronic prescription is saved in the PC system and is handily transmitted to the patient's favored drug store in a wink of an eye. Obviously, the sensitive information recorded in the prescription (what the medication is, what it's for, and the name of the patient). One of the objectives of electronic prescription is to improve how you deal with the practice and how you convey patient services. With electronic prescription set up, one can depend on progressively exact documenting of prescribed drugs. Better patient safety and more straightforwardness are the awards for changing over to a digital system for prescribing medicines. This implies less time would be squandered waiting around to guarantee that the remedy is right.

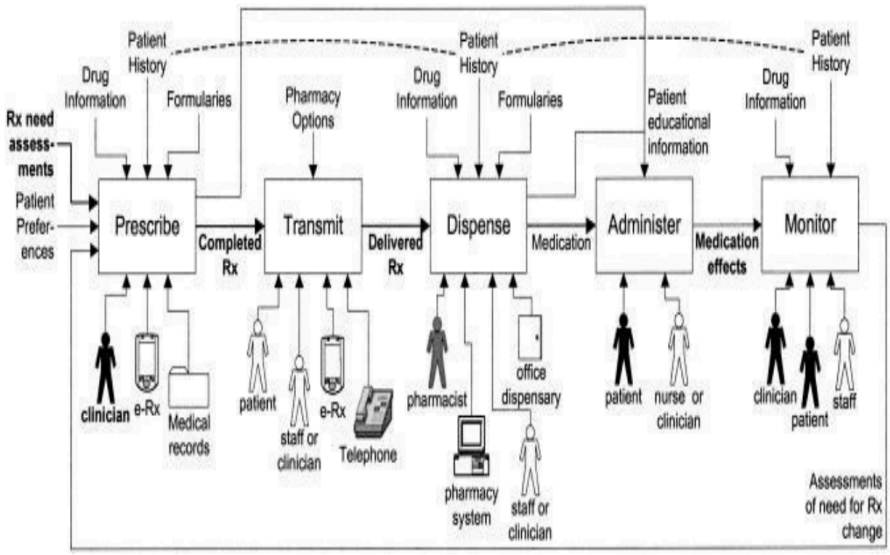

Figure 6. Hospital medication process and it's components

Source: Bell et al. (2004, p.64).

The above diagram explains, each box and its functionalities, had input that includes individuals, technology and information stream. The main stage is "prescribing", from the diagram it shows that the prescriber of medication assesses the patient's medication

need and examine the condition to which the patient needs medication, and the requirement for prescribing the drugs, the patients will use the electronic prescribe system to the pharmacy, and the prescriber and pharmacist will access the patient medication history. While the output shows the movement that written prescription is completed". The following stage is the "transmitting" request to the drug specialist (pharmacist); generally, the patient delivers the completed request/prescription for fulfillment. The "dispensing" activity includes dispensing the medication in its required structure and dose. Drug specialists(pharmacist) utilize a pharmacy system to recover prescriber medication information. The fourth stage is "transmitting'' shows order to pharmacist; in many cases patient delivers the complete prescription for consummation. "The final stage is "Monitoring", it includes mainly patient. Clinicians watch the effect of the prescription and make assessment just as to decide whether changes are required.

2.5.1 Importance of electronic prescribing system

Certainly, electronic prescribing is more convenient than the traditional way which is the paper based system, it may not be promptly apparent why electronic prescribing is so significant. More concision in drug prescribing and descriptions, less patient visits, and the capacity to deal with ordinary prescription just as those for controlled substances are signs of electronic systems.

Concise Information:

At the point when the medicine is electronic, there will be no uncertainty about what the prescription is, what quantity has been requested, what number of refills are permitted, and whether a brand name or conventional form of the medication ought to be dispensed. The result of succinct data is less time-wasting phone calls and hassles for both patient and medical provider.

Shared Patient Information:

The medical professional that treats the patient will have the patient's medical records. This will incorporate notes if the patient has any sensitivities or if there are any possibilities for perilous contraindications.

Minimize Patient Visit:

With digital prescription it is so to transmit to the pharmacy (counting tops off), you will eliminate the number of patients who might somehow or another need to come into the hospital to get drug top up. Utilizes Electronic Health Record (EHR) software, you can actualize its implicit patient portal. With an entry portal, patients can sign in from home or with their cell phone from any location to click a couple of buttons to request a drug top online.

Improved Patient Safety:

Avoidable drug errors related with written by hand prescription can incorporate choice of a wrong or inaccessible drug or dosage, duplication of treatment, omission of information, and error of the request because of illegible handwriting. Illegible prescription orders bring about a large number of calls among pharmacist and suppliers every year which can at last postpone patient care.

Table 1.Comparison between paper-based prescription and e-prescription.

Paper-based System	Electronic Prescription System
High level of medication error	Prevent medication error
It increases cost, due to medication error	It saves cost
High level of prescription fraud	Low level of prescription fraud
No access to patient prescription records	Access to patient prescription records
Cannot track prescription fulfilment	Easy to track prescription fulfilment

Source: Author

2.5.2 Paper-based record keeping system

Paper-based healthcare record keeping started in the 90s whereas medical professional and hospitals use the manual method of record keeping scheduling and record patient medical history with the aim that it is safe and reliable. According to Chiang et al, "Paper-based method is used as hospital documentation portfolio has become enormous by the use information exchange between healthcare providers, the financial backings of the modern healthcare information system, it enables the increment of biomedical knowledge". (Chiang et al, 2013). However, it comes with different barriers like; low

space to store patient cards, if there's large number of patient in attendance, poor hand doctor handwriting. Furthermore, "in many cases patient has registered with different healthcare providers in different local these records which are collected from patient are not shared between other healthcare that the patient had visit, this is because there's no feasible communication between medical professionals. Information of patient become, mistakenly tempered with and data becomes divided causing interruption". (Overhage, et al, 2002). Often times patient doesn't have accurate records of their medical information which they need to meet their need. According to Gustafson, "recent studies have revealed that patient who understand their medical conditions are more likely to make better choice to manage their illness". (Gustafson, Hawkins et al. 1999).

2.5.3 Lessons from Early Adopters of Electronic Prescribing System

Estonia

Estonia, with population of 1.3 million occupants, is known for its leading-edge approach to digitization. The country has been known as tech savvy country where government had some digital meetings already in early 2000. That has been influencing the digitalization of all sectors. According to Ingrid et al "The important aspect of the electronic transformation of this domain has been the concept of interoperability between systems in the data exchange via secure exchange layer X-Road along the tight collaboration of the private and public sector". (Ingrid., et al,2017). Estonia started to graph a digital path after regaining their independence in 1991; the procedure raised with the rollout of a wide scope of e-government services. However, these services are well-linked around digital signature, electronic identification document (eID) card and tax filling which are empowered by the country's nationwide backbone X-Road. X-Road is an e-service architecture that allows for adding new e-service easily. Therefore, the digital domain is firmly interwoven with the country more broadly-governance service are widely adopted by various enterprise and individuals, and digital readiness among Estonians was high.

Beside the secure data exchange, it has been an important concept pay attention on data privacy and identity management supported by legal framework. Wide usage of the digital signing has been helping to provide digital public services in a common way, which has been a good foundation for digitalization of the health care domain as well (Ingrid., et al 2017).

The Estonian electronic prescribing system allows data change between patients, healthcare providers, drug pharmacy, and EHIF. To give a prescription, the health provider creates an entry in a patient's shared health record, based on which patients can get their medication in any pharmacy in the Estonia based on their eID. Patients can likewise sign in through an online gateway and view the audit trail of information access and use.

Sweden

Sweden, with a population of about 9.5 million people, which they have been using health information technologies to improve healthcare delivery. Sweden became one the first countries that adopted e-prescription system, in 1983, couple of medical specialist connected to local pharmacies to exchange prescribing system (Bengt., et al, 2009).
The country's effort to improve connectivity in their health system started in 2000, when the usual standards for data exchange between hospitals were introduced.

A particular condition in Sweden is that there was just one pharmacy chain (Apoteket AB) when electronic prescription was established. The (Apoteket AB) is a state-owned pharmacy implemented electronic prescribing system together with the Stockholm County Council, at first focusing on the area around the capital. From that point ahead, it was carried out throughout the country while ensuring interoperability, given that Sweden's healthcare services is well organized at the local level. The authoritative obligation regarding electronic prescription lies with the Swedish eHealth authority.
The portion of medication transmitted electronically in Sweden rose persistently over the last decade: in 2002 there were about 3 million electronic prescriptions and 25 million prescriptions in 2007, that is about 75 percent of prescriptions within that time frame, while n 2014 about 90 percent of prescription were done electronically. Patients expressed high fulfillment with the system, with positive attitudes for 85 percent of the population and positive perspectives regarding the safety 79 percent and benefits 78 percent of electronic prescriptions (Hammar et al.,).

Denmark

Denmark, with a populace of 5.6 million, has a central public health system with the Ministry of Interior and Health at its center. The likes of Estonia, Denmark can be classified as countries that has adopted health information technology in the early stage

and could be seen as leading countries in information technologies (Kierkegaard,2016). Danish citizens can make use of an online entry to access their health information and communicate with doctors. Electronic prescription system started in Denmark in 1994, with the central e-Health organization Medcom, which drives stakeholders' alignment and setting up the important guidelines for e-prescriptions. The new service started gradually, with around 4,000 exchanged messages in the first year (Ib Johansen,2004). the fundamental driver for growth over the following two decades was the computerization of the healthcare system. Because of the early presentation of electronic prescriptions, the basic functionalities (a central medication database and further basic principles) were implemented into bundles of software's in various vendors from the beginning

3 Research Methodology

3.1 Introduction

The research methodology gives description of the selected design for the study, it then goes further to explain the conditions surrounding the way the research is to be conducted. The chapter is divided into five parts. The first part will cover the detailed explanation of the research settings. The second section went further by providing a brief explanation of the case study. The third part explains the data collection procedures to be used in carrying out the research. The last two sections which explains the data analyses procedure to be utilized in the research, the chapter is rounded up with a summary of the whole chapter.

For better understanding, the adoption of survey questions was used after interviewing healthcare stakeholders in their respected area of specialization. However, our survey questions focus on healthcare providers knowledge of electronic prescription and information sharing system, their experience with paper-based method of record keeping and prescribing, roles the stakeholder would play to make the adoption of the technology a success, and willingness in using electronic prescription system.

3.2 Research Setting

The author did not visit any healthcare center to conduct the study. The empirical material was gathered based on informal telephone discussions held with some healthcare stakeholders working in the secondary healthcare facilities. Furthermore, the author chooses to carry out the assessment mostly in secondary healthcare setting, this is because most of the secondary healthcare facilities are situated in urban area of Nigeria, and this will give a broader understanding as to whether the adoption of e-prescription will be possible or not.

3.2.1 Research approach

The primary objective of the study was to assess to general attitude of healthcare providers working in General hospitals and other private hospitals on the challenges that can impede the implementation of electronic prescribing and information sharing system in their facilities. For us to attain our goal, recorded interview was conducted via telephone, this interview help us in understanding the perspective and opinion of

healthcare stakeholder toward the implementation of the technology, to improve healthcare delivery system in the Nigerian settings.

3.2.2 Study Design

According to Myers, "Various information systems researcher choose to adopt quantitative or qualitative research method to carry out their investigation on different studies, in some of their research many of the authors have suggested using either qualitative or quantitative method for data collection, Myer also stated that both research methods can be combine for data collection depending on the research". (Myers 1997). For this study the author chooses qualitative research method for data collection, because qualitative research will help us in understanding individual attitudes, it will help us generate more content and provide insight that are specific to the study.

3.2.2.1 Qualitative research approach

The use of qualitative research method has seen to be one of the valid means of data collection because it provides valuable data. For instance, survey, interviews and participant opinion, will enable us to understand behavior patterns of a participant and as well describe the characteristic of the present occurrence. According to Kaplan and Maxwell "To achieve this result, qualitative research approach is conducted in natural form to provide us with details about participant behavior, emotion and participant needs". (Kaplan and Maxwell, 2005).

3.2.2.2 Interpretive Research

"Interpretive research in recent years has been proposed to be an approach that enables information system research to understand interpretation of idea", actions and make sense of their experience. (Klein and Myers, 1999). Interpretive research approach focuses analytic information that is assumed to be the experience or knowledge of an individual through social growth and different cultural and historical interest. "Interpretive research is aimed at developing comprehension of context in information system research and whereas the information gathered can be influence by the context". (Walsham,1993). However, Interpretive research approach is paradigm that is based on individual social reality, meaning that as people interact with their surroundings, it helps them in understanding the social situation through what they can access. Interpretive research approach studies thusly reject the chance of a "goal" or "factual"

3.3 Case Study

The use of case study research is widely According to Orlikowski and Baroudi, “just like qualitative research approach is used information systems”. (Orlikowski & Baroudi, 1991). It usually used by investigators to explore a case. As indicated by Yin, a case study research is a pragmatic finding that investigate a situation within reality context, meaning that when the limits between situation and context are not stated clearly”. (Yin, 1999). According to Simons, He added that “a case study research approach is an extensive research investigation from various perspective”. (Simons, 2009).

3.3.1 Interviews

The aim of research interview is to help us have better understanding, and investigate our research objectives, opinions and our participant behavioral experiences. Our conducted interviews enable us to have in-depth information from our respondents. However, interview questions contribute to our data collection process that is theoretical. This method is adopted so as to understand different experiences of our respondents. In our case a formal telephone interview was conducted because the author was unable to visit Nigeria due to the ongoing pandemic. The telephone conversations lasted between 15-40 minutes and the interview was recorded so as to validate our responses.

3.3.2 Survey

According to Runeson, “define survey research as a data collection method which is an important procedure when carry out a case study research”. (Runeson et al, 2012). Survey is defined as the act of assessing a process or questioning some selected individuals to obtain information about a service or process. Data collection survey gather information from a focused group of individuals about their opinion, behavior, or knowledge.

3.3.2.1 Sampling size method

Sample size method is the act of selecting the number of respondents to include in a statistical report. In this study a suitable sampling strategy was adopted in choosing our respondents. However, 10 to 14 respondents were selected for this study. The sample size approach is assured to certain respondents of the chosen cases in respective of the “location” which researcher intend to generalize” In this study the secondary healthcare center is refer to as the location.

3.3.2.2 Selection of Respondents

The participants of the study are divided into three parts. The first category of our respondents were medical professionals who have an idea about electronic prescription system and information sharing system and some with basic knowledge and the third category are the general public who have an idea of the technology and those who does not have an idea of the technology. Additionally, most of the healthcare providers who took part in this study have spent more than 6 years in their respective specialties.

3.4 Data Collection Methods

Data collection process is the way of collecting, gathering and measuring of information from relevant sources in other to find valid answers to research questions. According to Runeson, He stated that "the important methods to improve research validity is to adopt various information and data from different sources". (Runeson, 2012). This is known as data triangulation and it assists to provide a broader picture of the situation being studied and furthermore to guarantee that the outcomes gotten from the study are dependable. The researcher has chosen to utilize the main data collection strategy. This data collection procedure as stated by Runeson et al., (2012) is a direct strategy where the investigator is in direct contact with the interviewees and information is gathered progressively. Different sources of evidence were used for this research which includes; Web survey and semi structured interview.

3.5 Data Analysis Methods

According to DiCicco-Bloom and Crabtree, "qualitative data analysis" refers to the process of data collection, it can be observed and recorded so that researchers can gather "as much information as possible". (DiCicco-Bloom, 2006). Qualitative data analysis creates easy analysis for information to be gathered from this study. And since we are conducting a case study research, In the data collecting process we make use of qualitative data analysis method in order to keep track of our research activities. In this case, we have utilized the RQDA software, RQDA is a computer assisted software that is built for qualitative data analysis. This is typically done in other to discover the new bits of knowledge that may emerge. The telephone Interview information were analyzed based on Open Coding. This type of subjective data analysis deals with labelling ideas or codes

generated from the interview that was carried out, that describes the situation being measured and afterward going forward to generalize them into categories based on their attribute.

The step that was taken is to code the data collected which implies that different parts of the collected data are given a code that is representing a specific theme. On the other hand, one code is allocated to each part of the text and one code can be assigned to one or more. The coded report will be joined with remarks in other to effectively recognize the contention of every text. In this way, a lot of hypothesis will be formulated which will, thusly, create a formalized group of information which is the conclusive outcome of the study. The codes generated from the analysis were developed step by step and reliably by reading through the transcripts.

The aim selected themes for the study is to assess the challenges and acceptance level of electronic prescription and information sharing system in the Nigerian healthcare facilities. The result from our interview was analyzed based on the selected themes; roles of healthcare providers to make electronic prescribing system a success, benefit of the implemented technology, willingness to adopt the system, possible challenges that can impede the implementation and Knowledge of electronic prescription system among healthcare providers.

3.6 Summary

This chapter give description about the case study research procedures, which includes empirical data collections, and also how the collected data was analyzed. Furthermore, the methods of the methods used for data collection in this study were discussed and, the validity evaluation of the data assortment instruments was investigated. The results was gathered from the previous chapter will be utilized for data analysis which will be explained in the in chapter four.

4 Results and Discussion

This chapter of the study gives descriptions on research findings, interpretation and analysis of the result gathered from the thesis.It then goes further to present views of healthcare stakeholders from the informal telephone conversation held during the interview. The various perspectives were from doctors, pharmacist, physician and pharmacist technician working in the General Hospitals in 2 different states in Nigeria. RQDA was adopted in order to give detailed description of the interview results and afterwards the section is concluded with summary of findings.

4.1 Interview Findings on Adoption Electronic Prescribing System

After conducting successful interviews which was designed to investigate the acceptance level of electronic prescribing system under study, the findings in this section will delineate the data gotten from interviews carried out with stakeholders in the healthcare sector. Furthermore, the data will be presented in various sections with the structure of our research questions. The first section is focused around knowing the general background of the stakeholders as a proportion of assessing the legitimacy of their response. Subsequently, other sections emphasis on addressing the relevant issues that are important in answering the research questions so that the general research objectives can be accomplished. The investigation is followed with an interpretation of the responses and a clarification for the observation.

4.1.1 General Description of the Respondents

This part of the thesis describes the information of our respondents that was chosen for this research. Furthermore, this section addressed the questions of our conducted interview. This was done to certify validity of the research and to verify that the stakeholders interviewed had knowledge about EP and other problems facing the health sector. From the conducted interviews among various healthcare stakeholders, All the interviewee were medical doctors, pharmacist, Pharmacy technician, gynecologist, and medical officer. Most of the interviewee had work in the medical field for over 6 years while some had worked for 6-15years. Consequently, it could be gathered that majority of the interviewee have been working as medical stakeholders and have been in the system for a long time to know the information we seek for this study.

4.1.2 E-Health System in Nigeria

This research question answers “How the adoption of electronic prescribing system can influence the healthcare delivery process in the Nigerian secondary healthcare facilities? This research question answers “How the adoption of electronic prescribing system can influence the healthcare delivery process in the Nigerian secondary healthcare facilities? To more clarification, the question was divided into explicit sub-questions. “What do healthcare professionals (Stakeholders) feel are the challenge that can hinder the implementation of EP in their facility?” “What are the factors that might promote the usability of EP?” “What do healthcare providers believe are the prospects behind the implementation of electronic prescription and information sharing system in their respected facilities?” and what are the roles of stakeholders needs to play to make the adoption of EP successful. Interviews were conducted to find the suitable responses to the sub-questions and from the results gathered we chose to separate this section into various categories according to the codes used in our analysis

There are various ways by which electronic health surveillance provides a larger number of benefits than the regular approach. Electronic health provides data acquisitions; digital surveillance which enables data collection and analysis, which encourage data entry. However, the use of digital health has modified the way in which healthcare providers offer and use the new technology. The proliferation of the new technology creates an exciting opportunity for smooth patient medical records transfer and communication among hospitals. in Estonia, for example According to Ingrid, “Most of the services in Estonia are electronic based and in the public sector all types of documents are been exchange electronically. In other words, it should be possible to scale the same idea to this domain as well”. (Ingrid et al, 2017).

4.1.2.1 Present situation of e-Health and record keeping system in Nigeria

Based on our research questions to be answered to under this section. (“What is the general problem affecting the e-health system?”). It was significant to carry out question as to know the present state of the Nigerian healthcare system. Furthermore, many studies had stated the poor situation of Nigerian healthcare system and that manual method of patient record keeping and drug prescription system has seen to be the mostly used in the healthcare facilities.

Also, some of the stakeholders that was interviewed, confirm that the use of traditional method has been the only system used to prescribe and keep medical records of patients. Large number of our respondents had their opinion that some of the private hospital in Nigeria have adopted the use of electronic record system and that they hospitals prescribe digitally.

The section gives details on the present method of medication and record keeping in the Nigerian health settings and based on the information collected, majority of our interviewee confirm that the paper-based system was still the majorly means of patient record keeping and medication prescription in their facilities. Some of the stakeholders stated that the form of information sharing amongst hospitals and clinics was manually. Where the medical records and prescription of patients is written on paper and if needed to be transferred to another hospital the patient in question will take the written medication to the requested hospital.

4.1.3 Healthcare providers understand of the electronic prescription and information sharing system.

This question was important to as our respondents as it will enable us to have good understanding of how much knowledge of electronic prescribing and information sharing system the healthcare provided has. Furthermore, it will enable us to have to identify some of the benefit and challenges that could slow down the implementation of the technology.

Majority of our respondents understands what the electronic prescribing and information sharing system is, from their responses; *"Yes, I do understand what it means, and I believe it is a method of prescribing medication to patients electronically, in the sense that we as doctors prescribe digitally to the patient, while the patient takes the digitally prescription to the pharmacy" According to* Another respondent. *"Electronic prescribing system is such that doctors prescribes drugs or medication electronically, instead of using the paper-based method." (Respondent).*

Based on the responses from our interviewee, they were able to state some of the benefit perceive that can be seen in electronic prescription and information sharing system, these points are highlighted below:

"It enhances patient confidentiality because sometimes unauthorized personnel may temper with patient medication records in the sense that, it can easily be withdrawn from folders when in transit" (Respondent).

"It easy to reconcile patient medical history, In the sense that, the prescriber can easily view patient medication history when utilizing electronic prescription system and saves time for both patient and doctors" (Respondent).

4.1.3.1 Benefits that could be derived from the adoption of electronic prescription and information sharing system in the General Hospitals

This question enables our respondents to think of the benefit that could be derive from the adoption of the technology. Thus, below are the highlighted answers from our respondents

From the results gotten from our conducted interviews all of our respondents had point out some very important benefits that comes with the implementation of electronic prescribing system. Majority of our respondents mentioned patient safety, easy access to patient's medication records and reduce pharmacist errors. These points were quite given in different context. For instance, one of our respondents was of the opinion that "*The benefits are much if this is adopted in the Nigerian settings, some of the benefits I can think of now, I would say It will help monitor controlled substance prescription whereby doctors, pharmacist can track the number of controlled substance prescriptions that a patient has received, that will decrease the likelihood of over-prescribing, if adopted it will make it easy for states to track data across multiple pharmacies"* While another respondent share is thought that "*Electronic prescription comes with many of benefits if it will be implemented in the Nigerian settings, it will resolve several challenges like: Patient safety, where patient whose medication has been prescribed electronically will not spend more time in the hospital which mean it will reduce the time patient has to spend in the hospital, most of the hospitals are been crowded due inappropriate time schedule for patient, also, I think it will tackle the problem of medication error" (Respondent).*

Majority of respondents also stated some benefits of digital medication system, they really encourage the implementation because of easy access to patient records and it's easy to

retrieve patient information compare to the paper-based system. 3-6 of our respondents gave their opinion that; if the system is implemented it will give easy access to track prescription fulfilment, like when a patient leaves with a handwritten prescription, there are no means to track if the medicine gets filled, they respondents also added that, it will give physicians the ability to counsel patients on medication management if needed.

The below highlighted points were presented from the response of our interviewed participant. The perceived some of the benefits can could be derived from the adoption of the technology. Below is the list of benefit that comes with the implementation of electronic prescription system by our respondents: -

- Patient safety
- Improve Workflow and time
- Reduces pharmacist error
- Increase prescription efficiency
- Easy access to patient medical records
- Increase efficiency and convenience for patients and doctors
- Clarification of inaccuracies

4.1.3.2 Challenges that could slow the adoption of electronic prescription and information sharing system in General Hospital.

This sub question is important in this research, as the aim of the study is to investigate if the adoption of the technology is possible in Nigeria secondary healthcare facilities or not. However, the question will enable us to identify some of the challenges that could impede the adoption of electronic prescribing and information sharing system. It was clear that there are some barriers that can hinder the implementation taking and some of the mentioned factors highlighted need to be put in place in order for the technology to be adopted as seen in many developed countries. The below listed points are the response from our interviewee and the responses are segmented into three these are: -

- Infrastructural issues

- Political issues
- Human factor issues.

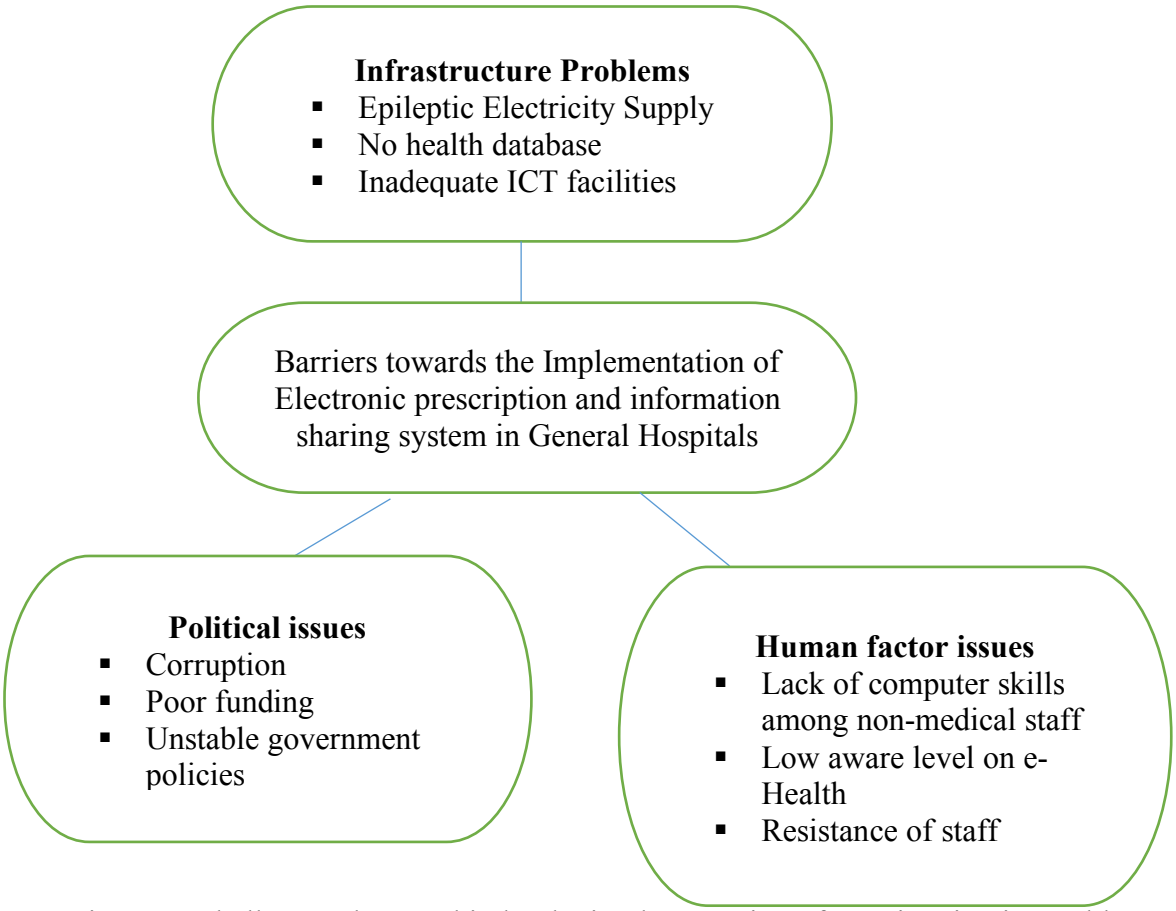

Figure 7. Challenges that can hinder the implementation of EPS in Nigeria Healthcare Facilities.

Source: Author

Majority our respondents express their opinion on unstable government policies and poor power supply. For example, one of our responses "*Other challenges that may hinder the implementation is Unstable government policy, different government has their own setting and how they want things done. For example, Nigeria government has this poor culture on not wanting to accept the progress of previous administration for some reasons that is best known to them, Scraping, the positive ongoing projects on previous administration is a total waste of funds"* the respondent also point out further challenges that may impede the implementation. "*Poor infrastructural facilities, poor management system among hospitals, lack of proper funding to make the new system last long" (Respondent*). Other respondents give an experience he had encountered while working in one of the general hospitals, this is due to poor power supply "*The issue of poor power*

supply has been one terrible problem in Nigerian, that has been happening even before I was born. If the government can supply good electricity, I believe it will make it easier for all hospitals to accommodate electronic prescription system, so imagine not having good electricity to power all the medical facilities in the hospitals. For example, I have been in a hospital where generator is run for (4) four days, so imagine the expense it will incur for the hospital" (Respondent).

This part of our research question was to identify the barriers to could impede the adoption of electronic prescription and information sharing systems in the secondary health facilities. However, the cause to identify these factors that may slow down the successful implementation of electronic prescription system. The response from the healthcare providers show that they understand the system and the also express their opinion on the perceived challenges.

4.1.3.3 Criteria that Measures the Efficiency and Effectiveness of Adopting Electronic Prescribing System in Nigerian Secondary Healthcare Facilities

The adoption of this question from our research is the measure the efficiency after the implementation of the technology. This is because it will enable us to understand if the newly adopted technology is working in these facilities as it should. "What are the criteria that can be used to determine the efficiency and effectiveness of Adopting electronic prescription system in Nigeria secondary healthcare facilities?". Interviews were conducted to find answers to the stated question above and from the results gathered, majority of our respondents gave their opinion on what can be used to measure the efficiency and effectiveness of electronic prescribing system in the secondary healthcare settings. From the responses gathered below is the list of points that can be used to measure the effectiveness of the newly adopted technology which include: -

- Level of drug abuse
- Patient waiting time
- Feedback from healthcare providers
- Feedback from patient

- Safety of patient records
- Rate of drug prescription error

Based on the response by our respondents, it could be gathered that the results of adopting electronic prescribing system in the secondary healthcare facilities can be measured using important key performance indicators highlighted above.

4.1.4 Roles of Stakeholders in the Adoption of Electronic Prescribing system in the Nigerian Secondary Healthcare Facilities

This section was designed to give answer to the research question "What are the roles stakeholders needs to play to make the adoption of EPS a success?". We need to investigate the roles stakeholders will play in making the adoption of the technology a success. From the results gathered, all our respondents gave similar answers to the question.

Majority of our interviewee were medical doctors, pharmacist, physician, Gynecologist and Pharmacy technician. Furthermore, most of our respondents had over four to seven years working experience in their respective area of specialization while other were below seven years. However, it was apparent that majority of our respondents had similar job routine while they carry out their daily activities. One of our respondents who is a medical doctors outline is routine on a daily basis. "My daily activities as a medical doctor is to attend to patient who need medical help, prescribe medication: and order, perform and interpret diagnostic tests and as well counsel patient on diet, hygiene and preventive healthcare" (Respondent). However, some of our respondents express their opinion on roles they could play to make this system a success. "*For electronic prescribing to be successful we need to make most of use of electronic systems in the health care setting, if it will work, all doctors need electronic consultations, at my place of work that is not obtainable, because we don't prescribe electronically, we only do the manually way of prescribing. There should be a centralized system for which the ministry of health should implement that all general hospitals across the country have one data base, where as if a patient medication records can be view from any part of the 36 states if he/she needs any medical attention in the respected state where the patient is at the point in time"* (Respondent).

Conclusively, we need to verify what is considered the activities of stakeholders in the healthcare settings. It is evident that medical practitioners support the implementation of electronic prescription and information sharing system in Nigeria as it will help the health sector grow and solve outstanding issues surrounding the secondary healthcare in the country.

4.2 Survey findings on Acceptance of Electronic prescription and Information Sharing System

This section provides and analyze, the gathered results of the survey conducted in this study. The use of charts and percentage analysis was adopted to describe the outcome of the survey. Also, the statistical data gathered in this section, form the basis upon which the findings were discussed in this section.

Format: Number of responses divided by total Number of respondents and then multiply by one hundred

The purpose of conducting a survey was to get the overall opinion from patient, medical staff and non-medical staff. Having carefully generated the web survey to investigate the problems under the study; about (180) response were gathered. This comprised the data that is hereby analyzed. Furthermore, the data was presented in only one section in line with the structure of the survey (see Appendix 2). The first two questions focused on knowing the age and gender of our respondents as a means to assess the age group and gender who had participated in the survey, the other questions centered on addressing fundamental issues that are relevant to answering the web survey questions and achieving the overall research objectives. Afterwards, the analysis is the followed with an interpretation of our respondents.

Question one was aimed to seek participants acknowledgement, that the study is voluntary, all participants must be 18 years of age or older to participate in the study. The distribution of the (180 respondents) 97.8% (176 respondents) accept the consent to begin the study while 2.2% (4 respondents) do not wish to participate in the study. From the distribution large number agree consent to the study (see Appendix3, Figure 1).

Question two was out to investigate the number of male and female respondents and other respondents who wish not to say. From the distribution of (180 respondents). 43.9% (79

respondents) of females participated in the study, and 55% (99 respondents) were male while 1.1% (2 respondents) prefer not to say (see Appendix 3, Figure 2).

Question three was aimed at investigating the age groups of our respondents. The distribution of (180 respondents). 46.7% (84 respondents) were between the age group of 18-25 years old, 49.4% (89 respondents) were between the age group of 25-40 years old, 1.1% (2 respondents) were between the age group of 40-50 years old and lastly, 2.8% (5 respondents) were between the age group of 50-60 years old (see Appendix 3, Figure 3).

Question four was out to investigate how often our respondents visit the pharmacist with prescription either electronically or manually. From the distribution of (180 respondents) the ratio shows that 10% (18 respondents) visit the pharmacy more than once in a month with prescription, 14.4% (26 respondents) visit the pharmacy once a month, while 40.6% (73 respondents) visit the pharmacist with prescription once in 6months and lastly 35% (63 respondents) visit the pharmacist once a year (see Appendix 3, Figure 4).

Question five aimed at ascertaining the number of medications involved when each respondent visits the pharmacist. The distribution of (180 respondents). According to the results, it shows that 16.7% (30 respondents) visits the pharmacist with only one medication, 79.4% (143 respondents) visits the pharmacist with two-five medications, while 3.3% (6 respondents) go to the pharmacist with more five medications and lastly, 0.6% (1 respondent) visit with more than ten medications (see Appendix 3, Figure 5).

Question six was out to investigate how often each respondent purchase medication for someone else. For example, if any of the respondent's family is ill and couldn't get the prescription for themselves, how often does this occur. From the result gathered it shows that 21.7% (39 respondents) has never purchase medication for someone else 36.7% (66 respondents) agree they purchase medications for someone else, 25.6% (46 respondents) agree this prescription is for someone else, while 16.1% (46 respondents) always purchase medication for someone else (see Appendix 3, Figure 6).

Question seven was aimed to investigate the general knowledge among Nigerians, majority of our respondent were not familiar with what electronic prescribing system is and from our findings it will be good to create awareness and educate the general public what electronic prescribing is and defined the benefits surrounding the technology. For the technology to be acceptance large number of Nigerians should understand the concept

of the system and also be able to point out its benefits compare to the paper-based which they are use too. The distribution of (180 respondent) 32.8% (59 respondents) have the knowledge of electronic prescribing system while on the other hand 67.2% (121 respondents) does not have the knowledge of electronic prescribing system (see Appendix 3, Figure 7).

Question eight was aimed to investigate the certainty of manual/ paper-based prescription method in Nigeria. The distribution of (180 respondents) shows that 17.8% (32 respondents) has experienced the digital way of prescribing drugs from their respected doctors, while a large number of our respondents from the results gathered show that 82.2% (148 respondents) have not experienced the digital way of prescribing medication (see Appendix 3, Figure 8).

Question nine was aimed to investigate the acceptance level of electronic prescription system among Nigerians. From the results gathered, it shows that a large number of our respondents, if given the choice would choose electronic prescribing system over paper-based method of prescribing, this shows the willingness of accepting the technology among Nigerians. The distribution of (180 respondents) 77.2% (139 respondents) would go with E-prescription system, while on the other hand 22.8% (41 respondents) made their choice of still using the traditional method of prescribing which is the paper-based system.

Question ten was aimed to investigate what our respondents feel about paper-based prescription and if it is a threat to their privacy. The distribution of (180 respondents). 12.2% (22 respondents) agree that paper-based prescription is a threat to their privacy, 35.6% (64 respondents) agree that paper-based is a little a threat to their privacy, on the other hand 17.8% (32 respondents) believes the chances are small, and lastly 34.4% (62 respondents) disagree that paper-based prescription is not a threat to their privacy (see Appendix 3, Figure 10).

Question eleven was aimed to investigate the rate of drug abuse in Nigerian and if the adoption of electronic prescribing system would reduce the rate of drug abuse. From the results gathered large number of our respondents believes that adopting electronic prescription system would reduce the rate of drug abuse among Nigerian youths. The distribution of (180 respondents) show that 62.8% (113 respondents) agrees that the

implementation of the technology will reduce the rate of drug abuse. While 13.2 (7 respondents) believes it will increase the rate of drug abuse and lastly 30% (54 respondents) are neutral (see Appendix 3, Figure 11).

Question twelve was aimed to investigate how the adoption of electronic prescribing system would affect patient safety. This part of the question would help understand the emphasizes safety in the adopting of EPS, through the prevention, medication reduction and analysis of medical error in Nigeria. The distribution of (180 respondents) shows that the 55.6% (100 respondents) agree that the adoption of EPS would increase patient safety, while 11.1% (20 respondents) a small number of our respondents believes that the adoption will decrease patient safety and lastly 33.3% (60 respondents) stayed neutral (see Appendix 3, Figure 12).

Question thirteen was aimed to investigate how the adoption of EPS would affect patient convenience. This part of the question would help understand the benefit surrounding the implementation of EPS in Nigeria secondary healthcare facilities, in terms of patient waiting time as well enables physician, pharmacist and doctors to prescribe remotely without patient visiting the hospital. However, the from the result gathered it shows that 12.8% (23 respondents) believes it will decrease patient convenience while 53.9% (97 respondents) agree that the adoption of EPS would increase patient convenience and lastly 33.3% (60 respondents) were neutral (see Appendix 3, Figure 13).

4.2.1 Summary

This section gives a summary of the case and subject selection for this research. The section went further to give analyses of the collated result gather from the interviews and survey in other to give proper answers to our research questions which was chosen for the study. However, results from the telephone interview disclose that healthcare providers have understanding of electronic prescription and information sharing system and they are willing to accept the new technology in their facilities.

5 Recommendations and Summary of Findings

The primary objective of this research was to assess and investigate the acceptance level toward to adoption of electronic prescription and information sharing system. Also, point out the challenges that can impede the implementation process of the technology. From the interviews and web survey carried out, as perceived by healthcare providers working in some of these facilities, each located in different part of the country. The importance of understanding the present situation of the country's health sector is needed, in other for us to identify the key problems that may stop or slow down the implementation of electronic prescription and information sharing system in Nigeria General Hospitals. However, from our result it revealed that there are various barriers that could slow impede the adoption. In this vein, we propose a practical framework to overcome the challenges that would hinder the adoption of electronic prescription system in Nigerian health sector. The propose practical framework is explained in the summary of findings section. The following sections will discuss limitations, and possible future work.

5.1 Summary of Findings

For a country to have a solid healthcare system, there must be a well suited financial structure in other to maintain the growth of the sector. Many causes of poor healthcare management rely on the financial strength of the country, which has been the case in Nigeria. Some key elements that has affect the growth of the Nigerian health sector is poor financial constraint, poor maintenance of facilities in hospitals and epileptic power supply. These listed elements are lacking in Nigeria General hospitals. However, among our respondents it was stated that these problems affecting the growth of the health sector can be fixed. Furthermore, from our conducted interviews these missing elements were addressed by healthcare providers in this study. The researcher reached a resolution that the government of Nigeria needs to establish a system that will help address the issues of recording keeping and information sharing system in the health sector. Thus, the researcher proposed a framework that would guide this process and help eliminate the obstruct to its implementation in the country. See Figure 8 below;

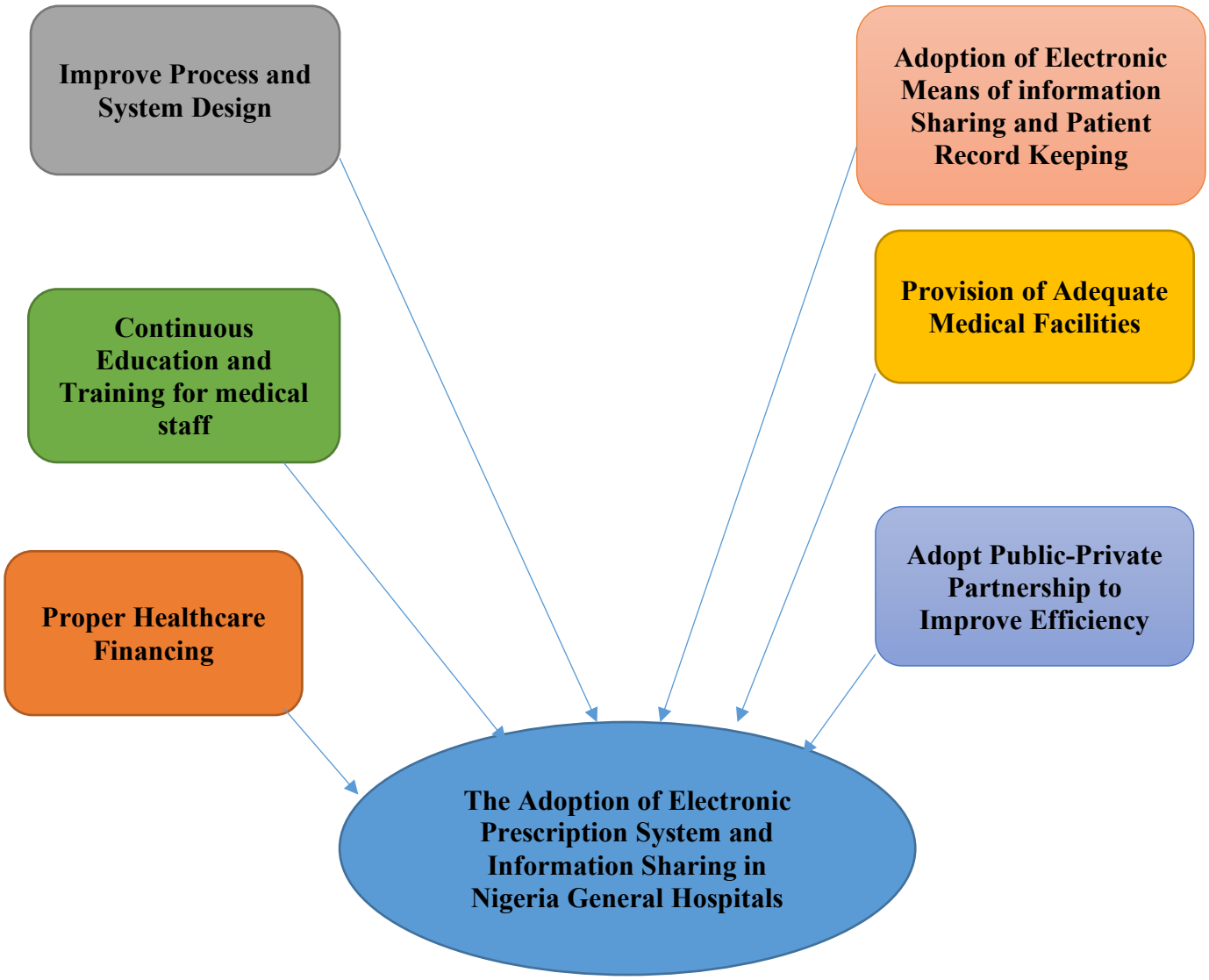

Figure 8. Proposed Framework for the Successful Adoption of Electronic Prescribing System in Nigeria

Source: Author

5.1.1 Proper Healthcare Financing

Proper health funding involves the functions of healthcare system that is mostly concerned in collection and mobilization of money allocated to cover the needs and want of the citizens to provide proper health system to them. Proper health financing is to improve human welfare, because without a good financing, healthcare providers would not be employed, and no medicine would be available for patients. However, provision of healthcare financing is more than just generating funds, it is also very important to understand the factors that can be used to sustain and grow the healthcare system. A proper healthcare financing can impact the general performance which includes quality, accessibility and efficiency of three tier of healthcare system that is in Nigeria, which include the tertiary, secondary and primary healthcare system.

5.1.2 Continuous Education and Training for Medical Staff

The healthcare industry is exhibiting high development rates in both developing and developed countries around the world. There's a growing absence of experienced and well-trained medical staff in the healthcare environment in various areas around the world. To counter this, there's a need raise awareness that education doesn't come to an end, once professional is in the middle of their career. Since the healthcare sector is consistently developing, technologies considered best practice today can change drastically. In Nigerian settings, there is a need for continuous training for health professional in the country on information sharing and recording keeping and how electronic prescribing system works. Furthermore, Nigerian government needs to continuously educate its citizens on what the technology entails and encourage further research on the technology. The government can achieve this by organizing conferences, trainings and workshops. The government can as well raise aware programs through social media platforms, radio station and television programs.

5.1.3 Improve Process and System Design

In Nigeria, for electronic prescribing system to be implemented effectively, processes need to be well structured in the context of the general health system and other contiguous service. Electronic prescribing systems must be approached as a socio-technical innovation. From how the world has is evolved with the use of technology, it is important to understand that for successful implementation of electronic prescription and information sharing system, there must be a good relationship between human and socio-

technical system that can enable the success of the technology in the health sector. Nigerian government should create a means in organizational work design that will create better interaction between healthcare provider and technology.

5.1.4 Adopt Public-Private Partnership (PPP) to Improve Efficiency

The Nigerian government should consider working with international experts on improving the e-health structure in Nigeria. This is one aspect the government should look into, there is the need for the government to cooperate with information technology startups dealing with electronic health management.

Also, the government should embrace a public-private partnership, this means that there should be a strong partnership between the government and the private sector in other to have a successful healthcare delivery system.

5.1.5 Implementation of Adequate Infrastructure

In other to achieve success towards the implementation of electronic prescription and information sharing system, it is important for the government of Nigeria to provide enough medical facilities to help improve efficiency in the General Hospital and all these must be put in place to attain success. From our conducted interviews with healthcare professionals were seen to address issues they felt the government was neglecting, to implement this technology, the government must make provision for constant power supply.

5.1.6 Adoption of the Electronic Form of Record Keeping Integrating the Use of Electronic Prescribing System

This is another important part of this. For the successful adoption of this technology I urge the Nigerian government to first implement the use of electronic record keeping system, some literature stated that all countries that had successful implement electronic prescribing system for healthcare delivery were making use of electronic record keeping system. However, to have a successful adoption there is a need for the form of record keeping in the health sector to be digitalized. This would enable the easy transition to implement the new technology.

5.2 Limitations

This section explains the limitation of our study and it has to do with the structure of our case study. According to Yin in 2003, he emphasized that when research design is used, the study is often addressed as to if it can be seen as scientific because of the investigator impact on the study which may bring result in the study being influenced (Yin,2003). However, in order to address its lack of rigor, the investigator must make sure that different sources of evidence are utilized, the research is carried out in a way that conforms to the case study approach and that the research structure is valid (Krusenvik, 2015).

According to Hyde et al, In spite the absence of vulgarity, they argued that the use of case study design is meant to reveal theories and not use to generalize the overall findings .They are of the opinion that case studies are generalizable in proving hypothesis cases and not to populations or the universe, Hence, we can induce the use of single case study research and this may be used to make a theoretical generalization on the phenomenon being studied and not to make generalization about the whole universe or population.

6 Conclusion

This study was aimed to assess the acceptance level of electronic prescription and information sharing system in the Nigerian secondary healthcare facilities. In order for us to attain success implementing electronic prescription and information sharing in the Nigerian healthcare setting, it is important to investigate and access the acceptance level. The adoption of electronic prescribing system has significant role in improving healthcare delivery system and reducing medication error. The application of technology acceptance model toward the adoption of electronic prescription and information sharing system will enhance the empirical picture of healthcare providers and examine their attitude.

This study has revealed the barriers that can slow down the implementation of electronic prescription and information system. Although from the conducted interviews, healthcare providers are positive to the usefulness and implementation of the technology. From the result gathered, human factor issues have been pointed out as a major problem affecting the adoption of the technology which is low awareness level on e-health, low computer literate among non-medical staff and resistance from healthcare professionals. Our respondents believe that electronic prescribing system can be easily adapt to and it can be user friendly (easy to use) compared to paper-based system which has lots of barriers in healthcare delivery. Our respondents accepted that infrastructural challenges such as; epileptic power supply and poor IT facilities. They went further to address human factor challenges such as; low computer literate and medical professional resistance. And lastly political challenges such as; lack of proper decision making and lack of proper healthcare funding. All the participant concurred on the advantages of implementing the technology at the hospital where they work. Some of the benefits surrounding electronic prescription and information sharing system is to enhance accessibility, healthcare delivery, decrease medication error, and create easy communication between hospitals

6.1 Future research

In the course of writing this master's thesis, a couple of study areas have been identified for possible future works. Future search could be to assess the need for proper data base

management in the Nigerian healthcare delivery system.Another research possibility is carrying out further studies on the development of an interoperability model among hospitals in Nigeria, to enable hospitals have smooth patient data exchange and communication.

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Appendix 1 Interview Questions

Step 1. **Discussion about the interviewee's roles and position**

What is your name?

What is your responsibility?

How long have you been practicing?

What are your daily activities?

Step 2. Understanding of EPS and EHR.

What how much do you know about electronic prescription system?

Do you prescribe electronically or manually?

Step 3. The Interviewer present the goal of the research.

How do you manage patient medical records in the hospital?

Can you explain how patient record is accessed?

What is your take on moving from the paper-based method of prescription to electronic form?

How much of computer knowledge do you have?

What do you perceive as challenges that might hinder the adoption of EPS?

How important is the need for the adopting electronic prescription?

How do you access patient medical history before prescribing new medication?

How do you address the need for getting patient's medical records from other health centers?

Can you prescribe medications to the patient without knowing his/her medical history?

Step 4. Measuring criteria for the effectiveness in the secondary healthcare facilities.

What are the criteria that you can use for measuring the effectiveness of the technology when implemented?

What do you perceive as benefits surrounding the adoption electronic prescribing and information sharing system?

Do you have any criteria for measuring the productivity in using the technology when implemented?

Step 5. Roles of stakeholders play in the system.

Do you consider yourself a stakeholder?

Do you think using the adoption of electronic prescribing and information sharing system will help increase productivity in your facility?

Do you think electronic record management will increase efficiency in healthcare delivery facility?

Appendix 2 Survey

SURVEY

Dear Participant,

I am a master's student of e-Governance Technologies and Services at Tallinn University of Technology(Taltech). The aim of this survey is to assess and investigate the acceptance level in the adoption of electronic prescription in Nigeria. Please be assured that your response will be kept completely confidential. The questionnaire will not take more than 10-15 minutes to complete. Kindly answer the questions to the best of your knowledge.

Thank you!

SECTION A

By clicking on the button below, you acknowledge that your participation in this study is voluntary, that you are 18 years of age or older.

(_) I consent, begin the study

(_) I do not consent, I do not wish to participate

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1. Gender?

   Male (_) Female (_)

3. Age?

Less than 25years (_) 25-40years (_) 40-50years (_) 50-60years (_) 60-70years (_)

4. How often do you go to the pharmacist with a prescription?

More than 1X/month (_) Once a month (_) Once in 6months (_) Once a year (_)

5. If you go to the pharmacist with a prescription, how many medications are involved?

1(_) 2-5 (_) 5-10 (_) More than 10 (_)

6. How often are these prescriptions for someone else?

Never (_) 25% (_) 50% (_) 75% (_) Always (_)

SECTION B: Select ''Yes or No''

7. Are you familiar with the current electronic prescription system? (It is a technology framework that allows physician and other medical experts to write and send prescriptions to a participating pharmacy electronically instead of using paper-based system.

   Yes (_) No (_)

8. Does your doctor prescribe electronically?
   Yes (_) No (_)

9. If you would have the choice, would you choose the paper-base system or E-prescription system (Briefly explain)

(_) Paper-based prescription, because ----------

(_) e-Prescription, because----------

10. Do you feel paper-based prescription is a threat to your privacy?

Yes, very much (_) Yes, a little bit (_) No, the chance is small (_)

SECTION C: "Decrease, Increase or Neutral"

11. Do you think electric prescription will increase or decrease the abuse of drug?

Decrease drug abuse (_) Increase (_) Neutral (_)

12. How Electronic prescription (EP) affects patient safety?

Decrease (_) Increase (_) Neutral (_)

13. How does (EP) affects patients convenience?

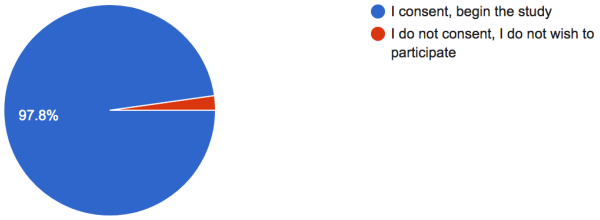
Decrease (_) Increase (_) Neutral (_)

14. Do you see disadvantages in the adoption of electronic prescription system? Briefly explain

Appendix 3 Results of the Survey

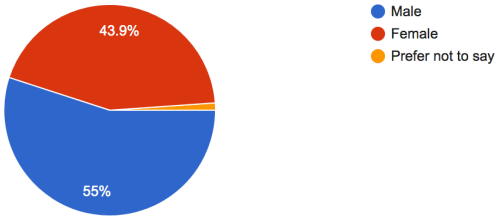
By clicking on the button below, you acknowledge that your participation in this study is voluntary, that you are 18 years of age or older.

180 responses



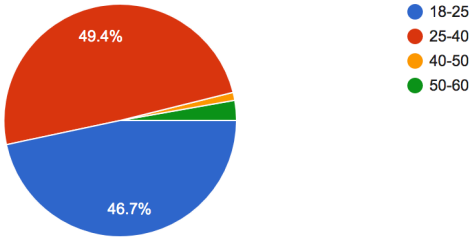
Gender?

180 responses



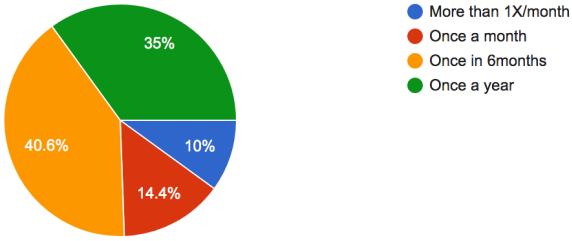
Age?

180 responses



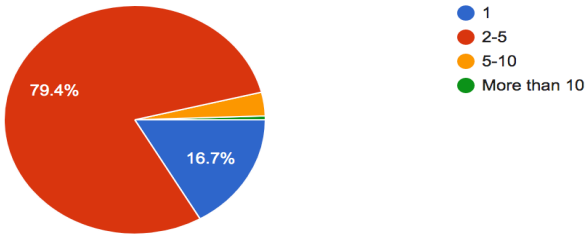
4. How often do you go to the pharmacist with a prescription?

180 responses



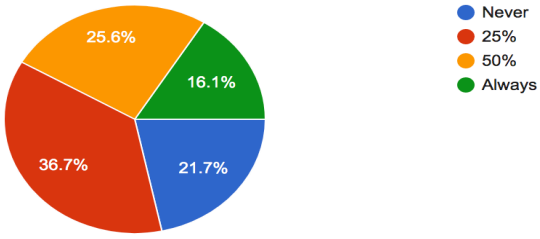
5. If you go to the pharmacist with a prescription, how many medications are involved?

180 responses



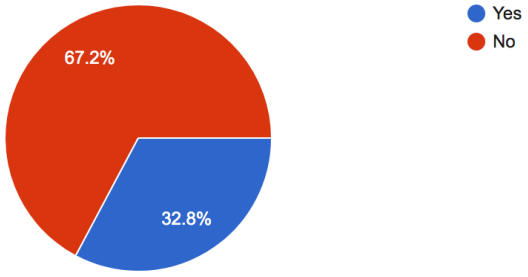
6. How often are these prescriptions for someone else?

180 responses



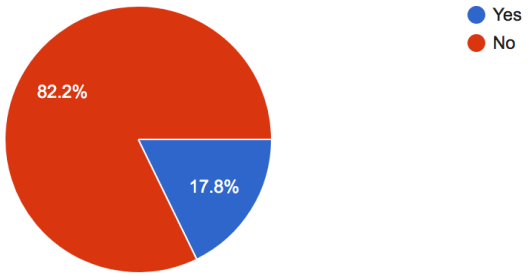
7. Are you familiar with the current electronic prescription system? (It is a technology framework that allows physician and other medical experts to write and send prescriptions to a participating pharmacy electronically instead of using paper-based system.

180 responses



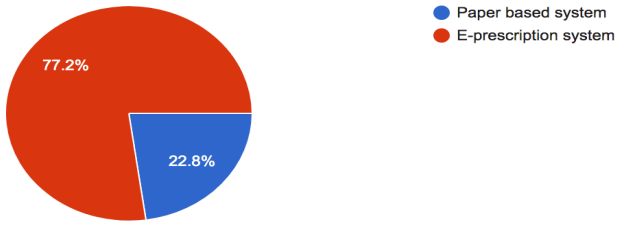
8. Does your doctor prescribe electronically?

180 responses



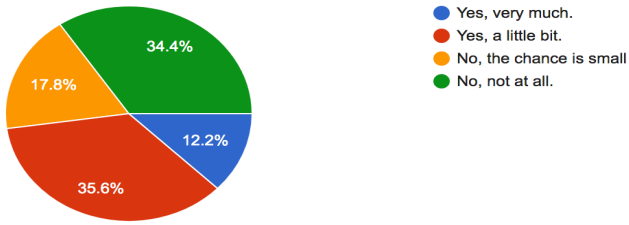
9. If you are given the choice, would you choose the paper-based system or E-prescription system

180 responses



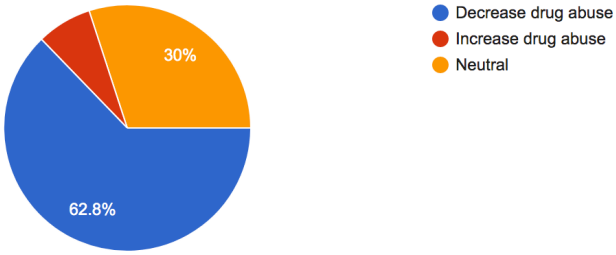
10. Do you feel paper-based prescription is a threat to your privacy?

180 responses



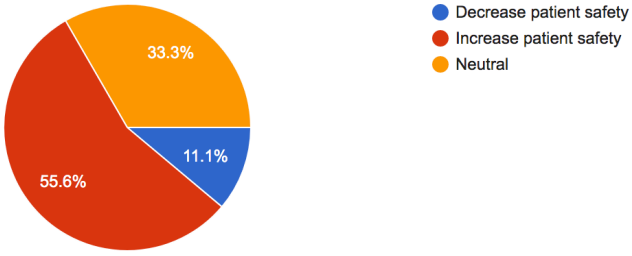
11. Do you think electronic prescription will increase or decrease the abuse of drug?

180 responses



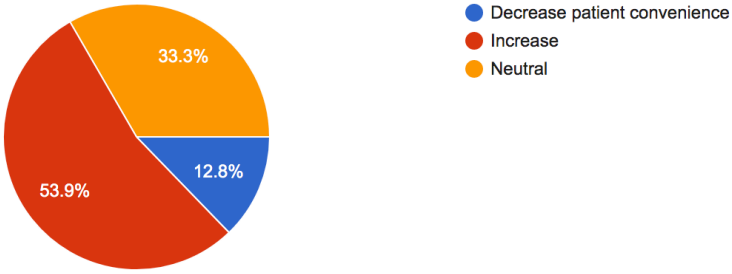
12. How do you think electronic prescription will affect patient safety?

180 responses



13. How do you think electronic prescription will affect patients' convenience?

180 responses



Appendix 4. Link to the interview audio recordings

Click the link provided below:

https://drive.google.com/drive/folders/1ppX-pUcwh7MqazydaL4k2Vx-c81pOu6n

Appendix 5. Thematic Map of All Categories and Codes